The influence of environmental factors on spineless cactus pear (*Opuntia* spp.) fruit yield in Limpopo Province, South Africa

by

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Dissertation submitted in fulfilment of the requirements for the degree of Magister Scientiae Agriculturae (Agrometeorology/Horticulture)

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DECLARATION

I hereby declare that the dissertation submitted for the degree of Magister Scientiae Agriculturae at the University of the Free State is my own independent work and has not previously been submitted to another University/Faculty.

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Johannes Petrus Potgieter

DEDICATION

I dedicate this dissertation to

my two daughters Sandra and Adéle

who mean the world to me

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ABBREVIATIONS AND ACRONYMS

°C	Degree Celsius
Alt	Altitude (m)
AMMI	Additive Main Effects and Multiplicative Interaction
ANOVA	Analysis of variance
Anon.	Anonymous
AppN	Applied nitrogen (kg ha^{-1})
ARC-ISCW	Agricultural Research Council: Institute for Soil, Climate and Water
ASV	AMMI stability value
B	Boron
BT	base temperature
C_3	three-carbon photosynthetic pathway
C_4	four-carbon photosynthetic pathway
Ca	Calcium
CAM	Crassulacean acid metabolism
$Ca,Mg(CO_3)_2$	Dolomitic lime
$CaSO_2.2H_2O$	Gypsum
cf	Number of fertile cladodes per plant (n)
clp	Number of cladodes left after pruning per plant (n)
CO_2	carbon dioxide
CU	chill unit
CV	Coefficient of variation (%)
df	Degrees of freedom
DL	day-length (days)
dS cm^{-1}	deci Siemens per centimetre
ed.	Editor
Eds.	Editors
EPROM	Erasable Programmable Read Only Memory
ET	evapotranspiration
ETo	evapotranspiration potential (mm)
ETx	maximum evapotranspiration (mm)
ETn	minimum evapotranspiration (mm)
E/W	East/West
fat	Number of fruit left after thinning per plant (n)
FAO	Food and Agricultural Organisation of the United Nations

FDP	Fruit Development Period (days)
frost	frost days
fs	Number of fruit set per plant (n)
fy	Fruit yield (t ha^{-1})
g	gram (s)
g L^{-1}	gram per litre
G X E	Genotype X environment interaction
G X L	Genotype X location interaction
H_o	Null hypothesis
H_a	Alternative hypothesis
ha	hectare
HU	heat units
IC	Infruitec chilling units
IPCA	Interactive Principal Component Analysis
K	Potassium
kg	kilogram(s)
L	litre
Lat	Latitude
Long	Longitude
LSD	Least significant difference
m	metre(s)
m.a.s.l.	metre above sea level
MCS	Mike Cotton Systems
mg	milligram(s)
Mg	Magnesium
MJ m^{-2} s^{-1}	Mega Joules per square metre per second
mm	millimetre(s)
mol m^{-3}	Mole per cubic metre
mS m^{-1}	Milli Siemens per metre
n	Number
N	Nitrogen
Na	Sodium
NaCl	Sodium chloride
NH_4OAc	Ammonium acetate
NRF	National Research Foundation
ns	Non-significance
N/S	North/South

p	Probability
P	Phosphorus
pa	Per annum
PAR	Photosynthetic active radiation (µmol m^{-2} s^{-1})
PCA	Principal component analysis
PC	Positive chilling units
PEP	Phosphoenolpyruvate
PEP Case	Phosphoenolpyruvate carboxylase
pH	Negative logarithm of the hydrogen ion
PPECB	Perishable Products Export Control Board
PPF	Photosynthetic photo flux (µmol m^{-2} s^{-1})
r	Correlation coefficient
Rad	radiation (MJ m^{-2} s^{-1})
rain	precipitation (mm)
R	South African Rand (ZAR)
R^2	Coefficient of determination
RC %	Relative contribution percentage
RC	Richardson chilling units
RCBD	Randomised complete block design
Resist	soil resistance
RH	Relative Humidity (%)
RHx	Maximum Relative Humidity (%)
RHn	Minimum Relative Humidity (%)
Rubisco	Ribulose-1, 5-bisphosphate carboxylase/oxygenase
s	second
SA	South Africa
SACPGA	South African Cactus Pear Growers Association
SAWS	South African Weather Service
sem	Standard error of the mean
sp.	species
spp.	Plural abbreviation of species
SS	Sum of squares
t	Metric ton
t ha^{-1}	ton per hectare
Tave	Mean average temperature (^oC)
Tn	Mean minimum temperature (^oC)
TT	thermal time

Tx	Mean maximum temperature (^{o}C)
USA	United States of America
WMO	World Meteorology Organisation
WRC	Water Research Commission of South Africa
WS	wind speed (m s^{-1})
WUE	Water Use Efficiency
Zn	Zinc

Numbers 1, 2, 3, 4 represent period of the year

1	April to August (after harvest to new season)
2	May to August (winter)
3	August to March (fruit development period)
4	April to March (whole year)

ABSTRACT

The influence of environmental factors on spineless cactus pear (*Opuntia* spp.) fruit yield in Limpopo Province, South Africa

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Limited information is available on the response of local cactus pear cultivars to environmental factors that influence fruit yield. Eleven cultivars were evaluated in three diverse agro-climatic areas over seven production seasons in the Limpopo Province to assess their environmental adaptability. Significant differences between cultivars, areas and production years for five fruit yield components were evident. A strong genotype by environment interaction was observed, although some cultivar characteristics were genetically controlled. The most suitable production area is the cool mid-altitude area of Limpopo Province. Cultivars that can be recommended for fresh fruit production are: "Algerian", "American Giant", "Gymno Carpo", "Malta", "Morado", "Nudosa" and "Zastron". Fruit yield was significantly influenced by minimum temperature and plant macro nutrients. Soil phosphorus levels above 20 mg kg^{-1} and applied nitrogen higher than 100 kg ha^{-1} $year^{-1}$ had a positive effect on fruit yield. Soil pH did not influence the fruit yield of the cultivars tested. None of the cultivars tested had a winter chilling requirement to become fertile. Vegetative growth was stimulated by increased solar radiation. Cactus pear plants can be considered to be fully mature from the fifth year onwards. Environmental adaptability is related to species differences rather than plant morphological differences. Plant growth habit changed markedly in different environments. To obtain high fruit yields, it is important to match a cultivar with prevailing environmental conditions of the area. Fruit yield in cactus pear is a function of the number of fertile cladodes, the number of fruit set, the number of fruit left after thinning and individual fruit mass. Research into orchard practices, in particular pruning, and evaluation of the existing cactus pear germplasm should receive attention. As a "new" cultivated fruit crop it offers real solutions towards mitigation of the effects of drought in arid and semi-arid parts of Limpopo Province.

Keywords: AMMI, chilling, correlation, fertility, fruit set, fruit yield, nitrogen, phosphorus, regression, temperature

OPSOMMING

Die invloed van omgewingsfaktore op doringlose turksvy (*Opuntia* spp.) vrugopbrengs in Limpopo Provinsie, Suid-Afrika

Johannes Petrus Potgieter

Beperkte inligting rondom die invloed van omgewingsfaktore op die prestasie van plaaslike turksvykultivars ten opsigte van vrugopbrengs is beskikbaar. Elf kultivars is in drie uiteenlopende agroklimaatomgewings oor sewe produksiejare in Limpopo Provinsie geevalueer om hul omgewingsaanpassing te bepaal. Betekenisvolle verskille tussen kulitvars, areas en produksiejare ten opsigte van vyf vrugopbrengskomponente is bevind. Alhoewel sekere kultivareienskappe geneties van aard is, is ‘n duidelike interaksie tussen genotipe en omgewing bevind. Vrugopbrengs is ‘n funksie van die aantal vrugbare kladodes, aantal vrugte op die plant na uitdunning en vrugmassa. Die koel gemiddelde hoogte bo seevlak proefperseel is bevind as die mees geskikste produksiearea. Slegs “Algerian”, “American Giant”, “Gymno Carpo”, “Malta”, “Morado”, “Nudosa” en “Zastron” voldoen aan die minimum vrugopobrengsnorme, terwyl “Blue Motto”, “Direkteur”, “Fusicaulis” en “Skinners Court” nie aanbeveel word vir vrugproduksiedoeleindes nie. . In hierdie studie is vrugopbrengs beduidend deur minimum temperatuur en voedingstofstatus van die grond, veral t.o.v. die makro-elemente beinvloed. Vrugpbrengs is positief beinvloed by fosfaatvlakke hoër as 20 mg kg^{-1} en toegediende stikstof hoër as 100 kg ha^{-1} $jaar^{-1}$. Grond pH het geen effek op vrugopbrengs gehad nie. Vegetatiewe ontwikkeling is gestimuleer by verhoogde stralingsvlakke. Kultivars in die studie het geen kouebehoefte getoon nie. Volle boordvolwassenheid word reeds vanaf die vyfde produksiejaar bereik. Plantmorfologie is nie geskik om die aanpassingsvermoë van kultivars vir ‘n bepaalde agro-klimaatsarea te bepaal nie. Omgewingsaanpassingsvermoë kan eerder deur spesie as ‘n bepaalde plantmorfologieverskil bepaal word. Alhoewel dit van kardinale belang is om die korrekte kultivar vir ’n bepaalde omgewing te selekteer, kan boordpraktyke soos snoei ook gebruik word om vrugopbrengs te bevorder. Verdere navorsing is noodsaaklik om gepaste boordpraktyke te bepaal en om die volledige Suid-Afrikaanse turksvygenepoel te karakteriseer en dit in uiteenlopende omgewings van die land te evalueer vir vrugopbrengspotensiaal. Die veeldoelige turksvy is ‘n moontlike oplossing as droogte-versagtende maatreël in die ariede en semi-ariede dele van Limpopo Provinsie.

RESUMEN

Influencia del ambiente en el rendimiento de fruta del nopal tunero sin espinas (*Opuntia* spp.) en la Provincia de Limpopo, Sudafrica

Johannes Petrus Potgieter

La industria del nopal tunero es una actividad relativamente pequeña pero de rápido crecimiento en Sudáfrica, sin embargo la información disponible sobre la respuesta de las variedades locales a factores ambientales y su influencia en el rendimiento es muy limitada. Por lo anterior es necesaria la evaluación de variedades en diferentes ambientes para la elaboración de recomendaciones. Los datos de nuestros estudios mostraron diferencias significativas en los componentes de rendimiento del fruto de once variedades a través de tres ambientes diferentes y siete ciclos de producción. Aunque algunas características son genéticamente controladas, hubo una fuerte interacción genotipo x ambiente en parámetros relacionados con componentes del rendimiento. Las variedades que llenan las normas mínimas para rendimiento de fruto fueron “Algerian”, “American Giant”, “Gymno Carpo”, “Malta”, “Morado”, “Nudosa” y “Zastron”. El área con mayor aptitud para la producción de tuna fue la zona de altitud media y clima fresco de Limpopo. El rendimiento de tuna esta en función de el numero de cladodios productivos, el numero de frutos después del raleo y el peso de fruto. El rendimiento fue influenciado significativamente por las temperaturas mínimas y los macronutrientes. En comparación con otras áreas tuneras del mundo, se obtuvo una productividad relativamente alta en condiciones de temporal. El rendimiento se estabilizo a partir del quinto año del establecimiento. La morfología de la planta no fue útil para determinar la adaptación al ambiente del nopal tunero en Limpopo. La adaptación al ambiente estuvo relacionada a diferencias atribuibles a las especies más que a las diferencias morfológicas. Ciertas prácticas de cultivo pueden ser usadas para manipular la mayoría de los componentes del rendimiento, sin embargo, la adaptación de la variedad a las condiciones ambientales prevalecientes en el área es de vital importancia. La investigación sobre prácticas de manejo y la caracterización del total del germoplasma Sudafricano en otros ambientes del país debe recibir atención. La selección apropiada de áreas de producción conjuntamente con la variedad adecuada al área, conducirá a la obtención de altos rendimientos de fruta y posiblemente altos ingresos. El nopal tunero es un cultivo de propósito múltiple que ofrece una solución real para mitigar de los efectos de la sequía en las zonas áridas y semiáridas de algunas áreas de la Provincia de Limpopo.

CHAPTER 1

GENERAL INTRODUCTION

Arid and semi-arid regions cover approximately one third of the total land surface of the globe (Fisher & Turner, 1978; Nobel, 1994). According to Nobel (1994), arid regions receive less than 250 mm and semi-arid regions between 250-450 mm rainfall annually. More than half of the land surface of South Africa (SA) is rated as potential desert with large areas of the Northern Cape and Limpopo at very high risk of desertification (Tyson, 1981; Preston-Whyte & Tyson, 1988), with moderate and severe droughts the rule rather than the exception (De Kock, 1983). Drought is a normal and natural feature of many arid and semi-arid regions. Le Houérou (1994) defines agricultural drought as a scarcity of rainfall with respect to the median that negatively affects agricultural production for a period of several months to years, extending over a large geographical area.

1.1 Crop production constraints in South Africa

Only 11% of the surface area of South Africa is suitable for crop production of which 4% is of a high agricultural potential (Terblanche, 1997). According to Le Houérou (1994), 64.1% of the total surface area of South Africa, Lesotho and Swaziland receives 500 mm rainfall or less per year. Not only is rainfall too low for profitable dry-land crop production in most parts of South Africa, but the large variability and irregularity of rainfall exacerbates the already unstable climate for food production (Terblanche, 1997). Therefore, the most important factor limiting agricultural production is the availability of water (De Kock, 1983; Anon., 2006) and not land as is generally believed (Bannayan *et al*., 2007). Given that an annual rainfall of 500 mm is the generally acceptable minimum for successful cereal grain crop production under dry-land conditions, approximately two thirds of southern Africa is then marginal for crop production purposes.

It is estimated that South Africa will have 60 million inhabitants by 2015 (Le Houérou, 1994). This will significantly increase the stress on the natural resource base (Sivakumar *et al*., 2000). In these dry areas, economic activities are usually minimal and most rural people rely on agriculture to generate a living (Garcia-Hernandez *et al*., 2006).

The expansion of cultivated areas during good rainfall years into areas not suited to sustainably supporting such activities, often results from increased population pressure and the concurrent need for increased food production. Conversely, during times of declining rainfall or drought, the resultant ecological imbalance may lead to the collapse of a dry-land farming system and the hastening of conditions leading to land degradation

and desertification (Tyson, 1981). The rapidly growing human population emphasises the fact that water will probably become the most limiting natural resource during this century. Land degradation will have a severe negative impact on the ecology, economy and social welfare of people (Sivakumar *et al*., 2000) as already evidenced by regular crop failures and accompanying food insecurity, particularly in rural areas.

In addition it is a commonly known fact that potential irrigation expansion in Limpopo, as in most other parts of the country, is minimal. Due to greater demands on limited water supplies, irrigated agriculture (which includes most horticultural commodities) will have to become more water efficient (Wolstenholme, 2002). Water shortages and resultant plant stresses are likely to be the biggest limiting factors in crop production especially where industrial and human activities will demand an increasing proportion of already limited water supplies (Wolstenholme, 2002). Future agricultural food production will therefore have to focus on improving food security by employing agricultural systems that are ecologically sound and economically sustainable (De Kock, 1983; Swart, 2006). Since most of the natural water sources in South Africa are already used, alternative future solutions will entail:

- more sensible use of the resource by levying charges for water consumed,
- re-utilisation of drainage water from irrigation schemes,
- more efficient use of irrigation water where as much as 30% is currently wasted,
- re-utilisation of sewage and effluents (grey water) for agricultural use,
- increased utilisation of crops with a high water use efficiency (WUE) (Le Houérou, 1994).

1.2 Climate change

In addition to the above, predictions of increased climate change and global warming will place even greater pressure on already limited water sources in southern Africa. Climatic changes due to global warming are expected to decrease rainfall, increase mean temperatures and increase atmospheric CO_2 content, making it more difficult to grow crops with high water requirements (Nobel, 1994). According to Wolstenholme (2002), most scientists agree that there is a trend towards a warmer global environment and that mean temperatures will on average increase by 1.5^{o}C to 5.8^{o}C by the year 2100, threatening to turn large semi-arid areas into deserts (Midgley *et al*., 2002). These higher temperatures will have severe effects on agriculture such as greater weather variability, loss of species diversity, shifting of agricultural production areas and more vulnerable and water stressed food crops (Wolstenholme, 2002). According to Midgley

et al. (2002), it is predicted that in South Africa mean temperatures in January will increase most in the central interior and Northern Cape (2.5-4.5^{o}C), while summer rainfall will decrease by between 5% in the northern parts of the country (Limpopo) and 25% in the eastern and southern Cape. These predictions illustrate the severity of the situation for crop production and water provision in general (Midgley *et al*., 2002).

1.3 Cactus pear as drought-tolerant plant

Laboratory simulation studies have shown that cactus pear, which has a high WUE, might play an increasingly important role in the agricultural systems of arid and semi-arid regions given a future with increased atmospheric CO_2 concentration (Nobel & Israel, 1994; Nobel, 1995). In contrast to most other crops, the enhancement of the greenhouse effect should lead to the spread and increased productivity of this species. For example, a doubling of atmospheric CO_2 concentration, would lead to higher biomass production in cactus pear by 23% to 55% due to increased WUE (Barbera, 1995; Nobel, 1995). Reduced rainfall caused by anticipated climatic change will therefore favour CAM plants with their higher WUE (Le Houérou, 1994), while the high potential productivity of *Opuntia* species may be used to slow the tendency of increasing atmospheric CO_2 levels (Nobel, 1994). It is thus foreseen that the cultivation of cactus pear may assume greater agricultural importance in the future since a larger part of the land area of Southern Africa is destined to become arid or semi-arid due to climate change (Snyman, 2006).

Within these natural resource constraints, and uncertain future prospects for crop production, the question can rightfully be asked what can be done to increase levels of crop production in arid and semi-arid environments. There are a number of drought-management strategies that should be researched such as:

- employing drought-avoiding techniques, such as staggered planting times or later planting dates with shorter growing season annual crops,
- optimal usage of rainfall by water harvesting and mulching,
- optimal usage of scarce irrigation water sources by improved irrigation scheduling and,
- planting drought-tolerant crops such as cactus pear (*Opuntia* spp.).

1.4 Role of new crops in sustainable development

It is estimated that there are over 250 000 flowering plant species in the world of which man only uses approximately 150-500 species (Sedgley & Gardner, 1989), while more than 95% of our calories and protein come from only 30 crops (Jaenicke & Hoeschle-Zeledon, 2006). However, throughout the ages, people have gathered and used over

7 000 plant species for various purposes (Williams & Haq, 2002). Many of these species grow in areas where farming conditions are unfavourable, such as arid areas (Jaenicke & Hoeschle-Zeledon, 2006). There is therefore a need to develop crop alternatives and opportunities in these semi-arid areas (Garcia-Hernandez *et al*., 2006).

Many minor food crops have not been adequately researched and exploited in response to the anticipated global climatic changes. "New" or alternative crops such as the cactus pear with inherent drought-tolerance may offer some real solutions and benefits in unfavourable climatic situations (Nobel, 1994). This is particularly so in less developed countries such as South Africa, where accelerated population growth and the need for sustainable agricultural development necessitate constant increases in productivity through the diversification of crops and better utilisation of under-utilised plants (Swart, 1998). The Opuntias hold considerable potential particularly for producing fruit, vegetables (immature cladodes) and animal fodder on semi-arid lands (Russel & Felker, 1987; Gathaara *et al*., 1989).

Opuntia species have been widely used in many semi-arid countries around the world. The land area devoted to cactus pear cultivation in 2001 was about 1.8 million hectares, mostly for fodder in northern Africa and northeast Brazil (Anon., 2006). Cactus pear as a fruit crop has grown commercially to over 100 000 ha distributed mainly through Mexico, Chile, Italy, South Africa, North Africa and the USA (Mondragon-Jacobo & Perez-Gonzalez, 2000). Cactus pear as a drought–tolerant crop has good potential for exploitation in arid and semi-arid areas of South Africa and has the following advantages:

- high potential productivity of both cladodes and fruit,
- high WUE due to the CAM pathway,
- multiple uses,
- adaptation to many varied environments (Barbera, 1995).

Many authors have highlighted the multitude of products that can be sourced for both humans and animals from this plant (Meyer & McLaughlin, 1981; Sawaya & Khan, 1982; Russel & Felker, 1987; Barbera *et al*., 1992; Inglese *et al*., 1995a; Felker, 1995; Le Houérou, 1996; Mohamed-Yasheen *et al*., 1996; Nefzaoui & Ben Salem, 2000). It is therefore a very useful plant for many semi-arid regions affected by land degradation and famine in South America, India and Africa, particularly when the expected global changes will increase aridity (Pimienta-Barrios *et al*., 1993).

1.5 Cactus pear cultivar recommendations

Despite the high WUE, and relevance of its multiple uses, the crop has received little horticultural research attention (Nobel, 1994; Inglese *et al*., 1995a; Le Houérou, 1996). According to Inglese *et al*. (1995) and Nerd & Mizrahi (1995) basal temperature, as well as thermal time for cladode fertility and fruit development are unknown (Inglese *et al*., 1995a). According to Inglese & Barbera (1993), no difference in fruit production has been verified, in terms of yield potential, as related to different environmental conditions. In addition, production in hot sub-tropical climates of Limpopo is a relatively new development and distinct differences in vegetative growth, flowering and fruiting patterns are apparent, although yet poorly documented (Brutsch, 1997b). Finally, the fruit production potential of cultivars at different plant ages is unknown (Felker & Guevara, 2001).

Although the use of cactus pear as a fodder crop has been known for many years in semi-arid areas of South Africa, its exploitation as a dry-land fruit crop is relatively new (Potgieter & Carstens, 1996). In the last 15-20 years, cactus pear became a commercial fruit crop with good local and export market potential. Of an estimated 73 000 ha under cultivation in South Africa, 1 500 ha is known to be intensively farmed for fruit production purposes. When compared to more common fruits, competitive prices were obtained on the national fresh produce markets as well as the export markets. During 2004/5, 800 t at an average value of R3353 t^{-1} were sold on the twelve major local fresh produce markets (National Department of Agriculture, 2004), while 735 t were exported as an exotic fruit mainly to Canada, Europe and the Middle East (PPECB, 2007). In addition, it is estimated that a similar amount of fruit are sold informally. The commercial cultivation of cactus pear in SA is therefore a relatively new activity with huge economic potential if conducted wisely (Brutsch, 1997a).

For many years, cactus pear cultivar recommendations in South Africa have been based on the performance of cultivars at Grootfontein, in the Karoo, Eastern Cape. Both Brutsch (1979) and later Wessels (1988d) noted that some cultivars yielded well in the Karoo interior (Grootfontein) but performed poorly in the higher rainfall area of Alice (Eastern Cape), and in Pretoria (Gauteng), indicating clonal differences in environmental adaptation. From trial results where many cultivars were tested, Wessels (1989) made cultivar recommendations for different climatic areas based on plant morphology. Despite these cultivar recommendations, producers regularly reported good vegetative growth in many cultivars but poor reproductive performance and fruit quality in different areas of the country. In the last number of years, commercial plantations of spineless

cactus pear have been established and Limpopo Province currently has the largest cactus pear plantations for fruit production in South Africa (Potgieter, 2002a).

Limited information is however available on plant response to environmental influences in these sub-tropical production areas (Brutsch, 1997b). As these areas differ vastly in terms of soil and climatic conditions from the traditional production areas such as the Great Karoo, area-specific information is needed to guide existing and new producers of the crop. Due to a complete lack of information on cultivar performance in these "new" areas, farmers experimented with many cultivars to find adapted ones (S. Rech, Consolata Estates, Haenertsburg, personal communication, 1990). These observations indicate a possible interaction between genotype and environment (G X E) that is exacerbated by limited research findings on the effects of environmental factors on the reproductive development of the genus (Inglese *et al*., 1995a). According to Barbera (1995), poor knowledge of plant x environment interaction may be accountable for large variances in cactus pear fruit yield. One of the major challenges for future research on this crop is determining the influence of environment on fruit productivity (Inglese *et al*., 1995a) which will allow an entire evaluation in order to identify suitable areas for cactus pear fruit production.

Turpin & Gill (1928) reported results from cultivar adaptability trials in five areas of South Africa but were mainly interested in fodder potential and gave less attention to fruit production. Later, cactus pear fruit trials were conducted in the Eastern Cape (Brutsch, 1979), Gauteng (Wessels, 1988a) and Central Karoo (De Kock, undated). However no comparative field trial data, together with accurate microclimate weather information is available to conclusively indicate specific environmental requirements of many economically important cactus pear cultivars. Because cactus pear is cultivated as a permanent crop, adaptability of a cultivar to a particular climatic area is probably the most important decision a prospective grower will have to make (Price & Zandstra, 1987). This fact highlights the importance of correctly matching the climatic requirements of all major cactus pear cultivars to various agro-climatic zones in South Africa, as it is unrealistic to expect the same level of performance in all environments.

Knowledge of the broad environmental requirements of a crop and of the critical ecological parameters of a particular locality is important as a first step in land-use planning (Wolstenholme, 1977). Horticultural tree crops have fairly specific climatic requirements and a limited range of adaptability and due to their perennial nature tree crops must be able to withstand climatic extremes occurring over a period of years (Wolstenholme, 1977). It is known that most sub-tropical tree crops show broad genotypic variation in response to many environmental factors and this provides a good

opportunity to select cultivars that are adapted to a particular agro-climatic region (Breedt, 1996). However, since environmental factors are interactive, cultivar selection should be based on responses to a range of environmental circumstances rather than on a single environmental factor or season (Breedt, 1996).

According to Breedt (1996), climatic variables are the most important criteria in crop selection because seasonal changes and intensity of some climatic variables such as rainfall amount, air temperature, wind speed, relative humidity, solar radiation, hail and frost occurrence all have important consequences for crop potential. In addition to climatic factors, the type, structure and fertility of prevailing soils may dramatically influence the yield potential of a specific cultivar due to different soil requirements (Breedt, 1996).

Although a large number of cultivars, differing in plant and fruit characteristics are available in South Africa (Brutsch, 1979; Wessels, 1988d), little scientific information concerning variations in cladode fertility and productivity under different climatic conditions is available (Nerd & Mizrahi, 1995a). This lack of information prompted Wessels (1988d) to express the need for thorough research into the specific climatic requirements of different cactus pear cultivars in South Africa. Similarly, Barbera (1995) emphasised that poor understanding of genotype x environment interaction is responsible for large worldwide variability in cactus pear yield. The value of a good cultivar as the basis for any horticultural industry should be self-evident and as a result, the need for intensive awareness to the problem of cultivar selection cannot be over emphasised (Schroeder, 1990).

To fully exploit the potential of cactus pear as a drought-tolerant crop in semi-arid areas, a thorough understanding of the ecophysiological and reproductive mechanisms under different environmental conditions is essential. Due to the complexity of factors that may influence fruit yield in cactus pear, the approach used in this study was to very broadly investigate and explore all potential environmental factors that may affect the reproductive development of the plant. The main environmental factors identified in this study would, in a further investigation, be more closely scrutinised where different species and cultivars would be separated per environment.

1.6 Broad research objectives

Although the importance of vegetative growth and development on fruit yield is fully acknowledged, this study focuses on understanding the environmental influences on reproductive growth and development. These results should provide a better understanding of the crop requirements and therefore a more scientific basis for devising

cultural practices to obtain higher yields in the cactus pear industry. Although reference will be made to the spiny prickly pear plant and its invasive nature, this study is concerned only with the spineless or Burbank types cultivated for fruit and fodder in Limpopo Province. Although the multitude of other uses of cactus pear are important, only matters related to fruit production will be dealt with in this dissertation.

In this study, literature that deals with the environmental factors affecting the reproductive biology of the plant will be reviewed. From this review, broad objectives and a hypothesis was developed and suitable experiments planned to test this hypothesis. Very few reports on fruit yield of cactus pear as a function of plant age are available (Ratsele, 2003; Felker *et al*., 2005), therefore this study attempts to provide information on the reproductive potential of a number of cultivars over seven production years in diverse environments. Data will be collected on the vegetative measurements closely related to fruit yield and yield components and results statistically analysed. Finally, the hypothesis will be accepted or rejected based on the results of the study and then practical recommendations will be made to guide farmers on what cultivar to plant and which production areas in Limpopo to select.

Although specific objectives were set in each of the research chapters, the broad overall aims of this study were to:

- establish if there are differences between cultivars, areas and production years in terms of fruit yield and its components,
- determine if there is G X E interaction of fruit yield in cactus pear cultivars grown in three diverse agro-climatic zones, thereby identifying adapted and superior cultivars for future cultivation and breeding,
- determine the relationship between fruit yield variables and environmental factors,
- develop statistical models of best fit by means of a regression analysis to determine which of the environmental factors explains the most variability in fruit yield,
- determine if the additive main effects and multiplicative interaction (AMMI) model, as a multi-variate analysis technique is suitable to provide accurate information on the response of cactus pear cultivars to different environments.

1.7 Hypotheses

From the objectives, the hypotheses developed for this study are as follows:

- H_o: there is no difference in yield and its components of eleven cactus pear cultivars planted at three different agro-climatic areas in Limpopo Province.
- H_a: there is a difference in yield and its components of eleven cactus pear cultivars planted at three different agro-climatic areas in Limpopo Province.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Cactus is the common name for the large and diverse dicotyledonous family Cactaceae, which has approximately 1 600 species in 122 genera (Gibson & Nobel, 1986), and close to 300 species of *Opuntia* (platyopuntias) (Scheinvar, 1995; Mohamed-Yasheen *et al*., 1996).

The platyopuntias, of which the stems are flattened segments (cladodes), are the most important group commercially (Gibson & Nobel, 1986). *Opuntia ficus-indica,* a member of the platyopuntias, is cultivated in more than 30 countries in both hemispheres and across all continents except Antarctica (Inglese *et al*., 2002a) as a multi-purpose crop (Russel & Felker, 1987; Nobel, 1988).

It is believed that the *Opuntias* originated in the tropical areas of the Americas (Pimienta-Barrios, 1990). However, due to the dispersal of various species by early users and the resultant hybridisation between species, the place of origin of the most widely grown cactus pear species, *Opuntia ficus-indica* is not known with certainty (Griffiths, 1909; Nobel, 1994). The largest concentration of cacti species occurs in the southern third of North America through Central America, to the northern half of South America (Nobel, 1988). More than 70% of all the *Opuntia* species occur in the arid to semi-arid regions of Mexico, Argentina, Peru and Chile (Gibson & Nobel, 1986).

Cactus pear was spread from Mexico to many countries such as Spain, Portugal, Italy, Greece, Israel, Australia, South Africa, Brazil, Argentina, Columbia and USA (Pimienta-Barrios, 1990; Brutsch & Zimmermann, 1995; Casas & Barbera, 2002). In the early 1990s an estimated 60 000 ha was cultivated worldwide for fresh fruit production, more than 80% of which was in Mexico (Nobel, 1994). In many regions of the world, cactus pear has become part of the natural landscape (Barbera, 1995) to the extent that in South Africa many people believe the plant to be indigenous.

More than 70 cactus pear cultivars are available in South Africa (Potgieter & Smith, 2006), which has the largest cactus pear germplasm source in Africa and is second only to Mexico in terms of number of accessions. However, only a few are planted for commercial fruit production (Potgieter & Smith, 2006). These differ in terms of fruit yield, colour, pulp percentage, peel thickness, post harvest physiology and response to environmental factors (Chapman *et al*., 2002). Unlike South Africa and Mexico, that

have large and genetically diverse germplasm collections, other countries rely on only a handful of cultivars for commercial cactus pear fruit production (Inglese *et al*., 2002a).

2.2 Main cactus pear fruit production areas in South Africa

Brutsch (1979) and Brutsch & Zimmermann (1993) documented the cactus pear industry in South Africa, including the utilisation of both the prickly pear and the cultivated spineless cultivars, in detail. The industry is roughly divided into a subsistence and commercial sector where the former is based on the wild or naturalised cactus pear that is widely naturalised in the drier areas of the Eastern Cape (Brutsch, 1988) and Limpopo. It is estimated that roughly the same quantity of fruit sold in the formal markets is also sold in the informal markets, especially from road side sales (Brutsch, 1988; Nobel, 1994). On the other hand, a small but reasonably well developed commercial sector is distributed in virtually all provinces of the country, including the temperate Gauteng Province and the predominantly sub-tropical Limpopo Province (Brutsch & Zimmermann, 1993).

Although the naturalised cactus pear is still very abundant in the Eastern Cape, the area is not important in terms of commercial cultivation (Inglese *et al*., 1995a). The Western Cape has a few commercial orchards although potential is good in this Mediterranean climate provided irrigation water is available during the dry summer months (Inglese *et al*., 1995a). The main production areas in South Africa are situated in the summer rainfall areas and specifically in the Limpopo and North West Provinces (Van der Merwe *et al*., 1997). However, with the exception of some arid areas where irrigation water is not available and high lying areas where minimum temperatures are below -10^{o}C, the whole of South Africa can be seen as having a potential for cactus pear production (Russel & Felker, 1987). In agreement with this, Wessels (1988c) noted that *Opuntia ficus-indica* grows in virtually all areas of SA.

In the absence of any recent official statistics, it is estimated that 1 200 ha of cactus pear are grown commercially in South Africa (Potgieter & Smith, 2006) mainly in Gauteng and Northern (now Limpopo) Province (Brutsch, 1997). This figure does not include large areas planted for animal fodder purposes such as those in the Free State, Northern Cape and Karoo areas which are estimated to be between 200 000 (Le Houérou, 1994) and 80 000 ha (Groenewald, 1997).

Fruit production from spineless cactus pear cultivars started during the 1960s. Since the 1980s intensive, specialised plantations were established in the former Transvaal (North West, Limpopo, Mpumalanga and Gauteng provinces) and Ciskei (Eastern Cape)

(Brutsch, 1984). Over the past few years, fruit production for the export market has been exclusively based in the sub-tropical areas of Limpopo where the earliest fruit for the local markets is also produced. Technical advice on general orchard practices and cultivar recommendations were drawn up (Potgieter, 1997a; 2001) and published through the South African Cactus Pear Growers Association (SACPGA). This booklet deals with all cultural aspects of commercial fruit production and cultivar recommendations.

South Africa exports a small volume of fruit to England and France from December to April (Barbera, 1995; Inglese *et al.*, 1995a). There is increasing interest on the local major markets for fruit of the spineless cactus pear where it competes with some of the better-known traditional summer fruits (Brutsch & Zimmermann, 1993). This is most probably because the fruit is already known by a broad section of the population and therefore demand for good quality fruits was expected to increase fairly rapidly (Brutsch & Zimmermann, 1993).

Brutsch (1997b) prepared climatic diagrams of representative localities in the different climatic zones across SA where prickly pear has become naturalised or where spineless cactus pear is cultivated commercially. They cover a wide range of climates from temperate to hot sub-tropical:

- **South Western Cape**: characterised by a Mediterranean climate and the major deciduous fruit growing area. It has good potential for commercial cactus pear cultivation although very few orchards have been planted thus far. Due to the dry summers, some supplementary irrigation is needed.
- **Eastern Cape**: where the naturalised cactus pear is still most widespread. Commercial cultivation of cactus pear for fruit is relatively small except as a fodder crop for use in times of drought in the Karoo areas.
- **Gauteng and Mpumalanga highveld**: cooler interior plateau where there are isolated commercial plantings of spineless cactus for both fruit and fodder production. Severe winter cold and frost can damage plants and negatively affect fruit production.
- **Northern areas**: the most recent expansion in commercial plantings has occurred in warm temperate to warm and hot sub-tropical climates (with predominantly summer rainfall) stretching through Gauteng, Mpumalanga, North West and Limpopo provinces. The earliest fruit crops ripen in the sub-tropical areas situated near the Tropic of Capricorn in Limpopo. High biomass production is attained and is substantially higher than in the cooler areas of the interior

plateau and areas further south. Naturalised stands of prickly pear exist and are exploited for their fruit by roadside vendors from January to March.

As is evident from the above, commercial spineless cactus production occurs over a wide range of climates in South Africa, resulting in a marketing season of about four months (December to March) (Brutsch, 1997b). However, in the last five years successful application of crop manipulation techniques such as scozzolatura (removal of all newly developing reproductive and vegetative structures during onset to induce a later crop) and winter production (to produce fruit out-of-season), has dramatically increased the provision of fruit to nine months of the year on the local fresh produce markets, although limited volumes are supplied from May to September (T. Unterpertinger, Consolata Estates, Haenertsburg, Limpopo Province, personal communication, 2007).

Orchard design and management vary greatly worldwide (Inglese *et al*., 1995a) and even within one country. In South Africa, commercial fruit plantations are characterised by (Unterpertinger, 2006):

- relatively large size (>30 ha) of orchards,
- high fruit yield (>18 t ha^{-1}),
- modern orchard management practices,
- export market orientated,
- no more than five cultivars planted, depending on the target market,
- diversification into animal production or processing,
- out-of-season cropping in addition to main summer crop.

Despite recent expansions in the commercial cactus pear industry, limited scientific information is available on the performance of cultivars in the many different agro-climatic regions of South Africa; establishment of cultivar trials is a way in which this situation can be rectified (Brutsch, 1979). Because vegetative plant growth determines canopy development and indirectly crop yield in cactus pear (Luo & Nobel, 1993), the general ecological factors such as soil and climate factors that affect plant growth will be discussed. The success of Opuntias across large areas of the world is related to their wide ecological adaptation and more specifically to their highly effective photosynthetic pathway, Crassulacean Acid Metabolism (CAM).

2.3 CAM

About 93% of the 300 000 terrestrial plant species are C_3 plants and about 1% of plants use the C_4 pathway, while approximately 6% of plants use the CAM pathway (Nobel, 1994). Horticulturally important plant species that use the CAM pathway are the pineapple (*Ananas comosus*), various other succulent plants and some tropical epiphytes (Nobel, 1988). According to Nobel (1988), although the majority of cacti are CAM plants, not all use this pathway for photosynthesis.

Various features of cactus pear that contribute to its wide adaptability and spread include their unique asynchronous reproduction, structural, anatomical and physiological adaptations which have enabled them to survive under difficult conditions (Nobel & Bobich, 2002). These adaptations have allowed this plant to maintain assimilation of CO_2 during long periods of drought and reach acceptable levels of production even under limited rainfall conditions (Nefzaoui & Ben Salem, 2002).

The key to the success and agricultural usefulness of *Opuntia* species in water-stressed environments rests on their daily pattern of stomatal opening that has been described in detail by Nobel (1988; 1994; 2001) and Nobel & Bobich (2002). This gaseous exchange pattern is referred to as CAM because it was widely studied initially in the Crassulaceae plant family (Nobel, 1988). The stomates mainly open at night, allowing gaseous exchange to occur when temperatures are lower than what they are during the day (Nobel, 1994). This pattern substantially reduces water loss from the plant tissues of CAM plants as compared to C_3 and C_4 plants which take up CO_2 exclusively during daytime. Average temperature of plant tissue is at least 10^{o}C lower at night than during the day, thus, CAM plants tend to lose only 20-35% of the water lost by C_3 or C_4 plants for a given degree of stomatal opening (Nobel, 2001). Nobel (2001) concluded that the nocturnal opening and daytime closure of stomates is crucial for water conservation in CAM plants.

The uptake and retention of CO_2 for later use requires that it be bound to the 3-carbon compound phosphoenolpyruvate (PEP) via the enzyme PEP carboxylase (PEP Case) (Nobel, 1994; 2001). CO_2 bound to PEP leads to the accumulation of 4-carbon acids such as malate in the tissues, which is transported into a large central vacuole in plant cells (Nobel, 2001). According to Nobel (1988), the transport of malate into the vacuole at night leads to the increasingly acidity of CAM plants at night. At dawn the following day, solar radiation stimulates the C_3 photosynthetic pathway in the chloroplasts of CAM plants (as in the case of C_3 plants). However, the major source of CO_2 for CAM plants during the day is from the decarboxylation of malate and other organic acids that

accumulated in the vacuoles the pervious night (Nobel, 2001). Stored malate diffuses out of the vacuoles during the day and the CO_2 released internally is from the decarboxylation of the organic acids retained within the tissues and refixed into stable carbohydrates via the enzyme ribulose-1, 5-bisphosphate carboxylase/oxygenase (Rubisco). Over a period of hours, the acidity of the chlorenchyma decreases and photosynthetic products accumulate. These processes do not require additional CO_2 from the atmosphere, therefore the stomates of CAM plants can remain closed during daytime (Nobel, 1988).

When water conservation is a major management issue, the advantages of CAM species should be considered (Nobel, 1994) as cacti are capable of high productivity in water stressed regions (Nefzaoui & Ben Salem, 2002). WUE is three times higher in CAM plants than for C_4 and five times higher than for C_3 plants, enabling CAM plants to produce more dry matter than C_3 or C_4 plants under arid and semi-arid conditions (Nefzaoui & Salem, 2002; Nobel & Bobich, 2002).

2.4 Environmental factors affecting the reproductive biology of cactus pear

The environment represents all natural conditions that affect plant growth and survival, and includes soil factors such as water and nutrient content (Nobel, 1988).

In contrast to the current level of knowledge on vegetative growth, relatively little is known about the influence of environmental factors on cladode fertility in cactus pear. There is a lack of published accounts of controlled experiments where the effect of environmental factors on cactus pear flowering is examined (Nerd & Mizrahi, 1995a). The productivity of cactus pear cultivated for fruit production is extremely variable. Inglese (1995) ascribed this variability in yield to orchard design and management, rather than on prevailing environmental constraints. However, in contrast, Barbera *et al*. (1991) and Nerd & Mizrahi (1995a) reported that temperature and plant nutrition influenced plant fertility.

According to Garcia de Cortazar & Nobel (1992); Inglese *et al*. (2002a) and Inglese & Gugluizza (2002), cladode fertility depends on environmental conditions; however, these environmental conditions were not described. Nerd & Mizrahi (1995a) lamented the lack of knowledge about the influence of environmental factors on cladode fertility in cactus pear. Wessels *et al*. (1997) attributed the large variation in the fertility of clonal plants to genetic variation and environmental influences such as location on the mother plant, soil variation and orchard practices. Under normal circumstances, almost all flower buds formed, set fruit. Therefore, the number of fruits produced per plant is a function of both

the number of fertile cladodes and the average number of flower buds per cladode (Nerd & Mizrahi, 1995a).

Cactus pear plants produce fruit 2-3 years after planting, reach full production after 7 years and can remain fruitful for 25 to 30 years and even longer depending on overall orchard management practices (Mohamed-Yaseen *et al*., 1996; Inglese & Gugluizza, 2002). A mature cactus pear plant produces new fruits and cladodes every year at a ratio of 4:1 (Barbera & Inglese, 1993). Most of the flowers occur on one-year old terminal cladodes while new cladodes usually develop on two-year-old or older cladodes (Inglese *et al*., 1994; Wessels, 1988a; Sudzuki-Hills, 1995). Although most (80-90%) terminal one-year-old cladodes bear fruits and account for 90% of the yield, their fertility is dependant on environmental conditions, plant age and dry matter accumulation (Garcia de Cortazar & Nobel, 1990; Inglese *et al*., 2002b; Inglese & Gugluizza, 2002).

Fruit productivity in cactus pear can be increased by increasing the number of fertile cladodes per plant and/or by increasing the plant population (Inglese *et al*., 2002a). These authors recommend 28 000 to 30 000 fruiting cladodes per hectare, given 6 fruits per cladode and a fruit mass of 100-120 g to obtain a targeted fruit yield of 20 t ha^{-1}. Closer spacing distances will, however, necessitate higher pruning intensity and frequency (Inglese & Gugluizza, 2002). Productivity in cactus pear is therefore a function of the number of one year old fertile cladodes, number of fruit per cladode left after thinning as well as fruit mass (Inglese, 1995).

According to Wessels (1988d), the primary indicator of the adaptability of a cultivar to a particular environment is its fruit yield. Both internationally and locally reported cactus pear fruit yields have been very variable (Pimienta-Barrios, 1994; Inglese *et al*., 1995a). Fruit yields vary from 1-5 t ha^{-1} where traditional methods are used but can reach 15-30 t ha^{-1} with intensive orchard practices under rain-fed conditions of 400-600 mm per year (Monjauze & Le Houérou, 1965). In the Central Karoo area of South Africa, total fruit yields in excess of 50 t ha^{-1} have been reported (Brutsch, 1979). This author concluded that cactus pear is capable of very high fruit yields provided adapted cultivars are used at high plant densities. This variability in fruit yield has been ascribed to inadequate knowledge of the G X E interaction in cactus pear (Barbera, 1995).

According to Nobel (1995), the four main environmental factors that determine net CO_2 uptake and biomass accumulation in cactus pear are soil water content, air temperature, solar radiation and soil nutritional elements, while other environmental factors may play minor roles.

2.4.1 Genotype effects

South African cultivars differ in terms of vegetative vigour and cladode fertility (Wessels, 1988a; 1989). Since cactus pear is not a monospecific species (Chessa & Nieddu, 1997), this variability between cultivars is to be expected. However, research comparing the fruit yield of the commercially most important South African cultivars in diverse environments is limited.

2.4.2 Environmental effects

2.4.2.1 Temperature

Although temperature is generally not a major factor limiting the daily net CO_2 uptake in cactus pear, maximum net CO_2 uptake occurred at day/night temperatures of 25/15°C (Nobel, 1995). When the day/night temperature is raised to 35/25°C, daily net CO_2 uptake was decreased to 60% of its maximum value and decreases further to zero at higher day/night temperatures of 44/34°C (Nobel, 1995). Areas with milder temperatures could thus be expected to have faster growth rates than those with extremely high temperatures.

Unlike many other fruit crops, very few cactus pear flowers abscise and 95% of the flowers that set can become fruit (Pimienta-Barrios & Del Castillo, 2002) unless damaged by late winter frost. Similarly, the flower buds of columnar cacti, which are more advanced in their development (>20 mm), rarely seem to abort even under cold conditions (Petit, 2001).

Cactus pear needs an average air temperature of >10°C, mild winters and hot summers (Inglese *et al*., 2002a). In the Southern Hemisphere, Sudzuki-Hills *et al*. (1993) reported that an average monthly temperature of 22°C in January and 10°C in August is optimal for fruit production in Chile.

2.4.2.2 Solar radiation

To ensure high CO_2 uptake and cladode fertility it is important to prevent excessive cladode shading (Pimienta-Barrios, 1990; Inglese, 1995). Most cladodes exposed to sunlight will produce from zero to 20 flower buds (Nerd & Mizrahi, 1995a), while shaded terminal cladodes are usually infertile (Pimienta-Barrios, 1990; Garcia de Cortazar & Nobel, 1992). This indicates the need for formative pruning as a standard orchard practice. Plants should be shaped to allow solar radiation to reach as many terminal cladodes as possible.

In the South African cactus pear industry, it is standard practice to perform annual winter pruning (Potgieter, 1997a). The number of one-year-old cladodes left after pruning is then used as an indicator of the relative size of the bearing surface at the start of the season. Pruning is thus an important horticultural practice that controls fruiting in cactus pear. According to Wessels (1988b), 20-30% of the cladodes of the preceding season need to be removed, while excessive pruning will reduce yield and contribute to strong vegetative growth the following season (Guttermann, 1995).

In addition to pruning, plant spacing (Garcia de Cortazar & Nobel, 1992) is another method of reducing shading of cladodes. Although more plants per hectare will increase fruit yield, it must be weighed against potentially causing excessive shading and ultimate reduction of solar radiation that will decrease CO_2 uptake and plant fertility (Nobel, 1995). However, according to Wessels (1988a; 1989) fruit production per plant can still be substantial in lower density plantings where limited shading of cladodes occurs.

From a plant physiological point of view the role of shading is particularly important since it decreases cladode dry mass. Nobel (1994) showed that shaded cladodes generally did not contain dry mass in excess of the minimum required and thus generally do not produce fruit. On the contrary, unshaded cladodes accumulate considerable dry mass and produce up to 6 tons of fruit (dry mass basis) ha^{-1} $year^{-1}$ (Nobel, 1994). In addition, the specific cladode mass of shaded plants was 10-15% less than for unshaded plants (Luo & Nobel, 1993) indicating the importance of pruning on relative cladode fertility.

2.4.2.3 Water

Garcia de Cortazar & Nobel (1992); Barbera & Inglese (1993) and Mulas & D'Hallewin (1997) have reported the beneficial effect of irrigation on plant growth, cladode number and canopy size. Without new cladode development, fruit yields decrease since the bearing surface of the plant is reduced. In Sardinia, the canopy volume of four cactus pear cultivars increased two fold and was significantly larger in irrigated trees when compared to the unwatered controls (Mulas & D'Hallewin, 1997).

Both cladode fertility and fruit growth benefit from irrigation. The application of 2-3 irrigations (60-100 mm) during fruit development increased yield, fruit size and fruit pulp percentage (Barbera, 1994). According to Nerd *et al*. (1989), the suspension of irrigation during winter when annual rainfall is lower than 300 mm, will result in a substantial reduction of cladode fertility and delay spring bud burst. Unfortunately no crop factors have been developed for cactus pear. Under semi-arid and low rainfall conditions, Inglese *et al*. (2002a) recommends low daily amounts of irrigation to ensure high yields and adequate fruit growth and development. Similarly, in a study on the effect of

irrigation on fruit yield and quality in Gauteng, Van der Merwe *et al*. (1997) concluded that supplementary irrigation during drier years or in areas that received low rainfall had a positive effect on fruit size and yield of cactus pear. Mulas & D'Hallewin (1997) showed that fruit yield per plant was significantly higher in watered than in unwatered plots and ascribed the higher yield to the higher number of fruit per cladode rather than the increase in fruit mass.

Although the plant is highly drought-tolerant, it does react positively to low amounts of rainfall or irrigation during critical growth phases. Nobel (1995) showed under laboratory conditions that as little as 10 mm rainfall is adequate to wet the soil in the root zone of Opuntias, raising the soil water potential above the root water potential, leading to water uptake. The drought-tolerance of *O. ficus-indica* is high and the plant can survive in areas that receive as little as 200 mm annual rainfall (Acevedo *et al*., 1983). However, economically feasible fruit yields under dry-land conditions can only be obtained in areas that receive more than 300 mm rainfall (Barbera, 1984; Nerd *et al*., 1989; Sudzuki-Hills *et al*., 1993; Inglese *et al*., 2002a).

2.4.2.4 Plant nutrients

A reasonable body of information exists on the role of plant nutrients on vegetative growth in cactus pear. However, much less research has been done on reproductive responses. Consequently, fertilisation recommendations do not relate to any specific biological or technical information (Inglese *et al*., 1995a; Gugluizza *et al*., 2002). In general, information on plant nutrient response is still controversial due to conflicting results and the fact that different species and cultivars were used in fertiliser trials. In addition, standardised reference parameters for nutrient diagnosis still need to be established (Inglese *et al*., 1995a).

Some research has been done locally and internationally on the influence of fertilisers on fruit yield in cactus pear. However, the results are inconsistent and their applicability to the many different *Opuntia* species cultivated under various environmental conditions in different countries is questionable. In addition, information on the timing of fertilisation and fertiliser type needed for fruiting is lacking (Inglese *et al*., 1995a). Nutrient responses are extremely complicated and varied as elements interact with each other in the soil and during uptake into roots (Nobel, 1994). Therefore, the assumption that cactus mineral nutrition and fruit production will be similar to other fruit crops should not be made (Galizzi *et al*., 2004).

A number of studies on macro elements have concentrated on the effect of N on fruit production in cactus pear. This is possibly due to its dramatic effect on flowering. In cactus pear, an additional flower flush can be brought about with the application of N just after the removal of the summer harvest (Nerd *et al*., 1991a; 1993; Brutsch & Scott, 1991). Nerd *et al*. (1989) showed that when plants are watered and fertilised with N, P, K, an autumn floral bud burst occurs and the resultant fruits ripen in late winter. Later Nerd *et al*. (1993) showed that N was the factor responsible for the autumn bud burst, where flower bud production increased with increasing N levels up to 120 kg N ha^{-1}. Similarly, it has been shown that the N concentration in the cladode tissue is related to the number of flowers formed (Nerd *et al*., 1993). Nerd & Mizrahi (1995a) further found that the flowering response to N was plant age sensitive since the autumn flower yield was higher in younger plants (<6 years) than in older plants.

In South Africa, Potgieter & Mkhari (2000) obtained lower N values from cladodes in field trials, than those grown in laboratory experiments. They further recommended optimal N values for cactus fertilisation under conditions in the Limpopo Province. These authors reported more than a five-fold increase (2 to 11 t ha^{-1}) in fruit yield from the control to the highest treatment level of N. Significant increases in fruit mass and number of fruits formed per plant at 150 kg N ha^{-1} were obtained. However, higher N levels (200 kg ha^{-1}) resulted in excessive vegetative growth, making orchard management practices such as pruning and insect control difficult while raising input costs (Potgieter & Mkhari, 2000). In fertiliser trials in a semi-arid region of North West Province, Claassens & Wessels (1997) reported optimum fruit yield at 0.94-0.96% N in terminal cladode tissue. These authors recommend N applications of 30-60 kg N ha^{-1}, although the amounts to be applied will depend on soil fertility status.

Cladode age, position on the plant and cladode tissue type (parenchyma and chlorenchyma), influence N concentration in plant tissues which range from 0.6% to 2.5% (Nerd & Nobel, 1995). In addition, nutrient concentration in cladodes also varies with fruit load and season (Inglese, 1995). However, N concentrations higher than 2.2% in two and three year old cladodes may reduce cladode fertility, fruit colour development and ripening (Inglese, 1995; Inglese *et al*., 2002a).

A number of researchers have shown a positive relationship between P and fruit yield (Gathaara *et al*., 1989; Nerd *et al*., 1989; Pimienta-Barrios, 1994; Claassens & Wessels, 1997), even though its role has never been clearly demonstrated (Gugluizza *et al*., 2002). Nobel (1995) reported that P, K and B are rarely major limiting factors in cactus pear growth. In addition, Claassens & Wessels (1997) showed that under dry-land

conditions P had no influence on fruit yield of cactus pear, this was dependant on soil P status.

Many reports on fertiliser trials have commonly showed no response to the application of mineral elements. This lack of response is attributed to the error of conducting such trials in areas where the soil status for that particular element was already high at the start of the experiment. For example, Galizzi *et al*. (2004) performed a fertiliser trial with different combinations of N, P, K and Mg on 8-year-old cactus pear plants in Argentina. These researchers reported no significant response in fruit yield to N, P, K and Mg and concluded that the plant requirement for these elements is low. However, examination of the soil analysis results before planting, indicate that the lack of response could be attributed to the high levels of the P, K and Mg cations previously present in the soil.

Magnesium (Mg) has been shown to be correlated with fruiting (Inglese & Pace, 1999), while Karim *et al*. (1998) found a close relationship between cladode fertility and Mg content in the cladode tissue. Claassens & Wessels (1997) showed that even where dolomitic lime is applied on top of the soil and not worked in, it still had a positive effect on fruit yield. The effective use of surface applied lime is probably related to the very shallow rooting system of cactus pear that enables it to use the lime. Whether this is a calcium or pH effect is not known at this stage.

2.4.2.5 Salinity

Most cacti do not tolerate even moderate levels of soil salinity, since it affects the vegetative growth of cactus pear negatively (Nobel, 1994). In pot experiments, it was found that plant growth was reduced by 40% at a concentration of 30 mol m^{-3} (1.76 mg kg^{-1} NaCl) while a concentration of 100 mol m^{-3} (5.85 mg kg^{-1} NaCl) reduced growth by 93% (Gersani *et al*., 1993). However, as cactus pear is increasingly cultivated for fruit in areas with saline soils, more research is necessary to examine the effect of salinity on fruit yield and quality (Nerd *et al*., 1991b).

2.4.2.6 Soil pH

As with many other ecological aspects of this plant, no literature was found on the effect of soil pH on vegetative or reproductive development. Yet, similar to other cultivated plants, differences in the effect of soil pH on vegetative or reproductive development may occur between cultivars and *Opuntia* species. Research on this aspect is needed.

2.5 Conclusions

There can be little doubt that *Opuntia* species are highly successful in their distribution, multiplication and establishment. It is therefore easy to see why they have become so successful in spreading to diverse environments around the world.

As a multi-purpose plant with huge potential in arid and semi-arid areas, it is ironic that more research has been done on eliminating cactus pear than on its cultural requirements and utilisation. A change in attitude towards the plant and realities of crop production constraints in South and southern Africa is needed. A severe lack of water, both for human consumption and agriculture in many parts of South Africa and particularly in Limpopo Province is the main constraint to increased crop production. Strategies such as the planting of drought-tolerant fruit and fodder crops should be actively investigated and implemented. The increased cultivation of spineless cactus pear is an important alternative to combat desertification and climate change and is seen as important for sustainable development in arid and semi-arid areas.

However, the role that cactus pear can and rightly should play in semi-arid parts of South Africa such as Limpopo Province in terms of sustainable agricultural development have not been realised. One of the major reasons for this state of affairs is that very little relevant technical information on the influences of climatic and soil factors on its reproduction processes are known and communicated to farmers, extension staff and scientists. Secondly, there are many contrasting findings particularly in terms of water relations and plant nutrition. Finally, as with many other minor crops, a great deal of so-called 'findings' on cactus pear in literature are nothing more than rough estimates or casual observations and little scientific data are ever presented. These 'findings' are subsequently reported as fact by many other researchers without questioning the validity of the assumptions made in the original report.

It is evident from literature that many environmental factors may be involved in the reproductive biology of this plant. As the interest in cactus pear as a fruit crop expands, a greater level of scientific knowledge on environmental conditions influencing its growth and reproduction are needed. Detailed information concerning the soil and climatic conditions in the area of origin of *Opuntia* species, may very well give a good indication of the conditions required. However, it should be kept in mind that as Opuntias are not monospecific, the many species and even cultivars may have subtle differences in optimal growing conditions, necessitating the need for studies at the species and cultivar

level. Equally important is the characterisation of the complete South African cactus pear germplasm for fertility and productivity.

Like other orchard crops, this plant will respond to standard management practices such as weeding, fertilisation, supplementary irrigation, fruit thinning and pruning practices. Unfortunately, limited information on the influence of orchard practices on reproduction and fertility is available. Finally, expanding the knowledge of the influence of environmental factors on fruit yield will result in a better evaluation of areas suitable for commercial cactus pear fruit production (Barbera, 1995).

CHAPTER 3

EXPERIMENTAL PROCEDURES

3.1 Introduction

In an attempt to determine if a G X E exists for some commercially cultivated cactus pear cultivars, multi-location trials were established in the northern sub-tropical parts of South Africa. Multi-location yield trials are advantageous in that they provide information for agronomists and plant breeders regarding cultivar recommendations, as well as enabling the study of G X E interaction of economically important traits and other plant responses (Smith & Smith, 1992).

According to Annicchiarico (2002), certain requirements should be fulfilled for a set of multi-environment trials in order to permit reliable inference from data in relation to cultivar selection:

- adequate representation of test locations where major production areas reflecting biotic and abiotic factors should be included in selection of experimental sites,
- adequate representation of the available germplasm in selection of cultivars,
- in order to perform statistical analysis of the data, adequate replication in the design is needed to allow for reduction of experimental errors.

In this study, field trails were planned and executed in such a way to conform to all of the above requirements such that three diverse locations were selected, data was collected from the first to the seventh production year, eleven cultivars representing all types of growth habits, fruit colours and species for fruit production were chosen and a Randomised Complete Block Design (RCBD) with five replicates per site was employed. Although field trials with permanent crops are long-term endeavours, the value and importance of cultivar trials should not be underestimated (Brutsch, 1979). Due to a chronic lack of comparative information, the need for fruit yield from replicated field trials with a number of genetically broad-based cactus pear cultivars was expressed by Felker *et al.* (2005). Felker *et al*. (2002b) also noted the scarcity of data on cactus fruit quality of similar genetic materials in diverse locations, an aspect that these trials will attempt to address.

An important requirement for any long-term, multi-seasonal and multi-location study should be to search for extremes in terms of the environmental conditions available for establishment of the trial. This requirement was ideally met with the selection of three very diverse environments within relatively close proximity in Limpopo Province, South Africa. Each site differs from the others in its environmental and soil attributes.

Plant establishment, orchard management and plant manipulation (winter and summer cladode pruning, fruit thinning, fruit removal on young plants) were done according to accepted practices in modern commercial cactus pear fruit farming in South Africa (Potgieter, 1997a;b; 2001). This approach was deemed necessary to be able to recommend and compare results obtained in this study with that of commercial growers. For research results to be relevant and applicable, they need to simulate on-farm conditions. For example, in a previous study of cultivar adaptation near Pretoria by Wessels (1989), fruit thinning and proper winter pruning were not performed, resulting in the fact that direct comparisons with farmer results were not possible. In particular, fruit mass and marketable yield will both be negatively influenced by not performing fruit thinning and pruning, which lessens the value of the work done. This study thus also provided an opportunity to evaluate current orchard practices used in the industry in an attempt to possibly recommend improvements. As early as 1909, Griffiths stated that there seems to be an opinion among horticulturalists and some growers that the plant must be abused in order for it to thrive, a perception that is, to some degree, still true today in South Africa. The ease with which the cladode strikes roots in virtually any environment may probably be the reason for the fact that this perception persists. However, as with any other crop it must be well managed for profitable production (Turpin & Gill, 1928).

Additional information on climatic, soil, biotic and orchard management factors of experimental sites and horticultural traits of cultivars are also provided as it can shed light on:

- reasons for the occurrence of genotype by environment (G X E) interactions,
- providing a way of characterising the experimental sites and thereby possibly extrapolating the results to potential new growing areas,
- comparison of climatic data obtained from the experimental years with long-term data may help to identify any experimental year with unusual features that may have occurred,
- identifying adaptive characteristics of cultivars and assessing their potential as indirect selection criteria for breeding (Annicchiarico, 2002).

3.2 Location, climate and soils of experimental sites

The trial was conducted at three locations, representing the main agro-climatic areas (Nondweni: hot low-altitude, Gillemberg: cool mid-altitude and Zaaiplaas: cold high-altitude) of Limpopo Province (Figure 3.1 and Table 3.1).

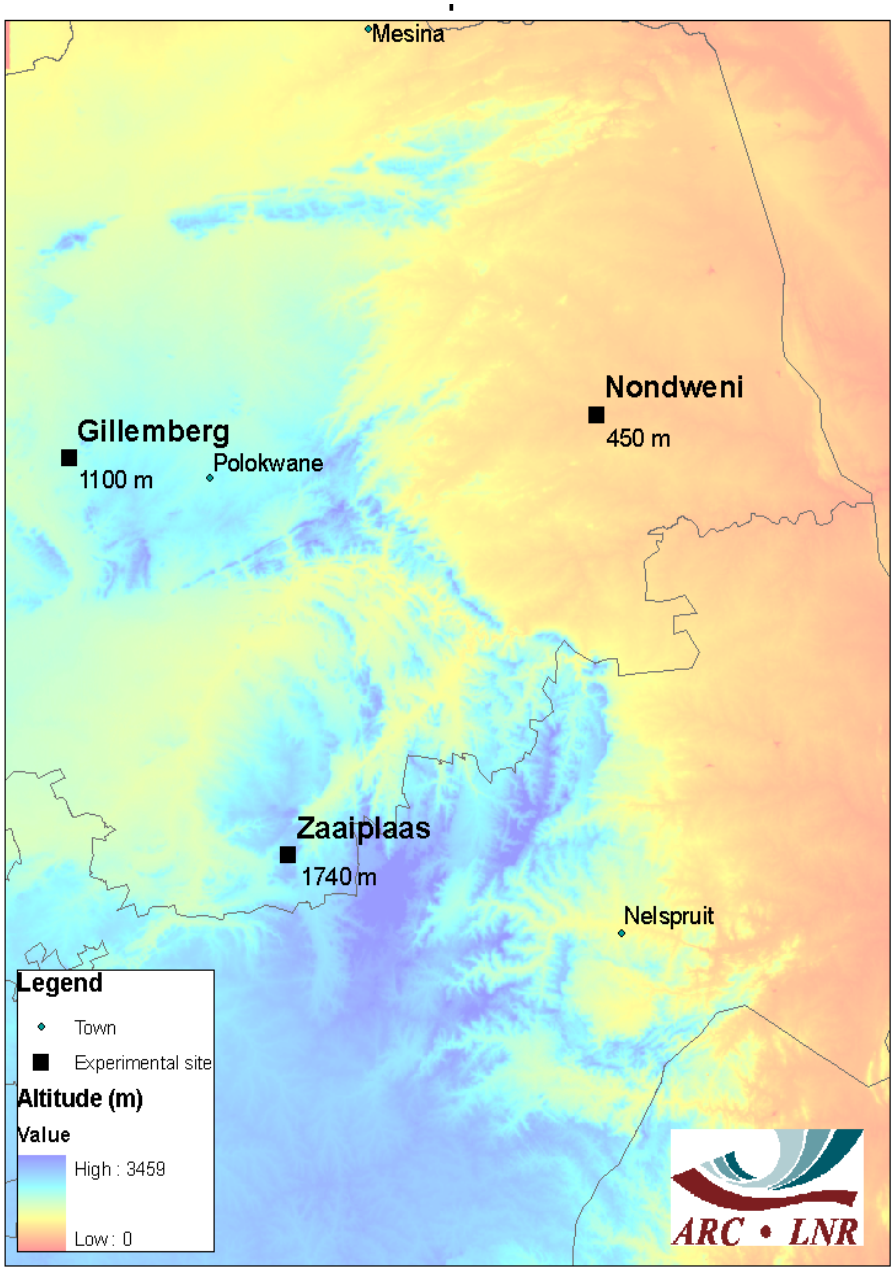

Figure 3.1 Map indicating the position of cactus pear trial sites in Limpopo Province, South Africa (Rademeyer & Potgieter, 2007)

A relatively new development is the cultivation of cactus pear for fruit production in hot, sub-tropical climates of South Africa where markedly different responses in vegetative growth, flowering and fruiting patterns are seen (Brutsch, 1997b). The study was carried out over eight years after establishment with data gathered during seven production seasons (1994/5-2000/01).

Table 3.1 Location, climate and soils in Limpopo Province, where cactus pear field trials were established

Agro-climatic area	Low-altitude	Mid-altitude	High-altitude
Site name	Nondweni	Gillemberg	Zaaiplaas
Magisterial district	Ba-Phalaborwa	Mokopane	Nebo
Altitude (m.a.s.l.)	450	1100	1740
Latitude	23°41'S	23°50'S	25°12'S
Longitude	30°53'E	28°58'E	29°46'E
Climatic region[z]	Lowveld Bushveld	Central Bushveld	Eastern Mountain Grassland
Soil pH (water)	6.7	6.8	4.9
Soil texture	Sandy loam	Loamy sand	Sandy loam
Clay%	18	17	14
Silt%	10	8	5
Sand%	72	75	81
Soil taxonomy (form, family)*	Glencoe, Driehoek	Dresden, Tevreden	Kranskop, Dargle
Vegetation type#	Arid Lowveld	Mixed Bushveld	Highland Sourveld

[z] Kruger (2004) , * Soil Classification Working Group (1991), # Acocks (1988)

Large differences in altitude are evident (Table 3.1) with 650 m difference between the hot low- and cool mid-elevation sites and 640 m difference between the cool mid- and cold high elevation sites. It is expected that such large differences in altitude would result in temperatures decreasing by approximately 1°C for every 100 m increase in altitude (Preston-Whyte & Tyson, 1988). Elevation is also indirectly related to plant growth and development as it affects the amount of rainfall received, relative humidity (RH) and temperature. Due to the close proximity of the sites to one another, there is relatively little difference in latitude and longitude. The implication of these relatively small differences in latitude indicates that major differences in day-length would possibly be negligible between trial sites. However, longitude, evapotranspiration (ETo) and rainfall are all related (directly or indirectly) to water availability to the plants. The general climate of the three trial areas can be described according to Kruger (2004) as follows:

- **Hot low-altitude**: Savanna type: Lowveld Bushveld climatic region characterised by moderate summer rainfall between 500-700 mm p.a. with warm to hot temperatures. Humidity is fairly high. The region is virtually frost-free. Sunshine duration during summer is below average.
- **Cool mid-altitude**: Savanna type: Central Bushveld climatic region with 500-700 mm rainfall p.a. and cooler than the Lowveld Bushveld. Frost occurs in this region.
- **Cold high-altitude**: Grassland type: Eastern Mountain Grassland where rainfall (500-2000 mm p.a.) occurs mainly during summer. Temperatures tend to be

cool. The climate is extreme with frost and fog occurring frequently, while snow is possible in some parts.

Soil pH (water) ranges from strongly acidic (4.9) in the cold high elevation area to slightly acidic (6.7 and 6.8) in both the hot low- and cool mid-elevation areas at the start of the trial. Sand percentage ranged from 72 to 81, resulting in a sandy loam to loamy sand texture, ideally suited for cactus cultivation where good soil aeration is an important physical property. Clay percentages were relatively low in all trial sites which is important as high clay percentages may give rise to root rot. Parent rock in all trial sites was granite, resulting in soils with a large sand fraction, inherently poor nutritional status but well drained which is important in cactus pear cultivation as the plant cannot tolerate prolonged periods of water saturation (Potgieter, 1997a). Soils were deep (> 1m) in both the hot low and cold high-elevation sites, while the effective rooting depth (A horizon) in the cool mid-altitude (Gillemberg) area was only 400 mm, being marginal for any crop production purposes.

The locations of commercial cactus pear plantations in the main production area of Mexico ranges from 1 800 to 2 200 m.a.s.l. Their summer rainfall ranged from 400-700 mm p.a. at a mean temperature of 17°C. The soil pH ranged from slightly acidic to extremely acidic, with a low organic matter content (Pimienta-Barrios, 1994). The general soil and climatic conditions of the three sites chosen for this study differed from those prevalent in the commercial production areas in Mexico.

Seasonal and periodic drought conditions are common in the hot low- and cool mid-elevation sites because of low and erratic rainfall and persistent high temperature during summer resulting in high ETo rates. No visible signs of water stress were observed in the cold high-elevation area, due to lower daytime temperature, lower evapotranspiration and higher rainfall as compared to the other two sites. The hot low-altitude area is completely frost-free in winter, while light and heavy frost was experienced in the cool mid and cold high-elevation sites respectively. All three experimental sites fall within the summer rainfall region of South Africa.

3.3 Plant material selection and multiplication

More than 70 cactus pear cultivars are available in South Africa (Potgieter & Smith, 2006) which includes the Burbank cultivars that were imported during 1914 from California, USA (Wessels, 1988a; d). At least 14 species of *Opuntia* are known in South Africa Anon (1940). However, only a few cultivars of different origins are currently used for commercial fruit production (Wessels, 1988a). Of these, “Algerian”, “Gymno Carpo”, “Morado” and “Skinners Court” are planted for local and export fresh fruit purposes.

Cultivars planted on a less extensive scale and/or only in specific environments include “Fusicaulis”, “Blue Motto”, “Malta”, “Direkteur”, “Nudosa” and “American Giant”. The only “new” cultivar included in the study was “Zastron”, selected by Marco Brutsch during the late 1980s (M.O. Brutsch, University of Fort Hare, Alice, personal communication, 1992).

Characterisation of germplasm accessions has long been hindered by confusion regarding species classification within the *Opuntia* genus (Mashope, 2007). According to Scheinvar (1995), the taxonomic classification of cactus pear is complicated by G X E interactions, polyploidy, sexual and asexual propagation and the existence of many hybrids between species. Using the DNA-based marker technique AFLP to estimate the genetic diversity of 38 South African cactus pear cultivars, Mashope (2007) recently showed that these cultivars could be clearly separated into four main clusters using the Jaccard and Simple Matching coefficients. Based on results from this study, Mashope (2007) concluded that sufficient detectable genetic differences exist within the varieties tested for the use of DNA fingerprinting for cultivar identification. There is therefore sufficient evidence to suggest that not all South African cactus pear cultivars belong to *O. ficus-indica* and that other *Opuntia* species are probably present.

Choice of the most appropriate cultivar is a key decision that growers have to make and one on which the profitability of the crop largely depends. Evaluation of cultivars for adaptation to local growing conditions is therefore of crucial importance to extension and research personnel serving the industry (Wien, 1987). To evaluate the environmental adaptability of a broad spectrum of South African cactus pear germplasm, it was decided to include eleven cultivars (Table 3.2) across species with different growth habits (Wessels, 1988a; 1989; 1992), cladode shape, pulp colours, yielding ability, fruit quality, ripening time and cultivars used commercially and less commercially (Potgieter & Mkhari, 2002a). “Morado” is included as the control cultivar as it is the most widely planted and appreciated as a fresh fruit amongst South African consumers due to its white pulp colour (Brutsch, 1979; Wessels, 1989).

Twenty true-to-type cladodes of the eleven spineless cactus pear cultivars were obtained from the University of Fort Hare, Eastern Cape and University of Pretoria, Gauteng during December of 1989. All cultivars sourced, were originally from the cactus pear germplasm block at Grootfontein Agricultural College, Eastern Cape Province. This was for many years the only germplasm source of all cultivars in South Africa. Basic observations on fruit production characteristics indicated that all cultivars used in this study except “Zastron” have possible fruit production potential (De Kock, undated).

Table 3.2 Characteristics of eleven cactus pear cultivars used in the environmental adaptability study from 1994/5 to 2000/1 in Limpopo Province, South Africa (Potgieter, 2001)

Cultivar	Growth habitus	Cladode shape	Likely species	Pulp colour (50% fruit ripeness)	Grown commercially	Relative ripening time (season)
Algerian	Bush	Ovate	*O. ficus-indica*	Pink	X	Mid
American Giant	Bush	Round	*Opuntia* spp.	White		Late
Blue Motto	Candelabra	Elliptic	*O. fusicaulis*	Khaki		Late
Direkteur	Candelabra	Elliptic	*O. fusicaulis*	Khaki		Late
Fusicaulis	Candelabra	Elliptic	*O. fusicaulis*	Green/white		Very early
Gymno Carpo	Bush	Ovate	*O. ficus-indica*	Orange	X	Mid
Malta	Bush	Ovate	*O. ficus-indica*	Orange		Mid
Morado	Bush	Ovate	*O. ficus-indica*	White	X	Mid
Nudosa	Bush	Round	*Opuntia* spp.	Red/orange		Late
Skinners Court	Large cladode	Diamond	*Opuntia* spp.	Green/white	X	Early
Zastron	Semi-bush	Ovate	*Opuntia* spp.	White		Very early

Mature cladodes were grown in 25-L plastic bags, filled with topsoil obtained from the area at the cool mid-elevation trial site (Mokopane district), irrigated and fertilised to multiply plant material for trial establishment (Figure 3.2). Plants that were bearing well during growth in the plastic bags were identified, marked and used as mother stock for all three trial plantings. Single, mature, large terminal cladodes of uniform appearance, visually free of any defects, insects and diseases were selected during early October 1992 and pruned for trial planting. Cladodes were kept in partial shade on a cement surface, for approximately six weeks until planting until cut-wounds were callused. It was decided to use single cladodes as propagation units as this meant lower transport costs and easier handling during the planting process.

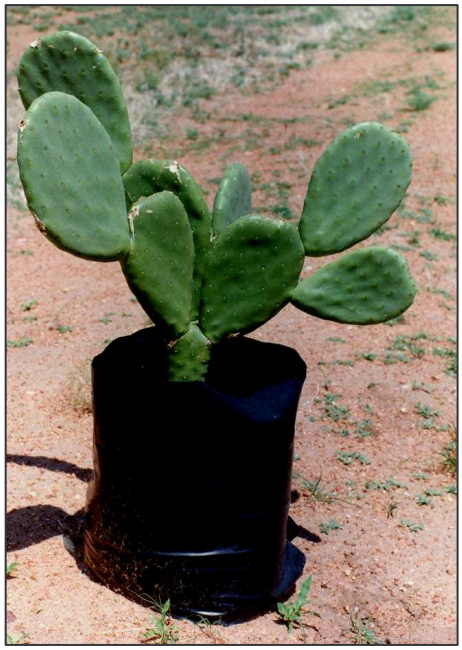

Figure 3.2 Cactus pear plant growing in a 25 L plastic bag for rapid multiplication purposes

3.4. Soil preparation and plant establishment

After sites were selected, clearing of vegetation and levelling of the plots commenced. All trial sites were fenced off with 1.2 m high diamond wire mesh to keep small game and livestock out that could possibly damage young plants. Top (0-300 mm) and sub-soil (300-600 mm) samples were taken from five positions over the trial site, thoroughly mixed and combined into a single top and subsoil sample for laboratory analysis purposes (Table 3.3).

Soils were deep ripped (>500 mm) both on the planting row and across the field to break up any impervious layers and to ensure good drainage. To break up large clods the field was ploughed with a mouldboard plough before liming and pre-plant fertilisation took place (Table 3.4). Pre-plant fertilisation was applied; the soil was disked and finally levelled prior to planting.

Cladodes were planted vertically (upright) with approximately one-third of the cladode below the soil surface. Plants were positioned with the flat sides orientated in-row and soil around the cladode firmed by mechanical means. Rows were spaced 5 m apart and plants 2 m apart in-row (1000 plants ha^{-1}), which is considered a semi-high density planting. The idea with this plant configuration/spacing is to form a hedgerow (Inglese *et al.*, 2002a).

Table 3.3 Pre-plant top (T) and sub-soil (B) analysis results of exchangeable and water soluble nutrients from three cactus pear trial sites in Limpopo Province

Property *	Soil sample position	Agro-climatic area		
		Hot low-altitude (Nondweni)	Cool mid-altitude (Gillemberg)	Cold high-altitude (Zaaiplaas)
pH	T	6.65	6.80	4.90
(H_2O)	B	7.15	7.35	4.40
Nutrients			**(mg kg^{-1})**	
P	T	14.5	28.0	3.0
(Bray 1)	B	6.5	8.5	4.0
K	T	213.0	96.5	101.0
(NH_4OAc)	B	254.0	75.0	161.0
Ca	T	1829.5	1370.5	47.0
(NH_4OAc)	B	4304.0	2999.5	169.0
Mg	T	269.0	341.0	23.0
(NH_4OAc)	B	467.5	469.0	81.0
Na	T	38.0	51.0	17.0
(NH_4OAc)	B	68.5	172.0	12.0
Zn	T	1.75	1.7	1.8
(HCl)	B	1.6	1.5	2.1
Conductivity	T	366.0	273.0	51.0
(mS m^{-1})	B	487.0	303.5	182.0
Particle size distribution			**(%)**	
Sand	T	72.0	75.0	81.0
	B	62.0	73.0	79.0
Silt	T	10.0	7.0	5.0
	B	13.0	8.0	7.0
Clay	T	18.0	17.0	14.0
	B	25.0	19.0	14.0
Texture	T	Sandy loam	Loamy sand	Sandy loam
	B	Sand clay loam	Sand clay loam	Sandy loam

* Determined with standard procedures (Non-Affiliated Soil Analysis Working Committee, 1990)

Due to practical considerations (shape of the field and slope), only in the high-altitude area were rows orientated N-S while both the low- and mid-altitude orchards were planted E-W. As the three sites were at an average latitude of 23° S, the likelihood that this would make a major difference in solar radiation interception are limited. Research regarding this aspect is however lacking. All three trial sites were planted within seven days of one another during the middle of December 1992.

Table 3.4 Previous use of trial sites, row orientation and pre-plant fertilisation of cactus pear experimental plots in Limpopo Province

Agro-climatic area	Hot low-altitude (Nondweni)	Cool mid-altitude (Gillemberg)	Cold high-altitude (Zaaiplaas)
Site history	Previously cultivated field (vegetables)	Previously cultivated field (tobacco seedlings)	Previously grazing land (virgin soil)
Row orientation	E/W	E/W	N/S
		Pre-plant fertilisation	
Phosphate (P)	20 kg P ha^{-1} as super phosphate (10.5% P)	-	40 kg P ha^{-1} as super phosphate (10.5% P)
Dolomitic lime $Ca,Mg(CO_3)_2$	-	-	3 000 kg ha^{-1}
Gypsum $CaSO_2.2H_2O$	-	2 000 kg ha^{-1}	1 000 kg ha^{-1}

3.5 Treatments

Eleven spineless “Burbank” cactus pear cultivars (Table 3.2) were used in the study. Numbers in brackets indicate the cultivar number used in the trials. Due to the possible confusion that may arise in using the numbers 6 and 9 when marking cladodes for planting material, it was decided to leave out the number 9:

- Algerian (12)
- American Giant (6)
- Blue Motto (7)
- Direkteur (1)
- Fusicaulis (3)
- Gymno Carpo (5)
- Malta (11)
- Morado (8)
- Nudosa (4)
- Skinners Court (2)
- Zastron (10)

Three agro-climatic areas:

- Hot low-altitude at Nondweni
- Cool mid-altitude at Gillemberg
- Cold high-altitude at Zaaiplaas

3.6 Orchard practices

Orchard practices as recommended by Potgieter (1997a; 2001) (Appendix 3.1) were followed throughout. All attempts were made to perform orchard practices as uniformly and at the most optimal time as possible at all three sites to minimise external sources of variation.

Supplementary irrigation was not provided, neither at establishment nor at any later stage during the study period. This was done to determine if the plant can survive and produce fruit of acceptable quality under the prevailing dry-land conditions in Limpopo Province. Although it is generally accepted that irrigation has beneficial effects on cactus pear fruit yield and quality (Van der Merwe & Wessels, 1994; Mulas & D'Hallewin, 1997), as access to irrigation water in many parts of Limpopo is severely limited, it was decided to test the fruit production potential and quality of cultivars under prevailing dry-land conditions.

3.6.1 Fertilisation

Pre-plant soil analysis results are provided in Table 3.3. Pre-plant fertilisation was made where required (Table 3.4). Optimal plant nutrient levels as recommended by Wessels (1988a) and Potgieter (2001) were followed after planting until the end of the trial (Table 3.5 and Appendix 3.2).

Table 3.5 Optimum soil nutrient levels for cactus pear fruit production (Potgieter, 2001)

Element	Optimal soil level ($mg\ kg^{-1}$)
P	15-20
Ca	>400
K	100-150
Mg	>150

Nitrogen (N) was applied in split dressings each season during the summer months (Appendix 3.2). Liming was done on the cool mid- and cold high-altitude sites as acid soils with a pH value near 5 or lower would restrict cactus pear growth (Nobel, 1988). All fertilisation took place just prior to or during the summer rainy season. Only inorganic fertilisers were applied during the trial period.

3.6.2 Weed control

Due to the shallow rooting system of cactus pear plants, weeds compete with roots for both soil water and mineral elements at the same soil depth. Annual and perennial broad-leaved weeds and grasses were chemically controlled in the plant

rows (1.5 m from the plant stem) using a registered non-selective herbicide containing the active ingredient glyphosate EC 360 g L^{-1} (Roundup) at a dosage of 1.5% during the period of active weed growth (Potgieter, 2001). To a limited extent, light hand hoeing was used to control any remaining weeds close to plant stems. During the early years of plant growth where lower trunk sections contained chlorophyll, stems were shielded with an old fertiliser bag when spraying glyphosate to prevent herbicide damage as cladodes are extremely sensitive to herbicides (Inglese, 1995a). Weeds between rows were controlled by mechanical means (tractor- or hand slasher) when their height exceeded 30 cm during summer.

3.6.3 Orchard sanitation

When orchard practices such as mechanical weed control are performed and during times of strong winds, cladodes may become detached from plants. If left on the orchard floor cladodes will start rooting and grow, as a result all detached cladodes were removed from the orchard at regular intervals. Detached cladodes also serve as host-plants for cochineal (*Dactylopius opuntiae*), cactoblastis (*Cactoblastis cactorum*) and disease (Potgieter, 2001).

Cladodes pruned during winter and summer were removed directly after data had been gathered on vegetative parameters. Thinned fruitlets will form roots and start growing if left in the orchard; therefore they were all removed after the final thinning exercise in November of each year.

3.6.4 Pest and disease control

Weekly scouting was employed in all trial sites to detect cochineal and cactoblastis infestations. Cochineal infected plants were marked with the date of detection and controlled with one of the registered chemicals (Nel *et al.,* 2002). Follow-up cochineal treatments were done if marked plants were found to be still infected. Cactoblastis egg sticks which are easily visible were removed weekly by hand during the egg-laying period (October to March) and destroyed. However, in the hot low- and cool mid-elevation sites egg sticks were observed even until May each year. Orchard sanitation, which includes removing and destroying all detached cladodes on a weekly basis, was employed to control cactoblastis larvae that had already penetrated into the cladodes and to eliminate hosts for cochineal insects.

Minor pests (army worms, grasshoppers, mice, termites, crows) occurred from time to time in the orchards. Plants were monitored for damage, but no control measures were implemented. The damage was relatively infrequent and had no effect on yield. Fruit flies, both the Mediterranean- and Natal fruit fly, damaged harvested fruit

in the cool mid-altitude (Gillemberg) trial site since the 1998/9 season. These were controlled by placing bait traps in the orchards each year thereafter (Potgieter, 2002b).

The planting at the low-altitude site (Nondweni) remained cochineal-free for five years mainly due to its isolated position, absence of any other *Opuntia* spp. or cochineal in the vicinity. A cochineal infestation on two plants in 1999/2000 was controlled and the plants then remained free of the insect until termination of the trial in 2001.

Although observations were made of possible physiological disorders and disease symptoms occurring throughout the trial period, neither identification nor chemical treatment was attempted as no chemicals are registered in South Africa for the control of any cactus pear disease. A number of plants died in the cool mid-altitude site possibly due to root rot where the main trunk rotted off and plants turned yellow. Seeing that tobacco seedlings were previously raised at the site, it is likely that this may have caused root rot in cactus pear. Where plants died, they were replaced by planting double cladodes during September to November of the particular year. These young plants were not used for data gathering until they reached two years of age.

3.6.5 Pruning

3.6.5.1 Winter pruning

All plants were pruned from the first year after establishment. Pruning was done every year from May to August (winter), when plants were dormant. Plants were skirted at 0.5 m above soil level and plant height was restricted to 1.8 m for easier fruit thinning, insect detection and control and harvesting. Plants were trained to develop 4-7 well-spaced primary branches from the mother cladode. Cladodes touching or overlapping were removed to minimise cochineal breeding sites and to ensure adequate solar radiation penetration into the plant canopy which is essential for cladode fertility. Approximately 40-50% of the terminal cladodes were pruned (Oelofse *et al.*, 2006). A working-row space of 3.0 m between rows was maintained throughout, implying that plants were left to develop 1.0 m from the mother cladode into the between-row area on each side. In the rows, plants were allowed to form a continuous hedgerow, but taking care that shading between plants did not occur.

3.6.5.2 Summer pruning

The vegetative flush normally follows just after the appearance of flower buds in late winter to spring (August/September). These rapidly developing cladodes that may emerge close to flower buds cause chafing damage to the epidermis of fruits, making them unsightly (Potgieter, 1997a). Fruits with marks on the peel are unmarketable or down-graded due to cosmetic damage. To prevent damage to developing fruit, selective summer pruning of young cladodes was performed. In addition, summer pruning was applied to reduce the number of new cladodes which may also compete with developing fruit for assimilates.

3.6.6 Fruit thinning

Fruit thinning to approximately 50 mm distance between fruits was performed when fruitlets were approximately 20 mm in length and easily distinguishable from vegetative buds. Reproductive buds in cactus pear appear spherical while vegetative buds are more elliptic in shape. At this early stage of fruit development, fruitlets are easy to remove by hand as attachment to the cladode is not yet well established. No more than 8 fruits per cladode were left to develop to maturity. When leaving approximately 50 mm between fruits, the harvesting process is substantially easier with less damage to adjacent fruits when using the specialised harvesting secateur.

3.6.7 Fruit removal in establishment year

An interesting and economically important characteristic of cactus pear is its early bearing ability. Newly planted cladodes from fertile mother plants can form flowers and fruit within weeks after establishment. All flowers in the establishment (1992/3) and first year of production (1993/4) were removed before anthesis to allow the plant to only develop vegetatively whereafter a crop was allowed from the second production season (1994/5).

3.7 Weather station and data gathering

As none of the trial sites were close to existing weather stations of the South African Weather Service or Agricultural Research Council: Institute for Soil, Climate and Water (ARC-ISCW), automatic weather stations from Mike Cotton Systems (MCS) were erected during November 1994 (Figure 3.3). These were erected within 10 m of each trial site to accurately record micro-climatic data for the duration of the study. All the climatic factors were measured according to the methodology adopted by the World Meteorology Organisation (WMO). Each station was fenced off with a 2.5 m

high security fence to avoid theft of, and interference with, meteorological instruments.

Figure 3.3 MCS automatic weather station used for climatic data gathering at the cold high-altitude (Zaaiplaas) cactus pear trial site

Sixteen channel data loggers (12 analogue and 4 digital) were used to record hourly weather data (Appendix 3.3). Data were recorded onto EPROM (16 000 data point memory modules) that were changed every four weeks. Tipping bucket rain gauge, measuring 0.2 mm per tip at a time were installed 1.2 m above ground level. Temperature sensors, accurate to 0.1^{o}C were housed in the Stevenson screen. Maximum, minimum, average and wet bulb temperatures were measured at 1.4 m above ground level. The aluminium wind speed sensor (cup anemometer) was installed to measure wind speed at 2.0 m above ground level. The MCS does not have a relative humidity (RH) sensor and therefore RH was determined from hourly wet and dry bulb temperatures. The MCS recorded data of all sensors at a one minute (60 second) interval and calculates the average over a one hour period. These hourly values were used in this study. The exception is rainfall, where rainfall is accumulated as an amount of rainfall received during the hour. All data were stored on the National Climate Databank of the ARC-ISCW, Pretoria. In Table 3.6 all 52 environmental variables used in this study with their abbreviations and units of measurements are indicated.

Due to a gap in climatic data between establishment of the trial (December 1992) and installation of the weather stations (November 1994) as well as for periods when data was lost due to battery failure or wet bulb reservoirs running dry between visits, estimates for the sites were obtained from nearby meteorological stations (Rademeyer & Potgieter, 2007) for the first production season (1994/5). Appendix 3.4 explains the method employed to patch data for the periods as indicated above. This was done particularly for those variables associated with the occurrence of genotype by location (GXL) interaction on the basis of test year data for other locations (Annicchiarico, 2002).

3.8 Experimental layout and design

The trial was designed as an 11 x 3 x 5 factorial and was laid out in a Randomised Complete Block Design (RCBD). Experience in other cactus pear trials in southern Africa where single tree replications were used (Brutsch, 1991), showed an unusually high degree of variation between plants of the same clone, indicating that more replications and/or more plants per replication are needed to reduce experimental error. For this reason, five replications, each consisting of four data plants of each treatment combination was used (Appendix 3.5). Each treatment consisted of eight plants of which the centre four were used for data analysis purposes. Each plot had two rows of four plants in each. Data were collected from the middle two plants of each row, leaving a border row of one plant between treatments in the row. On the outside of the trial site a border row consisting of an adapted cultivar for that area was planted to reduce border effects. The distribution of the degrees of freedom in the analysis of variance is indicated in Table 3.7.

Table 3.6 Environmental variable description, abbreviation and unit of measurement

Environmental variable	**Abbreviation**	**Unit of Measurement**
Altitude	Alt	m
Latitude	Lat	Degree (N,S)
Longitude	Long	Degree (E,W)
Mean minimum temperature: April to August	Tn1	^{o}C
Mean minimum temperature: May to August	Tn2	^{o}C
Mean minimum temperature: April to March	Tn4	^{o}C
Mean maximum temperature: May to August	Tx2	^{o}C
Mean maximum temperature: April to March	Tx4	^{o}C
Mean average temperature: August to March	Tave3	^{o}C
Richardson chilling units: April to August	RC1	units
Richardson chilling units: April to March	RC4	units
Infruitec chilling units: April to August	IC1	units
Infruitec chilling units: April to March	IC4	units
Positive chilling units: April to August	PC1	units
Positive chilling units: April to March	PC4	units
Frost days: April to March	frost4	days (below $0^{o}C$)
Day-length: April to August	DL1	h day^{-1}
Day-length: May to August	DL2	h day^{-1}
Day-length: August to March	DL3	h day^{-1}
Day-length: April to March	DL4	h day^{-1}
Precipitation: May to August	rain2	mm
Precipitation: August to March	rain3	mm
Precipitation: April to March	rain4	mm
Thermal time, base temperature $0^{o}C$: May to Aug	HU0-2	^{O}Cdays
Thermal time, base temperature $0^{o}C$: Aug to March	HU0-3	^{O}Cdays
Thermal time, base temperature $0^{o}C$: April to March	HU0-4	^{O}Cdays
Thermal time, base temperature $5^{o}C$: May to Aug	HU5-2	^{O}Cdays
Thermal time, base temperature $5^{o}C$: August to March	HU5-3	^{O}Cdays
Thermal time, base temperature $5^{o}C$: April to March	HU5-4	^{O}Cdays
Thermal time, base temperature $10^{o}C$: May to August	HU10-2	^{O}Cdays
Thermal time, base temperature $10^{o}C$: Aug to March	HU10-3	^{O}Cdays
Thermal time, base temperature $10^{o}C$: April to March	HU10-4	^{O}Cdays
Thermal time, base temperature $15^{o}C$: May to August	HU15-2	^{O}Cdays
Thermal time, base temperature $15^{o}C$: Aug to March	HU15-3	^{O}Cdays
Thermal time, base temperature $15^{o}C$: April to March	HU15-4	^{O}Cdays
Mean solar radiation: May to August	rad2	MJ m^{-2} s^{-1}
Mean solar radiation: August to March	rad3	MJ m^{-2} s^{-1}
Mean solar radiation: April to March	rad4	MJ m^{-2} s^{-1}
Wind speed: August to March	WS3	m s^{-1}
Wind speed: April to March	WS4	m s^{-1}
Maximum relative humidity: April to March	RHx4	%
Minimum relative humidity: April to March	RHn4	%
Potential evapotranspiration: April to March	ETo4	mm day^{-1}
Maximum evapotranspiration: April to March	ETx4	mm day^{-1}
Minimum evapotranspiration: April to March	ETn4	mm day^{-1}
Soil pH (water)	pH-H_2O	Numeric
Soil phosphorus	P	mg kg^{-1}
Soil potassium	K	mg kg^{-1}
Soil calcium	Ca	mg kg^{-1}
Soil magnesium	Mg	mg kg^{-1}
Soil resistance	Resist	ohm
Applied nitrogen	AppN	kg ha^{-1}

Table 3.7 Degrees of freedom distribution used in ANOVA

Source of variation	n	Degrees of freedom
Cultivar (G)	11	10
Area (E)	3	2
Replications/area	5	8
Interaction (G X E)	33	20
Error	113	124
Total	165	164

3.9 Data collection and statistical analysis

Fruit yield data were collected for cultivars at three trial sites over seven experimental years (Appendix 3.6). Data were collected from each of the four plants in the net plot area for five replicates per site, and year. The means (n=20) were used for statistical analysis. Data of the number of cladodes left after annual winter pruning (excluding the mother cladode), number of cladodes that set fruit, total number of fruit set, number of fruit left after thinning, fruit yield in ton per hectare and cumulative fruit yield were collected. The five yield components, the method of determination and measurements are shown in Table 3.8.

Data were subjected to analysis of variance (ANOVA) using the statistical software package, GenStat (2003). Some cultivars produced little or no fruit in certain years and locations; thus, where unequal replications were evident the ANOVA for unbalanced designs was used. Pairwise testing was only performed when the F test in the ANOVA proved to be significant at a p=0.05 (Appendix 3.7). To determine differences between treatments using the unbalanced design methodology, treatment means were not compared using the standard least significant difference test, but rather differences in t probability of the pair wise differences.

Due to the large variability in cactus pear fruit yield (Brutsch, 1979), data were not normally distributed for the number of cladodes left after pruning, number of fertile cladodes, number of fruit set per plant and number of fruit left after thinning. The data showed positive skewedness, therefore, square root transformations ($y=\sqrt{(x+0.05)}$) were done prior to statistical analysis to stabilise treatment variances (M. Smith, ARC Biometry Unit, Silverton, Pretoria, personal communication, 2007). However, fruit yield and cumulative fruit yield data conformed to the assumptions of homogeneity and normal distribution and were therefore not transformed prior to analysis. Results will be presented on the transformed data, and the original data will be presented in the tables.

Table 3.8 Data collection measurements for vegetative and reproductive parameters influencing fruit yield, method of determination and number of measurements made for cactus pear environmental adaptability studies in Limpopo

Measurement	Method of Determination	Number of Measurements
Number of cladodes left after pruning per plant (n) (cpl)	All cladodes, except the mother cladode were counted after annual pruning	Individually determined on four data plants per cultivar for each of the five replications per agro-climatic area
Number of fertile cladodes per plant (n) (cf)	All cladodes bearing fruit were counted during November of each year	Individually determined on four data plants per cultivar for each of the five replications per agro-climatic area
Total number of fruit set per plant (n) (fs)	All fruits set were counted during November of each year.	Individually determined on four data plants per cultivar for each of the five replications per agro-climatic area
Number of fruit left after thinning per plant (n) (fat)	After the last fruit thinning exercise in October/November, all fruit remaining were counted	Individually determined on four data plants per cultivar for each of the five replications per agro-climatic area
Fruit yield (t ha^{-1}) (fy)	The number of fruit left after thinning was multiplied by the mean fruit mass obtained during fruit quality determination and expressed as fruit yield in ton per hectare	Individually determined on four data plants per cultivar for each of the five replications per agro-climatic area
Cumulative fruit yield (t ha^{-1})	Annual fruit yields were added over the seven year period and expressed as fruit yields in ton per hectare	Individually determined on four data plants per cultivar for each of the five replications per agro-climatic area

To study the relationships between each of the five fruit quality parameters and the 52 climatic and soil variables, the data were correlated separately and in combination using Pearson's correlation coefficient at p=0.5, 0.1 and 0.001 levels of significance (Appendix 3.8). Based on the results obtained from the correlations, a series of step-wise multiple linear regressions were conducted with fruit quality components as the dependent and the environmental factors as the independent variables (Appendix 3.9) using GenStat (2003). Regression analysis was used to determine the climatic and soil variables that influenced fruit quality and were tested at p=0.05 significance level.

The Additive Main Effects and Multiplicative Interaction (AMMI) model, which combines the analysis of variance for the genotype and environment main effects, with principal component analysis (PCA) of the G X E interaction (Gauch, 1988) was performed on fruit yield data for the seven production years (1994/5 to 2000/1)

(Appendix 3.10). Although the AMMI model has been used on a cultivar of field crops, its use as a statistical procedure in permanent fruit crops is relatively new and was therefore evaluated for its appropriateness.

To enable researchers and farmers to determine if the fruit yields obtained are commercially acceptable or not, minimum criteria for economically viable fruit yields according to plant age in South Africa have been suggested by Potgieter & Mkhari (2002) (Table 3.9). Results obtained and cultivar recommendations in this study will be made based on these criteria.

Table 3.9 Minimum economically viable cactus pear fruit yield criteria (Potgieter & Mkhari, 2002)

Plant age (year after planting)	Minimum fruit yield criteria (t ha $^{-1}$)
2	1.0
3	2.5
4	4.0
5	7.0
6	10.0
7	15.0
8	20.0

CHAPTER 4

INFLUENCE OF ENVIRONMENT ON VEGETATIVE DEVELOPMENT

Although the primary aim of this study was to describe the fruit yield of cactus pear, it is equally important to view the vegetative parts of the plant (canopy), since potential fruit yield may be determined by the size and fertility of the bearing surface. For this reason, the number of cladodes that remained after pruning and the number of fertile cladodes were included to explain possible differences observed in the fruit yield of the different cultivars. The specific objectives of this chapter were to determine if there were any differences between cultivars in terms of the number of cladodes left after pruning (potential bearing surface) and the number of cladodes that bear fruit (fertile cladodes) and to establish how environmental factors influence vegetative growth of cultivars in the three experimental areas.

4.1 Genotype effects on vegetative development

As indicated in statistical procedures, the tabular and graphical values are of transformed data, with the original data included in the tables for cross reference. To avoid confusion, only the transformed data on which the statistical analysis was based will be used in the discussion of the results. The mean values over the seven-year period (right-hand column) in the tables will be the focus of the discussion as this gives an idea of the overall performance of the cultivar.

4.1.1 Number of cladodes left after pruning

4.1.1.1 Hot low-altitude area

According to the results (Table 4.1), “Gymno Carpo” had the greatest mean number of cladodes left on the plant after pruning (8.78) although it was not significantly different from that of “Algerian” (8.41). These cultivars had high vegetative growth rates in this environment as reflected by the number of cladodes left after pruning and thus a greater potential bearing surface. “Malta” (8.16), “Nudosa” (8.13), “American Giant” (8.08) and “Morado” (7.95) also had high mean numbers of cladodes left after pruning although significantly less than the two aforementioned cultivars. The three *O. fusicaulis* species (“Blue Motto” (6.17), “Direkteur” (6.06) and “Fusicaulis” (6.04)) all had low mean numbers of cladodes left after pruning, indicating that their vegetative growth was significantly

Table 4.1 Square root transformed data [a] (trans) of the number of cladodes left after pruning (clp) and standard error of the mean (sem) of eleven cactus pear cultivars in the three trial sites over seven production years from 1994-2001

Production year	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Mean/cultivar			
Cultivar	**clp**	**trans**		**sem**	**clp**	**trans**		**sem**	**clp**	**trans**		**sem**	**clp**	**trans**		**sem**	**clp**	**trans**		**sem**	**clp**	**trans**		**sem**	**clp**	**trans**		**sem**	**clp**	**trans**		**sem**
Hot low-altitude area																																
Algerian American	25.80	5.11	b	0.152	44.55	6.65	ab	0.231	65.55	8.10	b	0.245	74.75	8.65	ab	0.267	85.10	9.24	ns	0.277	100.65	10.04	a	0.252	96.90	9.86	ab	0.245	70.47	8.41	ab	0.199
Giant	19.85	4.51	cde	0.152	37.60	6.16	b	0.231	65.20	8.10	b	0.245	72.00	8.49	ab	0.267	75.05	8.68	ns	0.277	89.30	9.46	ab	0.252	94.95	9.76	ab	0.245	64.85	8.08	bc	0.199
Blue Motto	16.65	4.13	ef	0.152	25.85	5.11	cd	0.231	30.92	5.58	cd	0.245	39.63	6.31	c	0.267	42.35	6.54	ns	0.277	53.15	7.30	d	0.252	54.92	7.42	d	0.245	37.64	6.17	d	0.199
Direkteur	15.05	3.93	fg	0.152	24.15	4.96	d	0.231	29.50	5.46	d	0.245	38.70	6.25	c	0.267	44.05	6.65	ns	0.277	49.10	7.04	de	0.252	53.75	7.35	d	0.245	36.33	6.06	d	0.199
Fusicaulis Gymno	12.60	3.61	g	0.152	22.00	4.73	d	0.231	34.00	5.86	cd	0.245	41.10	6.44	c	0.267	42.75	6.56	ns	0.277	48.90	7.01	de	0.252	51.80	7.21	d	0.245	36.16	6.04	d	0.199
Carpo	30.70	5.57	a	0.152	53.25	7.31	a	0.231	79.90	8.94	a	0.245	82.45	9.09	a	0.267	84.85	9.23	ns	0.277	102.45	10.14	a	0.252	104.05	10.22	a	0.245	76.81	8.78	a	0.199
Malta	23.90	4.94	bc	0.152	42.20	6.52	b	0.231	63.00	7.95	b	0.245	76.85	8.78	ab	0.267	78.60	8.88	ns	0.277	92.08	9.61	ab	0.252	87.25	9.36	bc	0.245	66.27	8.16	bc	0.199
Morado	21.90	4.72	bcd	0.152	43.90	6.65	ab	0.231	62.45	7.91	b	0.245	71.85	8.50	ab	0.267	69.90	8.39	ns	0.277	83.40	9.15	bc	0.252	86.90	9.33	bc	0.245	62.90	7.95	bc	0.199
Nudosa Skinners	18.30	4.34	def	0.152	36.30	6.06	b	0.231	56.45	7.54	b	0.245	65.70	8.13	b	0.267	80.85	9.02	ns	0.277	97.60	9.90	a	0.252	104.00	10.22	a	0.245	65.60	8.13	bc	0.199
Court	15.15	3.95	fg	0.152	22.60	4.80	d	0.231	38.50	6.23	c	0.245	45.55	6.77	c	0.267	39.60	6.32	ns	0.277	42.45	6.55	e	0.252	41.25	6.45	e	0.245	35.01	5.95	d	0.199
Zastron	19.60	4.48	de	0.152	37.15	6.13	b	0.231	61.55	7.85	b	0.245	77.90	8.82	ab	0.267	68.85	8.30	ns	0.277	75.40	8.68	c	0.252	75.50	8.69	c	0.245	59.42	7.72	c	0.199
Mean/year	**19.95**	**4.48**			**35.41**	**5.92**			**53.37**	**7.23**			**62.41**	**7.84**			**64.72**	**7.98**			**75.86**	**8.62**			**77.39**	**8.72**			**55.59**	**7.40**		
CV (%)		**7.56**				**8.75**				**7.57**				**7.61**				**6.36**				**6.53**				**6.28**				**6.01**		
Cool mid-altitude area																																
Algerian American	15.20	3.96	abc	0.135	23.05	4.83	ns	0.223	31.90	5.63	ab	0.283	51.75	7.19	bcd	0.200	63.05	7.93	ab	0.250	75.45	8.67	ab	0.249	63.20	7.95	bcd	0.207	46.23	6.81	ab	0.193
Giant	13.45	3.73	cd	0.135	20.25	4.55	ns	0.223	34.80	5.93	a	0.283	53.30	7.33	abc	0.200	60.15	7.78	abcd	0.250	72.87	8.56	ab	0.249	65.58	8.13	b	0.207	45.77	6.80	ab	0.193
Blue Motto	10.40	3.30	ef	0.135	17.40	4.23	ns	0.223	23.87	4.93	b	0.283	37.85	6.18	f	0.200	51.05	7.50	bcd	0.250	60.7	7.80	c	0.249	60.23	7.79	bcd	0.207	37.36	6.14	d	0.193
Direkteur	13.60	3.75	cd	0.135	22.85	4.82	ns	0.223	30.88	5.64	ab	0.319	41.05	6.44	ef	0.200	54.70	7.17	cd	0.250	63	7.96	bc	0.249	64.15	8.04	bc	0.207	41.88	6.50	bcd	0.193
Fusicaulis Gymno	9.00	3.08	fg	0.135	18.40	4.32	ns	0.223	28.05	5.30	ab	0.283	43.35	6.59	ef	0.200	50.15	7.41	bcd	0.250	58.8	7.66	c	0.249	55.20	7.43	d	0.207	37.57	6.14	d	0.193
Carpo	18.45	4.34	a	0.135	23.45	4.88	ns	0.223	27.75	5.28	ab	0.283	59.55	7.74	ab	0.200	61.50	7.09	d	0.250	74.45	8.65	ab	0.249	64.35	8.04	bc	0.207	47.07	6.89	ab	0.193
Malta	14.55	3.86	bcd	0.135	17.85	4.27	ns	0.223	24.05	4.93	b	0.283	44.40	6.70	def	0.200	49.80	7.87	abc	0.250	60.65	7.81	c	0.249	55.85	7.50	cd	0.207	38.16	6.21	cd	0.193
Morado	13.85	3.77	cd	0.135	20.30	4.53	ns	0.223	25.90	5.09	b	0.283	49.30	7.05	cde	0.200	64.35	7.09	d	0.250	74.65	8.65	ab	0.249	66.50	8.18	b	0.207	44.98	6.73	abc	0.193
Nudosa Skinners	11.75	3.49	de	0.135	20.50	4.56	ns	0.223	35.45	5.97	a	0.283	47.90	6.95	cde	0.200	71.15	8.02	ab	0.250	85.35	9.26	a	0.249	79.65	8.95	a	0.207	50.25	7.12	a	0.193
Court	7.25	2.76	g	0.135	14.40	3.84	ns	0.223	16.40	4.09	c	0.283	30.75	5.57	g	0.200	29.50	8.45	a	0.250	34.75	5.93	d	0.249	30.75	5.58	e	0.207	23.40	4.88	e	0.193
Zastron	17.50	4.23	ab	0.135	26.40	5.15	ns	0.223	32.40	5.71	ab	0.283	60.35	7.79	a	0.200	56.10	5.47	e	0.250	65.75	8.13	bc	0.249	61.40	7.86	bcd	0.207	45.70	6.79	ab	0.193
Mean/year	**13.18**	**3.66**			**20.44**	**4.54**			**28.31**	**5.32**			**47.23**	**6.87**			**55.59**	**7.44**			**66.04**	**8.10**			**60.62**	**7.77**			**41.67**	**6.46**		
CV (%)		**8.24**				**10.98**				**11.93**				**6.52**				**7.53**				**6.86**				**5.95**				**6.67**		
Cold high-altitude area																																
Algerian American	9.95	3.23	e	0.138	20.30	4.55	de	0.164	23.20	4.85	e	0.213	34.75	5.91	d	0.212	37.40	6.13	de	0.244	41.30	6.43	bcd	0.259	37.90	6.17	def	0.256	29.26	5.43	de	0.187
Giant	16.55	4.13	ab	0.138	34.45	5.91	b	0.164	53.10	7.32	b	0.213	63.05	7.97	b	0.212	81.10	9.02	b	0.244	99.20	9.98	a	0.259	108.70	10.44	a	0.256	65.17	8.10	b	0.187
Blue Motto	14.30	3.84	bc	0.138	23.90	4.93	cd	0.164	29.70	5.49	d	0.213	40.50	6.40	cd	0.212	45.55	6.79	cd	0.244	42.65	6.57	bcd	0.259	42.75	6.57	de	0.256	34.19	5.89	cd	0.187
Direkteur	14.25	3.83	bc	0.138	21.15	4.65	cde	0.164	26.00	5.14	de	0.213	37.95	6.19	cd	0.212	45.45	6.77	cd	0.244	45.95	6.80	bc	0.259	45.65	6.78	d	0.256	33.77	5.85	cde	0.187
Fusicaulis Gymno	11.90	3.49	cde	0.138	24.95	5.03	c	0.164	29.80	5.50	d	0.213	43.90	6.65	c	0.212	52.30	7.25	c	0.244	46.70	6.86	bc	0.259	57.25	7.57	c	0.256	38.11	6.20	c	0.187
Carpo	13.20	3.69	cd	0.138	22.50	4.79	cd	0.164	25.40	5.08	de	0.213	33.75	5.85	d	0.212	30.45	5.55	e	0.244	37.10	6.12	cd	0.259	35.85	6.00	ef	0.256	28.32	5.36	de	0.187
Malta	11.15	3.40	de	0.138	20.85	4.61	cde	0.164	25.85	5.13	de	0.213	35.45	5.98	d	0.212	37.95	6.19	de	0.244	39.67	6.32	bcd	0.259	38.95	6.27	def	0.256	29.98	5.51	de	0.187
Morado	9.30	3.13	e	0.138	20.65	4.59	cde	0.164	27.50	5.24	de	0.213	38.43	6.18	cd	0.212	44.98	6.66	cd	0.244	49.17	6.97	b	0.259	39.85	6.29	def	0.256	32.84	5.72	cde	0.187
Nudosa Skinners	11.40	3.43	de	0.138	25.10	5.04	c	0.164	37.20	6.14	c	0.213	64.20	8.04	b	0.212	83.05	9.14	ab	0.244	106.85	10.36	a	0.259	89.40	9.48	b	0.256	59.60	7.75	b	0.187
Court	9.80	3.18	e	0.138	18.05	4.27	e	0.164	24.63	4.97	de	0.213	38.60	6.23	cd	0.212	37.95	6.18	de	0.244	35.15	5.94	d	0.259	33.20	5.78	f	0.256	28.20	5.33	e	0.187
Zastron	19.40	4.45	a	0.138	44.75	6.71	a		70.20	8.39	a	0.213	98.60	9.95		0.212	94.15	9.73	a	0.24	112.25	10.62	a	0.259	122.45	11.08		0.26	80.26	8.98	a	0.187
Mean/year	**12.84**	**3.62**			**25.15**	**5.01**			**33.87**	**5.75**			**48.11**	**6.85**			**53.67**	**7.22**			**59.64**	**7.54**			**59.27**	**7.49**			**41.79**	**6.38**		
CV (%)		**8.50**				**7.34**				**8.29**				**6.92**				**7.55**				**7.67**				**7.63**				**6.57**		

lower than that of other cultivars with the exception of “Skinners Court” that also had low numbers of cladodes after pruning per plant. No statistically significant differences were found in production year 5 due to an F probability value greater than p=0.05 in the ANOVA.

Plant growth habit in this area as compared to the other two areas, was upright and most cultivars developed into very tall plants. The maximum allowed plant height of 1.8 m was achieved in production year 2 for some cultivars while it occurred substantially later in the mid- and high-altitude areas. This provides evidence of a high degree of phenotypic plasticity in cactus pear as indicated by the number of cladodes left after pruning, showing the important role that environmental factors had in changing the expression of the individual characteristic (Sadras, 2007).

4.1.1.2 Cool mid-altitude area

Cultivars differed significantly from one another in this cool mid-altitude environment (Table 4.1). “Skinners Court” (4.88), “Blue Motto” (6.14) and “Fusicaulis” (6.14) had the least mean number of cladodes per plant after pruning, although this was not statistically different from that of “Malta” (6.21) and “Direkteur” (6.50). The low number of cladodes left after pruning indicates that the relative vegetative growth rates of these cultivars was lower in this environment, thus limiting the potential bearing surface. In contrast, “Nudosa” had the highest mean number of cladodes left after pruning (7.12), followed by “Gymno Carpo”, “Algerian”, “American Giant”, “Zastron” and “Morado” with 6.89, 6.81, 6.80, 6.79 and 6.73 respectively. No significant differences were observed between cultivars in production year 2.

4.1.1.3 Cold high-altitude area

“Zastron” with 8.98 had significantly more cladodes left after pruning than any other cultivars in this cold high-altitude environment, showing its’ adaptability in terms of vegetative growth under low mean temperatures, overcast conditions and sandy acid soils (Table 4.1). Both “American Giant” (8.10) and “Nudosa” (7.75) performed well in terms of the mean number of cladodes left after pruning, while none of the other cultivars showed satisfactory vegetative growth rates. Of all cultivars “Skinners Court” (5.33) had the least number of cladodes after pruning. These results indicate the poor adaptability of especially the *O. ficus-indica* cultivars (“Morado” (5.72), “Malta” (5.51) “Algerian” (5.43) and “Gymno Carpo” (5.36)) for vegetative growth under these environmental conditions.

An interesting phenomenon observed in this cold high-altitude area for the *O. ficus-indica* cultivars, is that plants tended to develop an extreme prostrate growth habit,

with cladodes hanging downwards and developing inwards. Eight years after establishment the *O. ficus-indica* species hardly reached 1.1 m in height, while "Zastron", "American Giant" and "Nudosa" (unidentified species) developed normally and were substantially taller (Figure 4.1). These findings confirm the highly plastic nature of the plant, where according to Mondragon-Jacobo & Bordelon (1996) this can manifest as drastic changes to growth habit, cladode shape and cladode size under different environmental conditions.

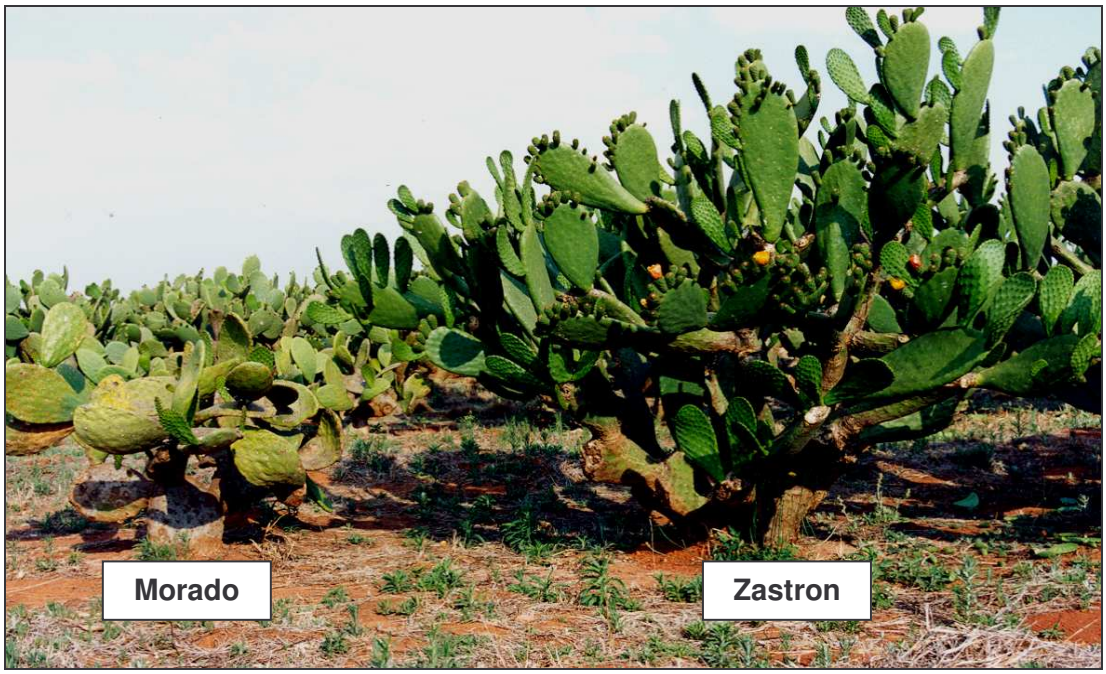

Figure 4.1 Comparison of the vegetative and reproductive growth and development of two *Opuntia* species of similar plant age at Zaaiplaas in the cold high-altitude area of Limpopo

These results from the three areas confirm that South African cactus pear cultivars differ in vegetative vigour (Wessels, 1988a; 1989), and as it is not a monospecific species (Chessa & Nieddu, 1997), this variability between cultivars is to be expected. Considerable variation between cultivars was also evident between environments and production years. In addition, large within clone variability is common in cactus pear where it influences both vegetative growth and productivity. For example, Wessels *et al*. (1997) showed that where cladodes (as plant material) were taken from high potential mother plants of the same clone, more cladodes and fruit developed on the daughter cladodes than of those from low potential mother plants. Although this result was not statistically significant, probably due to a high standard error, it nevertheless shows the within clone variability that exists and the importance of selecting plant material from fertile mother plants for orchard establishment.

One of the major productivity interactions to be expected in cactus pear orchards is that of tree age versus planting density. It seems reasonable to expect that vegetative growth will increase year-on-year until such time that tree crowding occurs, when adjacent trees start growing into each other, competing for solar radiation. In high tree densities (>1000 plants ha $^{-1}$) this is expected to happen earlier than in lower density plantings (< 500-800 plants ha $^{-1}$), but is also dependant on the environment. As seen in this study, the number of cladodes remaining after pruning (vegetative growth) is reduced in the cold high-altitude environment, indicating that overcrowding will occur at a later stage than for example in the hot low-altitude area where vegetative growth was higher. Higher plant densities can therefore be planted in cooler environments. Canopy management (winter and summer pruning) is an important tool to use to manipulate vegetative growth and should be started from the first year after planting to delay the onset of overcrowding and a consequent reduction in reproductive productivity.

The number of cladodes left after pruning is a good indicator of the relative size of the bearing surface at the start of the season. The trials were maintained according to commercially accepted practices where pruning is a standard practice in the South African cactus pear industry (Potgieter, 1997a). This is an important technique to facilitate easier cochineal detection and control, allowing adequate photosynthetically active radiation (PAR) into the plant canopy, facilitate easier harvesting (Wessels, 1988e) and to balance the vegetative versus the reproductive growth of the plant. As night time CO_2-uptake depends on the total daily PAR received, solar radiation received during the day would affect vegetative growth (Nobel, 1988). Pruning intensity and timing were applied as uniformly as possible over all cultivars and trial sites to prevent this practice from adding to the external sources of variation. The response seen is thus due to treatment (cultivars in different environments) and less influenced by pruning practice employed.

Cultivars had substantially fewer cladodes left after pruning in the cool mid-altitude environment than in the hot low-altitude, despite both areas having temperatures that favoured rapid vegetative growth during summer months. The most likely reasons for these differences in vegetative growth between the two sites are due to soil depth and soil Na content. For instance, it is known that Na inhibits net CO_2 uptake and reduces growth of Opuntias by about 30% at 100 mg kg^{-1} (Nobel, 1995). As the cool mid-altitude site had the highest soil Na content (51.0 mg kg^{-1}) and the shallowest soil (400 mm effective rooting depth) at plant establishment, it is speculated that the combination of higher Na content and shallower soils could have negatively affected

vegetative growth. Care should therefore be taken to extrapolate results from this cool mid-altitude site to other areas without considering possible differences in soil types.

4.1.2 Number of fertile cladodes

4.1.2.1 Hot low-altitude area

The performance of cultivars in the hot low-altitude area in terms of the mean number of fertile cladodes is shown in Table 4.2. In general, the higher the number of fertile cladodes, the higher is the potential bearing surface for fruit set. “Gymno Carpo”, “Algerian”, and “Malta” produced significantly more fertile cladodes with 4.76, 4.82, and 4.69 respectively, which is higher than the other cultivars in this environment. “Blue Motto” (1.02), “Fusicaulis” (1.32) and “Direkteur” (1.43) had the lowest number of fertile cladodes produced per plant in this hot environment, showing their poor adaptability for reproductive development in this environment.

4.1.2.2 Cool mid-altitude area

Table 4.2 indicates the performance of the cultivars in the cool mid-altitude area for mean number of fertile cladodes developed. “Algerian” (4.75) had the most fertile cladodes but this was not statistically different from that produced by “Zastron” or “Gymno Carpo” with 4.58 and 4.55, respectively. The mean number of fertile cladodes produced by “Morado” (4.24) and “Nudosa” (4.23) was however not significantly different from that of the last two mentioned cultivars. “Blue Motto” (2.45) and “Skinners Court” (2.23), produced the lowest number of fertile cladodes than any of the other cultivars in this environment.

4.1.2.3 Cold high-altitude area

Significant differences between cultivars were found in the cold high-altitude area in terms of number of fertile cladodes (Table 4.2). The highest mean number of fertile cladodes was recorded for “Zastron” (5.08) which differed significantly from all other cultivars. “American Giant” (4.42) and “Nudosa” (4.53) also had a high number of fertile cladodes. “Nudosa” (4.53) had a significantly higher mean number of fertile cladodes than “Algerian” (2.40), “Malta” (2.26) and “Gymno Carpo” (2.57). Both “Direkteur” (1.05) and “Blue Motto” (1.13) produced very few fertile cladodes in this environment with lower mean temperatures and colder winters than the other two areas, meaning that fruit yields are also expected to be lower.

Table 4.2 Square root transformed data [a] (trans) of fertile cladodes (cf) and standard error of the mean (sem) of eleven cactus pear cultivars in the three trial sites over seven production years from 1994-2001

Production year	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Mean/cultivar			
Cultivar	**cf**	**trans**		**sem**	**cf**	**trans**		**sem**	**cf**	**trans**		**sem**	**cf**	**trans**		**sem**	**cf**	**trans**		**sem**	**cf**	**trans**		**sem**	**cf**	**trans**		**sem**	**cf**	**trans**		**sem**
Hot low-altitude																																
Algerian	11.30	3.19	a	0.275	12.45	3.35	a	0.288	28.65	5.39	ab	0.216	24.45	4.98	a	0.215	29.20	5.41	a	0.181	34.40	5.88	a	0.188	20.15	4.53	a	0.238	22.94	4.82	a	0.127
American Giant	4.10	2.10	b	0.275	4.30	2.14	b	0.288	15.25	3.94	d	0.216	15.80	3.96	b	0.215	10.15	3.25	d	0.181	11.30	3.39	d	0.188	4.80	2.29	c	0.238	9.39	3.14	d	0.127
Blue Motto	0.20	0.83	c	0.275	0.40	0.92	c	0.288	1.08	1.19	gh	0.216	0.20	0.81	e	0.215	0.10	0.77	f	0.181	0.65	1.05	g	0.188	1.20	1.29	d	0.238	0.55	1.02	g	0.127
Direkteur	0.40	0.94	c	0.275	0.40	0.94	c	0.288	2.85	1.80	fg	0.216	1.50	1.35	e	0.215	1.00	1.20	f	0.181	2.40	1.60	f	0.188	2.50	1.69	cd	0.238	1.58	1.43	f	0.127
Fusicaulis	0.50	0.98	c	0.275	0.00	0.71	c	0.288	0.75	1.08	h	0.216	4.80	2.29	d	0.215	0.25	0.85	f	0.181	1.40	1.37	fg	0.188	1.05	1.23	d	0.238	1.25	1.32	fg	0.127
Gymno Carpo	12.53	3.52	a	0.275	13.70	3.67	a	0.288	31.10	5.59	a	0.216	29.65	5.43	a	0.215	23.55	4.89	b	0.181	26.60	5.20	b	0.188	19.20	4.42	a	0.238	8.87	4.76	a	0.127
Malta	9.10	3.08	a	0.275	9.90	3.20	a	0.288	24.05	4.93	bc	0.216	24.15	4.95	a	0.215	30.10	5.52	a	0.181	34.15	5.88	a	0.188	19.68	4.48	a	0.238	21.59	4.69	ab	0.127
Morado	9.75	3.18	a	0.275	10.80	3.34	a	0.288	21.00	4.62	c	0.216	17.05	4.19	b	0.215	17.60	4.24	c	0.181	22.48	4.79	b	0.188	11.27	3.36	b	0.238	15.71	4.02	c	0.127
Nudosa	1.05	1.21	c	0.275	0.85	1.09	c	0.288	5.20	2.37	f	0.216	10.50	3.29	c	0.215	18.50	4.34	c	0.181	16.55	4.10	c	0.188	9.45	2.98	b	0.238	8.87	3.05	d	0.127
Skinners Court	1.45	1.34	bc	0.275	1.85	1.51	bc	0.288	8.95	3.01	e	0.216	6.80	2.70	cd	0.215	3.50	1.98	e	0.181	5.65	2.46	e	0.188	4.85	2.26	c	0.238	4.72	2.28	e	0.127
Zastron	8.50	2.98	a	0.275	9.40	3.12	a	0.288	25.05	5.04	abc	0.216	28.15	5.34	a	0.215	17.80	4.27	c	0.181	21.95	4.73	b	0.188	18.00	4.28	a	0.238	18.41	4.35	bc	0.127
Mean/year	**5.35**	**2.12**			**5.82**	**2.18**			**14.90**	**3.54**			**14.82**	**3.57**			**13.80**	**3.34**			**16.14**	**3.68**			**10.20**	**2.98**			**10.35**	**3.17**		
CV (%)		**28.99**				**29.5**				**13.6**				**13.5**				**12.2**				**11.44**				**17.9**				**8.98**		
Cool mid-altitude																																
Algerian	7.30	2.75	a	0.187	9.65	3.14	a	0.230	20.90	4.57	a	0.309	26.05	5.13	a	0.187	32.60	5.73	a	0.211	45.45	6.75	a	0.182	13.70	3.76	b	0.280	22.23	4.75	a	0.141
American Giant	2.10	1.61	cd	0.187	2.65	1.77	cd	0.230	21.00	4.58	a	0.309	19.00	4.40	c	0.187	19.20	4.43	c	0.211	28.50	5.37	d	0.182	8.80	3.04	bcd	0.280	14.46	3.87	c	0.141
Blue Motto	1.95	1.55	cde	0.187	2.35	1.67	cde	0.230	6.50	2.63	de	0.309	5.35	2.40	e	0.187	3.90	2.09	f	0.211	9.35	3.13	g	0.182	9.27	3.09	bcd	0.280	5.52	2.45	f	0.141
Direkteur	3.85	2.07	bc	0.187	5.00	2.32	bc	0.230	11.20	3.18	bcd	0.309	12.15	3.54	d	0.187	11.25	3.40	d	0.211	18.70	4.36	ef	0.182	13.40	3.71	b	0.280	10.79	3.35	d	0.141
Fusicaulis	0.70	1.07	e	0.187	0.80	1.10	e	0.230	9.40	3.12	cd	0.309	9.90	3.22	d	0.187	9.40	3.13	de	0.211	17.80	4.27	f	0.182	6.65	2.65	d	0.280	7.81	2.88	e	0.141
Gymno Carpo	6.45	2.56	ab	0.187	8.35	2.88	ab	0.230	17.30	4.19	a	0.309	24.25	4.96	ab	0.187	29.85	5.49	ab	0.211	42.70	6.57	a	0.182	13.05	3.55	bc	0.280	17.49	4.55	ab	0.141
Malta	5.10	2.35	ab	0.187	6.55	2.63	ab	0.230	15.95	4.04	ab	0.309	20.65	4.60	bc	0.187	23.45	4.89	bc	0.211	33.05	5.78	cd	0.182	11.50	3.40	bcd	0.280	16.61	4.13	c	0.141
Morado	5.10	2.34	ab	0.187	6.55	2.63	ab	0.230	13.85	3.74	abc	0.309	22.00	4.71	abc	0.187	27.40	5.26	ab	0.211	35.45	5.98	bc	0.182	13.35	3.60	bc	0.280	17.67	4.24	bc	0.141
Nudosa	1.45	1.36	de	0.187	1.15	1.18	de	0.230	18.25	4.32	a	0.309	22.75	4.81	abc	0.187	26.95	5.20	ab	0.211	41.55	6.48	ab	0.182	10.30	3.21	bcd	0.280	17.49	4.23	bc	0.141
Skinners Court	1.05	1.21	de	0.187	1.10	1.20	de	0.230	3.95	2.08	e	0.309	5.60	2.45	e	0.187	6.25	2.59	ef	0.211	6.30	2.56	h	0.182	7.65	2.82	cd	0.280	4.56	2.23	f	0.141
Zastron	7.58	2.81	a	0.187	9.90	3.18	a	0.230	19.40	4.45	a	0.309	22.75	4.80	abc	0.187	26.45	5.17	ab	0.211	33.15	5.78	cd	0.182	24.75	5.02	a	0.280	20.57	4.58	ab	0.141
Mean/year	**3.88**	**1.97**			**4.91**	**2.15**			**14.34**	**3.72**			**17.31**	**4.09**			**19.70**	**4.31**			**28.36**	**5.18**			**12.04**	**3.44**			**14.11**	**3.75**		
CV (%)		**21.28**				**23.91**				**18.61**				**10.21**				**10.93**				**7.85**				**18.17**				**8.39**		
Cold high-altitude																																
Algerian	1.95	1.54	cd	0.148	3.00	1.84	c	0.160	3.80	2.00	cd	0.224	7.75	2.85	de	0.187	4.00	2.08	c	0.229	9.65	3.18	de	0.304	7.10	2.74	c	0.240	5.32	2.40	c	0.116
American Giant	4.00	2.12	b	0.148	6.05	2.55	b	0.160	23.70	4.92	a	0.224	22.40	4.78	b	0.187	26.70	5.20	b	0.229	20.75	4.25	c	0.304	29.80	5.48	a	0.240	19.06	4.42	b	0.116
Blue Motto	0.00	0.71	f	0.148	0.00	0.71	f	0.160	0.15	0.80	e	0.224	3.10	1.87	f	0.187	0.10	0.77	d	0.229	0.10	0.77	f	0.304	2.15	1.57	de	0.240	0.80	1.13	f	0.116
Direkteur	0.25	0.84	f	0.148	0.10	0.77	ef	0.160	0.10	0.77	e	0.224	1.30	1.29	g	0.187	0.10	0.77	d	0.229	0.45	0.95	f	0.304	2.25	1.59	de	0.240	0.65	1.05	f	0.116
Fusicaulis	0.20	0.81	f	0.148	0.95	1.18	de	0.160	2.10	1.59	d	0.224	7.70	2.84	de	0.187	1.70	1.41	d	0.229	0.25	0.84	f	0.304	3.75	1.95	d	0.240	2.38	1.69	e	0.116
Gymno Carpo	0.85	1.11	ef	0.148	3.10	1.87	c	0.160	6.15	2.53	c	0.224	12.20	3.54	c	0.187	5.70	2.48	c	0.229	10.40	3.28	d	0.304	4.30	2.16	cd	0.240	6.10	2.57	c	0.116
Malta	3.05	1.86	bc	0.148	4.55	2.21	bc	0.160	4.00	2.03	cd	0.224	8.20	2.94	d	0.187	4.67	2.23	c	0.229	5.45	2.39	e	0.304	3.28	1.91	d	0.240	4.74	2.26	cd	0.116
Morado	0.45	0.90	ef	0.148	1.55	1.36	d	0.160	2.40	1.51	d	0.224	5.45	2.32	ef	0.187	5.33	2.30	c	0.229	6.15	2.48	de	0.304	3.02	1.79	de	0.240	3.48	1.93	de	0.116
Nudosa	4.35	2.17	b	0.148	6.50	2.60	b	0.160	13.00	3.67	b	0.224	23.25	4.87	b	0.187	39.95	6.35	a	0.229	38.75	6.26	a	0.304	14.50	3.85	b	0.240	20.04	4.53	b	0.116
Skinners Court	1.40	1.32	de	0.148	3.10	1.86	c	0.160	3.55	1.99	cd	0.224	5.00	2.33	ef	0.187	1.20	1.28	d	0.229	0.55	0.99	f	0.304	0.80	1.12	e	0.240	2.23	1.65	e	0.116
Zastron	8.35	2.96	a	0.148	12.45	3.58	a	0.160	25.35	5.06	a	0.224	46.05	6.82	a	0.187	26.90	5.16	b	0.229	26.40	5.19	b	0.304	31.80	5.63	a	0.240	25.33	5.08	a	0.116
Mean/year	**2.26**	**1.48**			**3.76**	**1.87**			**7.66**	**2.44**			**12.95**	**3.31**			**10.58**	**2.73**			**10.81**	**2.78**			**9.34**	**2.71**			**8.19**	**2.61**		
CV (%)		**22.29**				**19.21**				**20.49**				**12.64**				**18.77**				**24.49**				**19.84**				**9.94**		

trans = square root transformed data of number of fertile cladodes. [a] Values presented are square root transformed data $y=\sqrt{(x+0.05)}$

Different letters in the same column (year) represent significant differences at P>0.05 by t probabilities of pair wise differences if the F-test was significant in the ANOVA.

The number of cladodes left after pruning gives an indication of the potential bearing surface of the plant. Therefore, high vegetative growth rates and ultimately a high number of cladodes formed are desirable for fruit yield. All three *O. fusicaulis* cultivars ("Direkteur", "Blue Motto", "Fusicaulis") produced low numbers of fertile cladodes in all environments and all years. However, their performance was particularly poor in both the hot low-altitude (< 2 per plant) and cold high-altitude areas (< 3 per plant), indicating that bearing potential was reduced under these extreme environmental conditions. The number of fertile cladodes was somewhat higher in the cool mid-altitude area (2.45 - 3.35 per plant), but was still significantly lower than that of other cultivars.

In comparison, all *O. ficus-indica* cultivars ("Algerian", "Gymno Carpo", "Malta", "Morado") produced substantially higher numbers of fertile cladodes in both the hot low-altitude (> 4.0 per plant) and cool mid-altitude environments (> 4.0 per plant), but performed very poorly in the cold high-altitude area (1.93 – 2.57 per plant). This shows a clear environmental preference between different species. The best environment in general for reproductive development was in the cool mid-altitude area where most cultivars formed at least some fertile cladodes. Unidentified cultivars ("American Giant", "Nudosa" and "Zastron") were the only cultivars that produced a high number of fertile cladodes in the cold high-altitude area, showing that these environmental conditions favoured their reproductive growth. According to Garcia de Cortazar & Nobel (1992); Inglese *et al*. (2002a) and Inglese & Gugluizza (2002), cladode fertility depends on environmental conditions, plant age and dry matter accumulation and if optimal, most (80-90%) terminal one-year-old cladodes should bear fruits and account for 90% of the yield.

Hoffmann *et al*. (1998) found an interesting relationship between total number of cladodes and onset of the reproductive stage for the weed *Opuntia stricta* in the Kruger National Park. Linear regression analysis showed that plants had to have a minimum 28 cladodes before they started to produce fruit. Thus showing for that species, the number of vegetative structures formed determines the onset of the reproductive stage and productive potential. However, as *O. stricta* plants had most probably grown from seed in the wild, this may be a juvenility response rather than the number of cladodes affecting the reproductive onset.

4.2 Environmental effects on vegetative development

4.2.1 Number of cladodes left after pruning

When the mean number of cladodes left after pruning for all cultivars over the seven production years were combined, significant differences (p=0.05) were observed between trial sites (Figure 4.2). The highest mean number of cladodes left after pruning in each of the seven production years was at the hot low latitude site where environmental conditions favoured vegetative growth. In four of the seven production years, the cool mid-altitude and cold high-altitude sites showed no significant difference in number of cladodes left after pruning, indicating that on average the same number of cladodes were left after pruning for both these areas.

At all three sites, the number of cladodes left after pruning increased with increasing plant age. Acevedo *et al*. (1983) reported similar findings where the total cladode area per plant increased more or less linearly with plant age for up to six years of age. Such a tendency is expected since canopy volume increases yearly as the plant develops vegetatively until such a time that it fills the space allocated in the row.

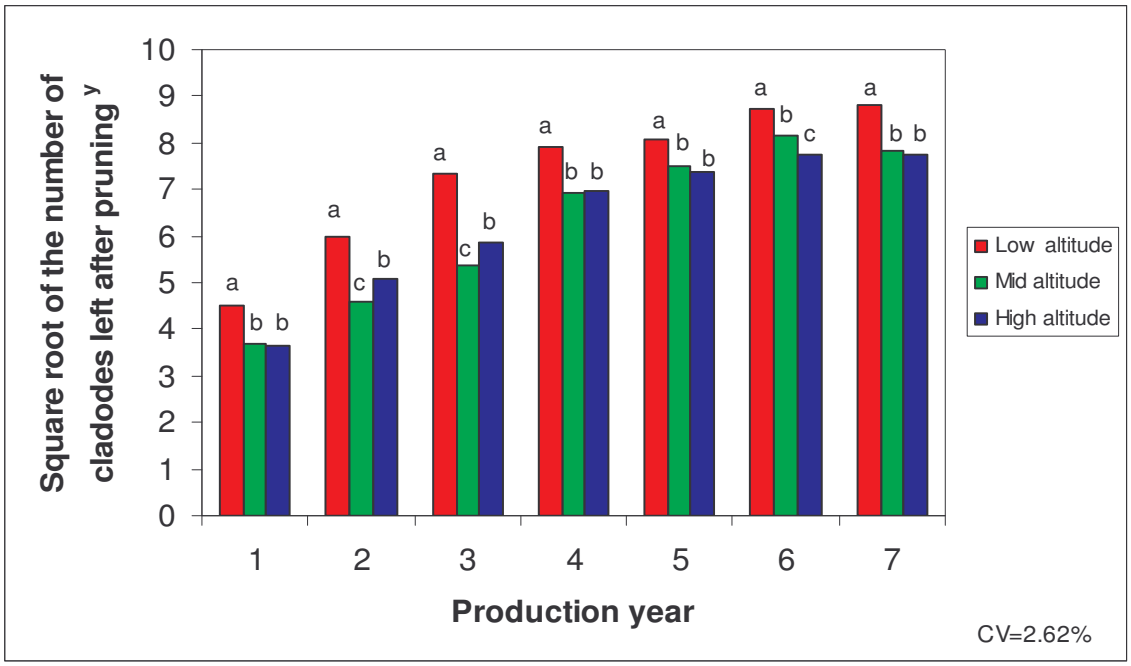

Figure 4.2 Square root of the number of cladodes left after pruning of cactus pear cultivars over seven production years in three locations. Different letters in the same year represent significant differences at P>0.05 when the F probability was significant in the ANOVA. [y] Values presented are square root transformed data y=√(x+0.05)

The plants in these trials had therefore reached full maturity in the final two years of this study. Adequate vegetative growth is necessary in cactus pear since most of the current season's crop sets on cladodes developed in the preceding season. However, very strong vegetative growth, such as that which occurred every year in the hot low-altitude area is seen as negative for a number of reasons. Firstly, it is speculated that it is highly likely that strong vegetative growth occurs to the detriment of reproductive development as it may cause a strong competitive sink for assimilates and as a result, reduced fruit yield. Secondly, excessive vegetative growth overcrowds the plant canopy, reducing solar radiation received by the terminal cladodes, which in turn will not be fertile the following season. Lastly, such rapid vegetative growth leads to increased labour costs associated with increased pruning. In a following section (Section 6.2), it will be shown that the number of cladodes left after pruning was relatively weakly correlated to fruit yield. Fruit yields were generally highest in the mid-altitude area, thus the vegetative growth in that area, although substantially lower than in the hot low-altitude area, was adequate to sustain high fruit yields. This may be due to higher net carbohydrate accumulation in the mid-altitude area, an aspect that needs investigation in future.

4.2.2 Number of fertile cladodes

For the first three production years, the number of fertile cladodes was highest in the hot low-altitude site as expected due to its favourable environmental conditions for vegetative growth (Figure 4.3). From production year four to seven, the number of fertile cladodes was significantly higher in the cool mid-altitude site than the other two areas.

In general and similar to the number of cladodes left after pruning, the number of fertile cladodes increased with increasing plant age, but decreased sharply in the seventh production year. The trials were terminated after the seventh production year, thus it is not clear if this reduction in number of fertile cladodes was a continuing trend or a once-off occurrence. Although all possible attempts were made to prune plants in such a way as to allow terminal cladodes to be fully exposed to solar radiation, it is possible that in the mature stages, solar radiation interception by the terminal cladodes was reduced and as such resulted in a reduction in the number of fertile cladodes.

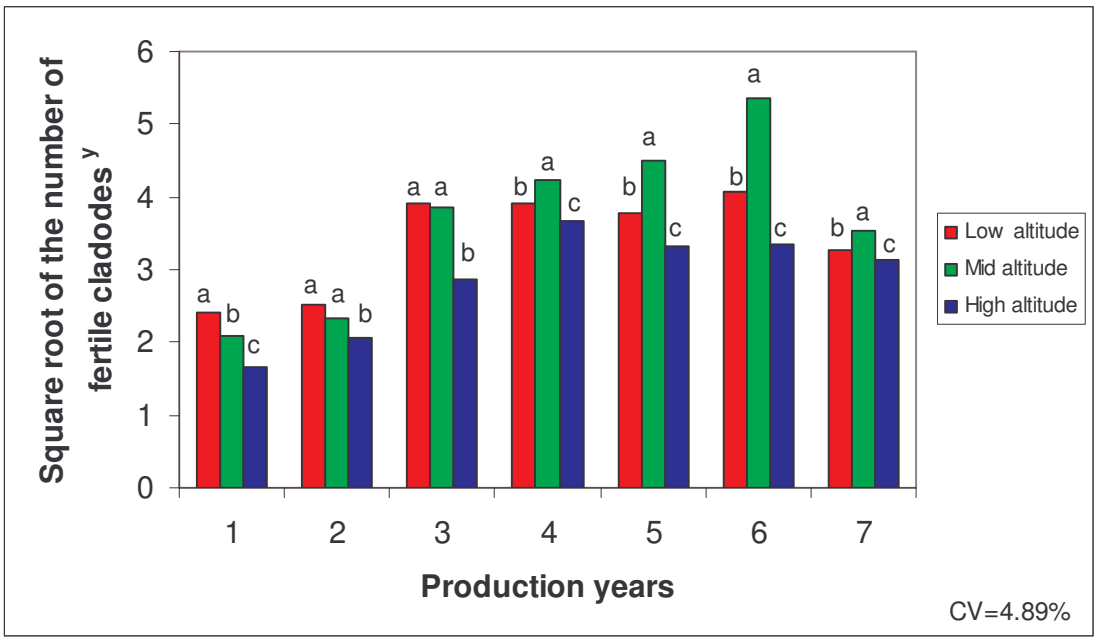

Figure 4.3 Square root of the number of fertile cladodes of cactus pear cultivars over seven production years in three locations. Different letters in the same year represent significant differences at P>0.05 when the F probability was significant in the ANOVA. [y] Values presented are square root transformed data $y=\sqrt{(x+0.05)}$

According to Barbera *et al*. (1991) the main difference between alternate bearing plants and normal bearing plants was the number of fertile cladodes, although the number of new cladodes formed were the same in both cases. In agreement with the findings of the previous author, a strong positive correlation was found between the number of fertile cladodes and fruit yield in this study, indicating that the more fertile cladodes a plant has, the higher the yield will be. This shows the importance of full exposure of new terminal cladodes to solar radiation in order to become fertile.

4.3 Conclusions

The number of cladodes left after pruning and number of fertile cladodes were statistically different for different cultivars across environments and production years. As expected, both the number of cladodes left after annual pruning and the number of fertile cladodes increased with increasing plant age. An interesting observation was that plant growth habit was different under the three different environmental conditions. In the hot low-altitude area, plants tended to grow upright, while having a prostrate growth habit in the cold high-altitude area with the exception of “American Giant”, “Nudosa” and “Zastron”. Cultivars that showed high vegetative growth rates in the hot low-altitude and

cool mid-altitude areas were “Gymno Carpo”, “Algerian”, “Nudosa” and “American Giant”, while only “American Giant”, “Nudosa” and “Zastron” produced a high number of cladodes in the cold high-altitude area. In contrast, all *O. fusicaulis* cultivars (“Blue Motto”, “Direkteur” and “Fusicaulis”) had low numbers of cladodes left after pruning, indicating that these cultivars have low vegetative vigour in all environments and possibly low fruit bearing potential.

The number of fertile cladodes closely follows a similar pattern as that observed with the number of cladodes left after pruning across all cultivars and environments. All the *O. ficus-indica* cultivars (“Algerian”, “Gymno Carpo”, “Malta” and “Morado”) had relatively high number of fertile cladodes in the hot low and cool mid-altitude areas. However, in the cold high-altitude area only “American Giant”, “Nudosa” and “Zastron” (unidentified spp.) had high numbers of fertile cladodes. The low numbers of fertile cladodes in the *O. fusicaulis* cultivars (“Blue Motto”, “Direkteur” and “Fusicaulis”) seems to be a genetic trait and less influenced by environmental conditions, while the rest of the cultivars interact strongly with the environment.

CHAPTER 5

INFLUENCE OF ENVIRONMENT ON REPRODUCTIVE DEVELOPMENT

Fruit yield potential is possibly one of the most important traits of a cultivar since it has a direct bearing on the economic viability of an enterprise. In cactus pear, a number of yield components affect fruit yield, and will be discussed in this chapter. The specific objectives of this part of the study were to determine if there were differences between cultivars in terms of the number of fruit set, number of fruit left after thinning, fruit yield and cumulative fruit yield across all production years at the three different experimental sites. The influence of environmental factors on these yield components in cactus pear will be investigated. As in the previous chapter, only transformed data values will be shown.

5.1 Onset of the reproductive phase in cactus pear

In general, perennial crops derived from seed, grow vegetatively for a few years before coming into the reproductive phase in which yield would increase annually until full plant maturity is reached. After full maturity, yields become relatively stable for the productive lifespan of the orchard. The length of the juvenile phase depends on the type of crop, cultivar, orchard management and environmental factors. In cactus pear the vegetative growth phase can be as short as a few weeks. It has been reported that newly planted mother cladodes can form fruit within weeks after planting (Figure 5.1).

The very short vegetative phase of cactus pear is one of its major advantages over other perennial crops. The vegetative phase in commercially cultivated South Africa cactus pear cultivars is very short in comparison with the situation in other parts of the world. For example, Mohamed-Yaseen *et al*. (1996) and Inglese & Gugluizza (2002) noted that cactus pear in the USA and Sicily starts producing fruit only after 2 - 3 years and reaches full production after 7 years and can bear for 25 to 30 years and even longer depending on pruning and overall orchard management.

The length of the unproductive juvenile phase in perennial crops is important as it largely determines when economic break-even point is reached. The shorter the juvenile phase, the quicker the break-even point is reached and the sooner the farmer will start accruing profits from the operation.

Figure 5.1 Flower buds emerging on a 4-week-old planted mother cladode of the Algerian cultivar in the sub-tropical area of Musina, Limpopo Province

A number of studies have reported cactus pear fruit yields at plant maturity; however, none reported fruit yield from establishment to full maturity in randomised field trials with more than two replications (Ratsele, 2003). It is important for farmers to know what the annual fruit yield from planting to full orchard maturity will be, as this determines the time to economic break-even point and overall economic viability of the enterprise.

5.2 Genotype effects on reproductive development

5.2.1 Number of fruit set

5.2.1.1 Hot low-altitude area

Table 5.1 shows the mean number of fruit set per plant (transformed data) for all cultivars in all areas. Statistical differences are evident between cultivars in this environment. “Algerian” (9.65) outperformed all cultivars in terms of numbers of fruits set and differed significantly from “Malta” (7.78). Both the two remaining O. ficus-indica species (“Morado” (7.46) and “Gymno Carpo” (7.44)) performed well, but differed

significantly from “Algerian” in terms of mean number of fruits set. “Blue Motto” (5.42) and “Direkteur”(5.29) set the lowest number of fruits which was significantly lower than most of the other cultivars, showing their low fruit set potential in this environment. Non-statistical differences between cultivars were evident in production years, 2, 5 and 7 shown by the F probability in the ANOVA being higher than 0.05 (Table 5.1).

5.2.1.2 Cool mid-altitude area

“Blue Motto”, “Direkteur”, Fusicaulis” and “Skinners Court” produced the lowest mean number of fruits set in this cool mid-altitude environment over all production years with transformed values of 7.24, 7.05, 7.43 and 7.86 respectively (Table 5.1). In contrast, “Algerian” (12.99) produced the highest mean number of fruits set although not significantly more than “Morado” with 10.57. With the exception of the first three mentioned cultivars, most cultivars performed relatively well in this environment in terms of the number of fruit set. The F probability value in the ANOVA was higher than 0.05 in production year 7, resulting in no significant differences between cultivars (Table 5.1).

5.2.1.3 Cold high-altitude area

Mean number of fruit set in this cold high-altitude site was in general less than in the other two areas, and only three cultivars showed adaptability (Table 5.1). “American Giant” with (10.44) did not produce significantly more fruits than “Zastron” (9.18), but both outperformed all other cultivars. “Skinners Court”, “Nudosa” and “Blue Motto” followed the first two mentioned cultivars with 7.10, 6.71 and 6.67 fruits set. Interestingly, and in sharp contrast with the situation in the hot low-altitude area, all the O. ficus-indica cultivars performed poorly in this environment with its lower mean temperature, showing that this species is not adapted to conditions in this environment. For this species, the transformed number of fruits set was low (<10), for example: “Gymno Carpo” (2.36), “Direkteur” (2.90), “Algerian” (3.12), “Malta” (3.42) and “Morado” (5.05).

In agreement with earlier reports by Brutsch (1979); Pimienta-Barrios (1990; 1994) and Wessels (1988a; 1989), results obtained here indicate that cultivars differ in reproductive vigour and cladode fertility. Cactus pear can set very high numbers of fruit per cladode (Figure 5.2). According to Wessels (1988e) thirty or more fruit can be set on a single cladode of the bush growth habit cultivars such as “Algerian”, “Gymno Carpo”, “Mexican”, “Morado”, “Nudosa” and “Santa Rosa”. All *O. ficus-indica* cultivars performed

well in the hot low-altitude area, with very high numbers of fruits being set, giving rise to the large observed coefficient of variation (CV). The suitability of the cool mid-altitude area to induce cladode fertility over a wider range of cultivars is also evident. In the cold high-altitude area, only “American Giant” and “Zastron” seem to be adapted to this environment from the view point of the number of fruit set.

High numbers of fruit set is not only important to obtain high fruit yields, but is important in obtaining higher individual fruit mass after thinning. However, if crop load is not reduced by thinning, whole branches and cladodes may break off plants (Figure 5.2). The number of fruits produced by a plant is a function of the number of fertile cladodes and the mean number of flower buds per cladode (Nerd & Mizrahi, 1995a). In contrast with many other fruit crops, very few cactus pear flowers abscise and 95% of the flowers that set become fruit (Pimienta-Barrios & Del Castillo, 2002) unless damaged by late winter frost.

Figure 5.2 Heavy fruit set on “Algerian” in the Central Free State area. Note broken off cladodes due to the large number of fruit set on each one

Table 5.1 Square root transformed data [a] (trans) of the number of fruit set (fs) and standard error of the mean (sem) of eleven cactus pear cultivars in the three trial sites over seven production years from 1994-2001

Production year	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Mean/cultivar			
Cultivar	**fs**	**trans**		**sem**	**fs**	**trans**		**sem**	**fs**	**trans**		**sem**	**fs**	**trans**		**sem**	**fs**	**trans**		**sem**	**fs**	**trans**		**sem**	**fs**	**trans**		**sem**	**fs**	**trans**		**sem**
Hot low-altitude																																
Algerian	110.10	10.25	a	0.689	72.95	7.91	ns	0.949	109.90	10.35	a	0.914	150.40	12.12	a	0.932	99.95	9.91	ns	0.978	85.20	9.11	a	0.756	47.00	6.72	ns	0.650	96.50	9.65	a	0.644
American Giant	37.15	6.07	cd	0.689	22.05	4.31	ns	0.949	63.95	7.60	bc	0.914	126.00	10.85	ab	0.932	73.05	8.33	ns	0.978	50.40	6.95	abc	0.756	26.80	4.73	ns	0.650	57.06	7.39	bcd	0.644
Blue Motto	0.90	1.28	e	0.903	21.25	3.42	ns	1.253	34.19	5.48	c	1.031	86.50	7.83	bcde	2.162	93.88	8.00	ns	1.588	43.81	5.97	bc	0.852	22.77	4.70	ns	0.650	32.89	5.42	e	0.644
Direkteur	1.70	1.43	e	0.689	20.35	3.82	ns	0.949	44.60	6.18	bc	0.914	57.30	6.92	de	0.932	57.60	6.56	ns	0.978	34.20	5.25	c	0.756	22.40	4.35	ns	0.650	34.02	5.29	e	0.644
Fusicaulis	0.94	1.23	e	0.776	-	-	-	-	47.69	6.08	bc	1.031	48.90	6.74	e	0.932	82.88	7.29	ns	1.588	51.60	6.80	abc	0.756	17.40	3.82	ns	0.650	35.23	5.62	cde	0.644
Gymno Carpo	102.70	9.86	a	0.689	39.00	5.82	ns	0.949	62.30	7.72	bc	0.914	104.85	9.81	abc	0.932	37.05	5.85	ns	0.978	34.50	5.60	bc	0.756	19.95	4.38	ns	0.650	57.19	7.44	bc	0.644
Malta	79.20	8.78	b	0.689	26.00	4.94	ns	0.949	73.85	8.36	ab	0.914	106.30	10.20	abc	0.932	60.70	7.66	ns	0.978	60.05	7.45	abc	0.756	29.25	5.20	ns	0.650	62.19	7.78	b	0.644
Morado	46.75	6.79	c	0.689	24.50	4.82	ns	0.949	73.30	8.22	abc	0.914	104.25	10.09	abc	0.932	71.35	8.01	ns	0.978	60.02	7.64	ab	0.756	24.45	4.67	ns	0.650	57.80	7.46	bc	0.644
Nudosa	6.50	2.48	e	0.689	28.50	4.70	ns	1.253	66.90	7.24	bc	0.914	107.75	9.50	abcd	0.932	86.05	8.52	ns	0.978	57.70	6.94	abc	0.756	30.55	5.26	ns	0.650	58.32	6.99	bcde	0.644
Skinners Court	1.31	1.42	e	0.776	19.70	3.79	ns	0.949	46.70	6.42	bc	0.914	66.50	7.78	cde	0.932	32.30	5.42	ns	0.978	33.15	5.47	c	0.756	23.75	4.64	ns	0.650	32.77	5.47	de	0.644
Zastron	24.05	4.59	d	0.69	22.85	4.64	ns	0.95	80.65	8.80	ab	0.914	87.35	9.00		0.93	44.65	6.07	ns	0.978	41.45	6.00	bc	0.756	28.75	4.96	ns	0.650	47.11	6.64	bcde	0.644
Mean/year	**37.39**	**4.9**			**29.72**	**4.82**			**64.00**	**7.50**			**95.10**	**9.17**			**67.22**	**7.42**			**50.19**	**6.65**			**26.64**	**4.86**			**51.92**	**6.83**		
CV (%)		**29.6**				**43.45**				**27.04**				**22.5**				**29.57**				**25.35**				**29.92**				**21.09**		
Cool mid-altitude																																
Algerian	115.70	10.76	a	0.483	46.20	6.42	a	0.593	175.10	12.92	a	0.744	235.90	15.18	a	0.836	190.25	13.58	a	0.822	385.10	19.29	a	1.040	53.20	7.12	ns	0.658	171.63	12.99	a	0.519
American Giant	72.45	8.53	bc	0.483	20.60	4.28	bc	0.593	149.20	11.93	ab	0.744	202.80	14.10	a	0.836	99.70	9.83	bcd	0.822	207.10	14.16	bc	1.040	39.85	6.23	ns	0.658	113.11	10.56	b	0.519
Blue Motto	3.15	1.89	e	0.483	14.90	3.46	bc	0.593	71.50	8.27	ef	0.744	78.90	8.40	d	0.836	74.50	8.15	d	0.822	110.50	9.95	e	1.040	37.20	5.98	ns	0.658	55.80	7.24	c	0.519
Direkteur	12.15	3.46	d	0.483	9.35	2.85	c	0.593	71.40	8.05	ef	0.839	80.20	8.11	d	0.836	71.60	7.75	d	0.822	109.60	9.44	e	1.040	33.70	5.62	ns	0.658	55.65	7.05	c	0.519
Fusicaulis	2.00	1.69	e	0.544	10.25	3.15	c	0.669	46.10	6.62	f	0.744	87.40	9.25	cd	0.836	72.70	8.46	cd	0.822	122.90	10.94	cde	1.040	28.15	5.30	ns	0.658	56.00	7.43	c	0.519
Gymno Carpo	98.50	9.72	ab	0.483	18.55	3.70	bc	0.593	92.20	9.54	cde	0.744	222.10	14.77	a	0.836	72.10	8.34	cd	0.822	207.90	14.19	bc	1.040	32.20	5.70	ns	0.658	106.22	10.24	b	0.519
Malta	106.45	10.24	a	0.483	18.65	4.20	bc	0.593	127.80	11.27	abc	0.744	175.30	12.91	ab	0.836	92.25	9.46	bcd	0.822	192.60	13.57	bcd	1.040	36.55	5.84	ns	0.658	107.08	10.25	b	0.519
Morado	73.45	8.49	bc	0.483	23.50	4.42	bc	0.593	105.60	10.21	bcd	0.744	186.30	13.47	ab	0.836	116.00	10.66	bc	0.822	250.50	15.60	b	1.040	34.40	5.73	ns	0.658	112.83	10.57	ab	0.519
Nudosa	22.50	4.76	d	0.483	11.33	3.91	bc	0.781	104.80	10.12	bcde	0.744	128.70	11.13	bc	0.836	135.70	11.35	ab	0.822	279.10	16.37	ab	1.040	38.25	6.15	ns	0.658	110.57	10.33	b	0.519
Skinners Court	1.95	1.47	e	0.483	25.56	4.28	bc	0.669	72.30	8.41	def	0.744	103.40	9.69	cd	0.836	71.40	8.34	cd	0.822	117.60	10.70	de	1.040	43.95	6.32	ns	0.658	63.71	7.86	c	0.519
Zastron	64.00	7.91	c	0.483	28.20	5.09	ab	0.593	134.20	11.51	abc	0.744	201.80	14.07	a	0.836	77.95	8.67	cd	0.822	130.10	11.21	cde	1.040	63.35	7.87		0.658	99.93	9.93	b	0.519
Mean/year	**52.03**	**6.27**			**20.64**	**4.16**			**104.56**	**9.90**			**154.80**	**11.92**			**97.65**	**9.51**			**192.09**	**13.22**			**40.07**	**6.17**			**95.68**	**9.49**		
CV (%)		**17.00**				**31.66**				**16.75**				**15.69**				**19.3**				**17.66**				**23.84**				**12.22**		
Cold high-altitude																																
Algerian	0.85	1.12	c	0.471	8.00	2.89	bcd	0.529	10.75	3.23	d	0.965	19.80	4.28	de	1.240	8.70	2.88	c	1.130	12.75	3.37	cd	1.080	7.80	2.64	c	1.330	9.81	3.12	de	0.974
American Giant	49.15	6.83	a	0.471	19.30	4.35	ab	0.529	189.65	13.74	a	0.965	111.10	10.36	ab	1.240	114.50	10.59	a	1.130	102.31	9.25	a	1.220	180.00	13.01	a	1.330	110.61	10.44	a	0.974
Blue Motto	-	-	-	-	-	-	-	-	31.50	4.86	cd	1.574	63.20	7.13	bcd	1.240	71.50	7.25	abc	2.640	91.00	8.88	ab	2.530	49.00	6.30	bc	1.330	54.99	6.67	bc	0.974
Direkteur	0.75	0.58	c	0.777	6.00	2.01	cd	0.861	2.12	1.64	d	1.585	10.06	3.30	e	1.400	2.50	3.89	bc	2.640	12.67	3.40	cd	1.430	9.05	3.06	c	1.330	8.51	2.90	de	0.974
Fusicaulis	1.00	1.05	c	1.110	7.20	2.50	cd	0.529	31.65	4.73	cd	0.965	45.05	5.98	cde	1.240	45.75	5.48	bc	1.130	62.75	6.51	abc	1.770	57.65	6.22	bc	1.330	37.16	5.22	cd	0.974
Gymno Carpo	0.25	1.00	c	0.624	2.25	1.43	d	0.529	6.45	2.54	d	0.965	13.45	3.59	de	1.240	3.40	1.64	c	1.130	2.65	1.62	d	1.080	7.45	2.52	c	1.330	5.61	2.36	e	0.974
Malta	1.15	1.29	c	0.471	7.45	2.58	cd	0.529	16.70	3.28	d	0.965	37.95	4.87	de	1.240	13.33	2.97	c	1.130	13.32	2.63	cd	1.080	32.97	4.47	c	1.330	17.55	3.42	de	0.974
Morado	1.00	1.74	c	1.140	7.31	2.38	cd	0.597	23.08	4.06	cd	1.274	38.43	5.30	de	1.240	40.87	5.39	bc	1.130	43.30	5.70	bc	1.080	32.82	4.95	bc	1.330	33.64	5.05	cde	0.974
Nudosa	3.90	2.03	c	0.471	7.80	2.82	bcd	0.529	53.55	7.32	bc	0.965	50.70	7.13	bcd	1.240	84.35	9.17	a	1.130	85.95	9.38	a	1.080	26.40	5.13	bc	1.330	44.66	6.71	bc	0.974
Skinners Court	4.94	2.22	c	0.534	16.45	3.82	abc	0.529	53.85	6.77	c	0.965	93.80	8.96	abc	1.240	71.10	7.61	ab	1.130	74.62	8.13	ab	1.220	78.95	8.36	b	1.330	56.16	7.10	bc	0.974
Zastron		5.42	b	0.471	24.55	4.86	a	0.529	93.50	9.61	b	0.965	152.20	12.02	a	1.240	60.70	7.47	ab	1.130	62.75	7.67	ab	1.080	182.00	13.30	a	1.330	86.76	9.18	ab	0.974
Mean/year	**7.00**	**2.33**			**10.63**	**2.96**			**46.62**	**5.62**			**57.79**	**6.63**			**46.97**	**5.85**			**51.28**	**6.05**			**60.37**	**6.36**			**42.31**	**5.65**		
CV (%)		**38.18**				**38.91**				**36.06**				**41.50**				**42.9**				**41.92**				**46.72**				**38.56**		

trans = square root transformed data of the number of fruit set. [a] Values presented are square root transformed data $y=\sqrt{(x+0.05)}$

Different letters in the same column (year) represent significant differences at P>0.05 by t probabilities of pair-wise differences if the F-test was significant in the ANOVA, ns=non-significant.

5.2.2 Number of fruit left after thinning

5.2.2.1 Hot low-altitude area

"Algerian" with (8.79), "Malta" (8.41) and "Gymno Carpo" (8.33) differed significantly from other cultivars in terms of the mean number of fruit left after thinning in this hot low-altitude area (Table 5.2). All three *O. fusicaulis* cultivars, "Blue Motto" (1.31), "Direkteur" (1.84) and "Fusicaulis" (2.13) performed poorly and had the lowest number of fruits left after thinning.

5.2.2.2 Cool mid-altitude area

Statistical differences in the mean number of fruit left after fruit thinning were observed for cultivars in the cool mid-altitude area (Table 5.2). The lowest number of fruits left after thinning was for "Skinners Court" (3.00) and "Blue Motto" (3.22) that differed significantly from all other cultivars tested. "Direkteur" and "Fusicaulis" with 4.83 and 4.53 also performed poorly in this environment. High performers in terms of number of fruit left after thinning were "Algerian" (10.27), "Gymno Carpo" (9.38), "Malta" (8.93) and Zastron (8.85). This again demonstrates the good adaptability of the *O. ficus-indica* cultivars to the cool mid-altitude area since the number of fruits left after thinning gives a good indication of its productive potential.

5.2.2.3 Cold high-altitude area

In this cold high-altitude area, "Zastron" (8.66) was the best performer in terms of mean number of fruit left after thinning and differed significantly from all other cultivars except "American Giant" (8.58) (Table 5.2). "Nudosa" (7.95) followed with fruit left after thinning. These cultivars are the only ones that showed adaptability to this environment. "Fusicaulis", "Skinners Court", "Blue Motto", and "Direkteur" with 2.44, 1.97, 1.91 and 1.63 respectively all had very few fruits after thinning. It is thus evident that none of the candelabra growth habit types (*O. fusicaulis*) and "Skinners Court" are suitable for cultivation in this cold high-altitude environment with acid soils.

Significant differences were observed between cultivars, areas and production years for the number of fruit left after thinning. Since the number of fruit left after thinning is a direct indication of fruit yield potential, a high number of fruits remaining after thinning is required to produce high fruit yields. All *O. fusicaulis* cultivars had lower numbers of fruit left after thinning in both the hot low-altitude and cold high-altitude areas, indicative of the poor adaptability of these cultivars to environments with temperature extremes. In

contrast, the *O. ficus-indica* cultivars all showed good adaptability to the hot low- and cool mid-altitude areas as observed from the mean number of fruits left after thinning. These cultivars are thus strongly recommended for fruit production in these areas.

Similar to pruning, fruit thinning is an important horticultural practice in cactus pear fruit production. Good thinning practices result in high individual fruit mass (Inglese *et al*., 1995a), facilitate easier harvesting (Wessels, 1988e) and could possibly reduce alternate bearing. The optimum number of fruit per cladode seems to be controversial as Inglese *et al*. (1995a) noted that fruit size decreased when more than six fruits were left per cladode in Sicily, while in South Africa, Wessels (1988e) recommends 12 to 16 fruit per cladode. In addition, cladodes with more than 10 fruits have shown irregular and delayed ripening (Inglese *et al*., 2002b). It seems unlikely that export sized fruits could be obtained under dry-land conditions with the higher fruit load. In contrast to Wessels's (1988e) recommendations, fruit were thinned to approximately 50 mm between fruits to a maximum of eight fruits per cladode, which is also now considered the norm in the South African cactus pear fruit industry (Potgieter, 1997a).

The effect of fruit thinning on individual fruit mass also depends on the number of fruits per cladode prior to thinning. The longer the time that fruits are left on the cladode, the greater the negative effect of high fruit number on fruit size (La Mantia et al., 1998). These results are in agreement with the findings of Brutsch (1992), where larger fruits were evident on thinned than unthinned cladodes for any given number of fruit per cladode. This suggests that the sink demand effect caused by the large number of flowers initially on the cladode may result in larger fruits after timely thinning. These findings suggests that any treatment that would increase the number of fruit set before thinning takes place would be beneficial to eventual fruit size, but further investigations are needed to clarify this point. Thus, good fruit size will be obtained with a high number of fruit set per cladode and the reduction of the crop load by timely thinning to a maximum of eight fruits. However, increased labour costs to remove excess fruits through thinning should be kept in mind as 70% of total labour costs in Sicilian orchards are for pruning, fruit thinning and scozzolatura (spring flush removal) (Inglese *et al*., 1995b).

Table 5.2 Square root transformed data[a] (trans) of the number of fruit left after thinning (fat) and standard error of the mean (sem) of eleven cactus pear cultivars in the three trial sites over seven production years from 1994-2001

Production year	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Mean/cultivar			
Cultivar	**fat**	**trans**		**sem**	**fat**	**trans**		**sem**	**fat**	**trans**		**sem**	**fat**	**trans**		**sem**	**fat**	**trans**		**sem**	**fat**	**trans**		**sem**	**fat**	**trans**		**sem**	**fat**	**trans**		**sem**
Hot low-altitude																																
Algerian	56.85	7.44	a	0.450	49.70	6.23	a	0.771	85.15	9.21	a	0.407	99.85	9.92	a	0.505	129.15	11.28	a	0.456	85.40	9.16	a	0.366	44.05	6.60	a	0.380	78.60	8.79	a	0.307
American Giant	20.40	4.53	b	0.450	12.65	3.46	bc	0.771	37.95	6.18	d	0.407	54.25	7.17	cd	0.505	38.95	6.23	e	0.456	24.95	4.97	d	0.366	10.65	3.31	cd	0.380	28.54	5.37	c	0.307
Blue Motto	0.75	1.17	c	0.590	0.67	0.86	d	1.017	2.35	1.61	g	0.459	1.00	0.70	g	1.173	0.50	0.85	f	0.741	1.06	1.29	f	0.413	2.07	1.53	e	0.380	1.32	1.31	e	0.307
Direkteur	1.55	1.38	c	0.450	0.40	0.94	d	0.771	4.40	2.17	fg	0.407	3.60	1.99	fg	0.505	1.45	1.35	f	0.456	4.45	2.08	f	0.366	5.10	2.26	de	0.380	2.99	1.84	e	0.307
Fusicaulis	0.69	1.14	c	0.506	-	-	-	-	1.81	1.38	g	0.459	12.45	3.57	e	0.505	2.50	1.59	f	0.741	3.00	1.83	f	0.366	1.80	1.49	e	0.380	4.07	2.13	e	0.307
Gymno Carpo	58.60	7.52	a	0.450	49.15	6.72	a	0.771	83.25	9.06	ab	0.407	113.65	10.55	a	0.505	89.20	9.44	bc	0.456	56.60	7.53	b	0.366	39.40	6.30	ab	0.380	69.98	8.33	a	0.307
Malta	44.35	6.62	a	0.450	33.80	5.79	a	0.771	76.90	8.74	abc	0.407	96.25	9.81	a	0.505	111.20	10.54	ab	0.456	88.97	9.45	a	0.366	41.92	6.50	a	0.380	70.49	8.41	a	0.307
Morado	25.35	5.02	b	0.450	36.20	5.97	a	0.771	63.25	7.87	c	0.407	67.25	8.21	bc	0.505	69.50	8.33	cd	0.456	57.55	7.59	b	0.366	27.95	5.24	b	0.380	49.58	7.06	b	0.307
Nudosa	4.45	2.16	c	0.450	3.33	2.07	cd	1.017	8.60	2.99	ef	0.407	35.60	5.96	d	0.505	53.25	7.30	de	0.456	38.55	6.15	c	0.366	18.70	4.09	c	0.380	24.43	4.97	c	0.307
Skinners Court	1.12	1.33	c	0.506	2.55	1.63	cd	0.771	13.95	3.79	e	0.407	16.85	4.11	e	0.505	6.05	2.53	f	0.456	12.80	3.60	e	0.366	11.20	3.38	c	0.380	9.45	3.14	d	0.307
Zastron	16.80	3.93	b	0.45	27.55	5.19	ab	0.771	64.55	8.03		0.407	89.70	9.51	ab	0.505	36.30	6.05	e	0.456	47.35	6.88	bc	0.366	37.70	6.13	ab	0.380	45.71	6.79	b	0.307
Mean/year	**20.99**	**3.84**			**18.48**	**3.63**			**40.20**	**5.55**			**53.68**	**6.50**			**48.91**	**5.95**			**38.24**	**5.50**			**21.87**	**4.26**			**35.01**	**5.29**		
CV (%)		**24.8**				**42.1**				**15.95**				**16.25**				**15.60**				**14.7**				**19.97**				**12.98**		
Cool mid-altitude																																
Algerian	115.70	10.76	a	0.490	40.50	6.29	a	0.465	90.80	9.37	a	0.480	110.90	10.54	ab	0.443	129.85	11.37	a	0.436	212.70	14.53	a	0.404	38.05	6.19	bc	0.605	105.50	10.27	a	0.230
American Giant	72.45	8.53	bc	0.490	7.70	2.81	cd	0.465	75.10	8.55	ab	0.480	89.45	9.45	bc	0.443	58.90	7.70	d	0.436	103.50	10.14	d	0.404	27.50	5.27	bcde	0.605	62.08	7.90	de	0.230
Blue Motto	2.45	1.66	e	0.490	2.95	1.83	cde	0.465	15.37	3.94	ef	0.480	5.70	2.44	f	0.443	6.25	2.56	g	0.436	16.70	4.13	f	0.404	20.28	4.51	cde	0.605	9.96	3.22	g	0.230
Direkteur	12.15	3.46	d	0.490	8.15	2.90	c	0.465	36.62	6.20	d	0.541	16.25	4.05	e	0.443	22.25	4.69	e	0.436	43.00	6.56	e	0.404	24.55	4.98	bcde	0.605	22.87	4.83	f	0.230
Fusicaulis	2.00	1.68	e	0.552	1.62	1.35	e	0.524	21.40	4.58	e	0.480	34.00	5.72	d	0.443	19.75	4.46	ef	0.436	41.80	6.48	e	0.404	12.55	3.57	e	0.605	20.38	4.53	f	0.230
Gymno Carpo	98.50	9.72	ab	0.490	27.70	5.05	ab	0.465	61.55	7.82	bc	0.480	108.60	10.26	b	0.443	99.85	9.96	b	0.436	170.70	13.06	b	0.404	46.35	6.30	b	0.605	87.60	9.38	b	0.230
Malta	106.45	10.24	a	0.490	21.75	4.67	b	0.465	64.10	8.01	abc	0.480	103.70	10.19	b	0.443	83.85	9.18	bc	0.436	145.60	12.05	bc	0.404	29.55	5.34	bcd	0.605	79.28	8.93	bc	0.230
Morado	73.45	8.49	bc	0.490	19.80	4.36	b	0.465	53.10	7.16	cd	0.480	89.25	9.44	bc	0.443	90.60	9.49	bc	0.436	141.60	11.88	c	0.404	35.60	5.62	bc	0.605	71.91	8.48	cd	0.230
Nudosa	22.50	4.76	d	0.490	5.33	2.42	cde	0.612	52.35	7.24	bcd	0.480	67.00	8.21	c	0.443	77.25	8.72	bcd	0.436	150.80	12.28	bc	0.404	24.90	4.88	bcde	0.605	60.32	7.79	e	0.230
Skinners Court	2.15	1.58	e	0.490	1.75	1.42	de	0.524	8.50	2.92	f	0.480	7.85	2.84	ef	0.443	10.35	3.25	fg	0.436	13.80	3.66	f	0.404	15.05	3.88	de	0.605	8.73	3.00	g	0.230
Zastron	64.00	7.91	c	0.490	31.20	5.49	ab	0.465	68.35	8.27	abc	0.480	133.70	11.58	a	0.443	70.10	8.35	cd	0.436	102.30	10.09	d	0.404	77.00	8.79	a	0.605	78.09	8.85	bc	0.230
Mean/year	**51.98**	**6.25**			**15.31**	**3.51**			**49.75**	**6.73**			**69.67**	**7.70**			**60.82**	**7.25**			**103.86**	**9.53**			**31.94**	**5.39**			**55.16**	**7.02**		
CV (%)		**17.27**				**28.58**				**15.92**				**12.86**				**13.44**				**9.47**				**25.08**				**7.34**		
Cold high-altitude																																
Algerian	2.00	1.54	b	0.338	8.9	3.00	bcd	0.309	8.20	2.73	c	0.409	14.85	3.83	d	0.337	9.85	3.13	d	0.464	19.30	4.42	d	0.327	12.80	3.61	c	0.424	10.84	3.34	cd	0.231
American Giant	25.95	5.04	a	0.338	15.25	3.89	b	0.309	85.70	9.28	a	0.409	92.05	9.60	b	0.337	86.80	9.32	b	0.464	86.12	9.19	b	0.370	121.45	10.94	a	0.424	73.42	8.58	ab	0.231
Blue Motto	-	-	-	-	-	-	-	-	0.62	1.10	de	0.667	4.20	2.10	ef	0.337	0.75	1.13	e	1.082	0.50	0.76	f	0.768	5.00	2.10	de	0.424	3.53	1.91	fg	0.231
Direkteur	0.63	0.78	b	0.558	0.25	1.13	f	0.503	0.25	0.50	e	0.672	2.69	1.69	f	0.380	0.75	1.01	e	1.082	0.67	1.20	f	0.433	5.70	2.34	de	0.424	2.27	1.63	g	0.231
Fusicaulis	0.50	0.86	b	0.797	1.25	1.27	f	0.309	3.65	2.00	cde	0.409	13.80	3.75	d	0.337	2.80	1.73	e	0.464	0.25	1.02	f	0.537	9.40	2.91	cd	0.424	5.56	2.44	ef	0.231
Gymno Carpo	1.08	1.39	b	0.448	8.2	2.91	cde	0.309	10.75	3.18	c	0.409	26.80	5.19	c	0.337	13.10	3.64	d	0.464	19.95	4.45	d	0.327	6.90	2.64	cd	0.424	13.21	3.70	c	0.231
Malta	1.90	1.54	b	0.338	10.5	3.19	bcd	0.309	6.70	2.54	cd	0.409	14.55	3.83	d	0.337	11.22	3.35	d	0.464	9.63	3.13	e	0.327	6.63	2.58	cd	0.424	8.73	2.99	de	0.231
Morado	1.25	1.45	b	0.819	5.25	2.30	de	0.348	9.33	3.04	c	0.540	10.13	3.00	de	0.337	12.47	3.34	d	0.464	10.85	3.22	e	0.327	5.08	2.26	de	0.424	8.11	2.83	de	0.231
Nudosa	3.90	2.00	b	0.338	12.9	3.55	bc	0.309	46.60	6.82	b	0.409	87.10	9.35	b	0.337	120.25	10.95	a	0.464	117.35	10.84	a	0.327	52.25	7.22	b	0.424	62.91	7.95	b	0.231
Skinners Court	4.31	2.16	b	0.383	4.15	2.07	ef	0.309	5.00	2.29	cd	0.409	6.05	2.55	ef	0.337	1.65	1.42	e	0.464	1.06	1.10	f	0.370	1.20	1.25	e	0.424	3.38	1.97	fg	0.231
Zastron	19.65	4.32	a	0.338	29.45	5.42	a	0.309	66.45	8.11	a	0.41	159.25	12.63	a	0.337	57.35	7.42	c	0.464	64.60	8.07	c	0.327	128.85	11.27	a	0.424	75.09	8.66	a	0.231
Mean/year	**6.57**	**2.17**			**9.61**	**2.87**			**22.11**	**3.78**			**22.11**	**5.23**			**28.82**	**4.22**			**28.82**	**4.31**			**30.03**	**4.47**			**24.28**	**4.18**		
CV (%)		**30.61**				**23.02**				**21.82**				**14.24**				**21.83**				**14.75**				**21.26**				**12.38**		

trans = square root transformed data of the number of fruit left after thinning. [a] Values presented are square root transformed data $y=\sqrt{(x+0.05)}$

Different letters in the same column (year) represent significant differences at P>0.05 by t probabilities of pair wise differences if the F-test was significant in the ANOVA.

5.2.3 Fruit yield

5.2.3.1 Hot low-altitude area

From Table 5.3 three cultivars are prominent in terms of mean fruit yield in the hot low-altitude area, showing their adaptability over the seven production years. "Algerian", "Gymno Carpo" and "Malta" are significantly higher yielding than all other cultivars for mean fruit yield, with 9.43 t ha^{-1}, 9.04 t ha^{-1} and 8.96 t ha^{-1}, respectively. "Morado" (6.36 t ha^{-1}) and "Zastron" (5.62 t ha^{-1}) differed significantly for fruit yield from the aforementioned and were statistically different from the rest of the cultivars. The lowest producing cultivars were "Blue Motto" (0.09 t ha^{-1}), "Fusicaulis" (0.36 t ha^{-1}) "Direkteur" (0.38 t ha^{-1}) and "Skinners Court" (1.03 t ha^{-1}). These cultivars should not be recommended for commercial fruit production in areas with high mean temperatures since they have a low production potential in this area.

5.2.3.2 Cool mid-altitude area

"Algerian" with (14.33 t ha^{-1}) had the highest mean fruit yield of all cultivars; however, it was not significantly different from that of both "Gymno Carpo" (12.96 t ha^{-1}) and "Nudosa" (12.80 t ha^{-1}) (Table 5.3). High-yielding cultivars in this environment produced on average 30% higher fruit yields than in the hot low-altitude area. "Skinners Court" produced the lowest fruit yield of all cultivars with 1.34 t ha^{-1}. This was however, not significantly different from either "Fusicaulis" (2.69 t ha^{-1}) or "Blue Motto" (1.59 t ha^{-1}). The last three mentioned cultivars are thus not recommended for fresh fruit production purposes in this environment.

5.2.3.3 Cold high-altitude area

Table 5.3 shows the yield performance of all cultivars in the cold high-altitude area. "Nudosa" with 11.85 t ha^{-1} mean fruit yield surpassed all other cultivars. "American Giant" and "Zastron" were second and third with 9.37 t ha^{-1} and 8.85 t ha^{-1} respectively, but did not differ significantly from one another. "Direkteur" (0.13 t ha^{-1}) and "Blue Motto" (0.13 t ha^{-1}) produced the least fruit in this environment, but did not differ significantly from "Fusicaulis"(0.41 t ha^{-1}), "Skinners Court" (0.42 t ha^{-1}), "Morado" (0.70 t ha^{-1}), "Malta" (0.943 t ha^{-1}) and "Algerian" (1.10 t ha^{-1}) which all produced very low yields in this environment, indicating their poor adaptability to these conditions. None of the *O. ficus-indica* cultivars can be recommend for this environment as shown by the low

productivity, while “Nudosa”, “Zastron” and “American Giant” are well adapted to these conditions.

It is unfortunate in field trials such as these that it is not possible to separate the effects of high-altitude and lower temperature from that of the acid soil conditions and varying soil nutrient levels as it remains unclear which environmental variable is responsible for yield differences between cultivars. For this reason, it would be important to establish a trial under neutral soil pH and similar soil nutrient levels to ascertain the real effect of low temperature on fruit production of these cultivars.

5.2.3.4 AMMI analysis of fruit yield per cultivar

Due to the relative infrequency with which the AMMI analysis is used in permanent crops, the ANOVA for the AMMI model is presented in Table 5.4. As data were collected over seven production years in three experimental sites, 21 environments were used in the analysis. Highly significant differences ($p < 0.001$) were indicated for cultivar, environment and more importantly the G X E interaction. Variance components of the sum of squares were 28.7% for cultivars, 34.5% for environments and 36.9% for G X E. This indicates a relatively strong influence of environment on fruit yield of cactus pear cultivars in Limpopo Province. The partitioning of a larger proportion of variance to G X E of genotypes as main effect is important.

Table 5.4 ANOVA (AMMI) of 11 cactus pear cultivars for fruit yield in 21 environments in Limpopo: 1994/5-2000/1 seasons

Source	df	SS	MS	F probability
Total	1154	48434	42	
Treatment	230	44373	192.9	
Environment (E)	20	15106	755.3	<0.001
Blocks within E	84	619	7.4	
Genotype (G)	10	12839	1284	<0.001
G X E	200	16429	82.1	<0.001
IPCA1	29	8629	297.5	<0.001
IPCA2	27	5715	211.7	<0.001
Residual	144	2085	14.5	<0.001
Error	840	3442	4.1	

Noise is 4.7% of treatment SS

Table 5.3 Fruit yield (fy) and standard error of the mean (sem) of eleven cactus pear cultivars in the three trial sites over seven production years from 1994-2001

Production year	Year 1			Year 2			Year 3			Year 4			Year 5			Year 6			Year 7			Mean/cultivar		
Cultivar	**fy**	**sem**		**fy**	**sem**		**fy**	**sem**		**fy**	**sem**		**fy**	**sem**		**fy**	**sem**		**fy**	**sem**		**fy**	**sem**	
Hot low-altitude																								
Algerian	6.04	0.69	a	4.96	1.08	ab	10.82	0.78	a	11.80	1.10	ab	15.50	0.98	a	11.53	0.75	a	5.37	0.49	a	9.43	0.58	a
American Giant	2.33	0.69	bc	1.13	1.08	bc	4.04	0.78	c	6.22	1.10	cd	5.03	0.98	de	3.08	0.75	d	1.19	0.49	e	3.29	0.58	c
Blue Motto	0.06	0.69	d	0.03	1.08	c	0.20	0.78	d	0.01	1.10	e	0.02	0.98	f	0.10	0.75	e	0.21	0.49	e	0.09	0.58	d
Direkteur	0.19	0.69	d	0.03	1.08	c	0.53	0.78	d	0.48	1.10	e	0.22	0.98	f	0.63	0.75	e	0.59	0.49	e	0.38	0.58	d
Fusicaulis	0.05	0.69	d	-	-	-	0.12	0.78	d	1.61	1.10	e	0.10	0.98	f	0.27	0.75	e	0.19	0.49	e	0.34	0.58	d
Gymno Carpo	6.70	0.69	a	5.47	1.08	a	10.98	0.78	a	14.36	1.10	a	12.56	0.98	b	8.55	0.75	bc	4.68	0.49	abc	9.04	0.58	a
Malta	5.47	0.69	a	3.66	1.08	ab	9.86	0.78	ab	11.56	1.10	ab	14.30	0.98	ab	12.88	0.75	a	4.97	0.49	ab	8.96	0.58	a
Morado	2.86	0.69	b	4.08	1.08	ab	8.35	0.78	b	9.25	1.10	bc	8.70	0.98	c	7.91	0.75	bc	3.35	0.49	cd	6.36	0.58	b
Nudosa	0.75	0.69	cd	0.28	1.08	c	1.25	0.78	d	5.95	1.10	d	7.56	0.98	cd	6.06	0.75	c	2.94	0.49	d	3.54	0.58	c
Skinners Court	0.10	0.69	d	0.23	1.08	c	1.56	0.78	d	1.95	1.10	e	0.76	0.98	f	1.71	0.75	de	0.93	0.49	e	1.03	0.58	d
Zastron	1.75	0.69	bcd	2.85	1.08	abc	8.03	0.78	b	11.42	1.10	ab	4.54	0.98	e	6.79	0.75	bc	3.95	0.49	bcd	5.62	0.58	b
Mean/year	**2.39**			**2.27**			**5.07**			**6.78**			**6.30**			**5.41**			**2.58**			**4.37**		
CV (%)	**64.21**			**116.77**			**34.56**			**36.12**			**34.66**			**31.03**			**42.52**			**29.67**		
Cool mid-altitude																								
Algerian	13.83	1.08	a	4.89	0.51	a	11.86	1.18	a	15.46	1.07	ab	20.19	1.24	a	28.21	1.31	b	5.88	1.26	bc	14.33	0.59	a
American Giant	8.71	1.08	bc	0.98	0.51	cd	11.25	1.18	a	13.96	1.07	bc	9.78	1.24	e	14.65	1.31	e	3.99	1.26	cd	9.05	0.59	d
Blue Motto	0.28	1.08	e	0.31	0.51	d	2.16	1.18	d	0.99	1.07	e	1.03	1.24	f	3.06	1.31	g	3.28	1.26	cd	1.59	0.59	ef
Direkteur	1.70	1.08	de	1.03	0.51	cd	4.54	1.18	cd	2.82	1.07	de	3.96	1.24	f	8.15	1.31	f	4.47	1.26	bcd	3.81	0.59	e
Fusicaulis	0.15	1.08	e	0.14	0.51	d	3.08	1.18	d	4.12	1.07	d	3.18	1.24	f	6.29	1.31	fg	1.86	1.26	d	2.69	0.59	ef
Gymno Carpo	13.53	1.08	a	3.20	0.51	b	9.75	1.18	ab	13.35	1.07	bc	16.39	1.24	bc	26.90	1.31	bc	7.62	1.26	ab	12.96	0.59	ab
Malta	12.75	1.08	a	2.64	0.51	b	10.04	1.18	ab	13.23	1.07	bc	14.88	1.24	bcd	23.73	1.31	cd	4.91	1.26	bcd	11.74	0.59	bc
Morado	9.09	1.08	b	2.31	0.51	bc	7.67	1.18	bc	11.53	1.07	c	13.39	1.24	cd	22.23	1.31	d	4.96	1.26	bcd	10.17	0.59	cd
Nudosa	4.29	1.08	d	0.73	0.51	d	12.23	1.18	a	15.13	1.07	ab	17.91	1.24	ab	33.92	1.31	a	5.37	1.26	bcd	12.80	0.59	ab
Skinners Court	0.33	1.08	e	0.17	0.51	d	1.35	1.18	d	1.09	1.07	de	1.73	1.24	f	2.28	1.31	g	2.44	1.26	cd	1.34	0.59	f
Zastron	7.49	1.08	c	3.61	0.51	ab	9.95	1.18	ab	18.12	1.07	a	11.37	1.24	de	14.07	1.31	e	10.80	1.26	a	10.77	0.59	c
Mean/year	**6.56**			**1.82**			**7.63**			**9.98**			**10.35**			**16.68**			**5.05**			**8.29**		
CV (%)	**36.86**			**62.83**			**34.60**			**23.91**			**26.90**			**17.58**			**55.63**			**15.84**		
Cold high-altitude																								
Algerian	0.23	0.25	c	0.93	0.29	de	0.86	0.51	c	1.23	0.52	de	1.02	0.72	d	2.13	0.88	c	1.32	1.11	c	1.10	0.35	cd
American Giant	3.22	0.25	a	1.95	0.29	bc	11.35	0.51	a	12.03	0.52	c	11.24	0.72	b	9.14	0.88	b	16.66	1.11	a	9.37	0.35	b
Blue Motto	-	-	-	-	-	-	0.03	0.51	c	0.42	0.52	e	0.02	0.72	d	0.01	0.88	c	0.47	1.11	c	0.14	0.35	d
Direkteur	0.02	0.25	c	0.01	0.29	f	0.01	0.51	c	0.23	0.52	e	0.02	0.72	d	0.04	0.88	c	0.59	1.11	c	0.13	0.35	d
Fusicaulis	0.01	0.25	c	0.12	0.29	ef	0.33	0.51	c	1.19	0.52	de	0.22	0.72	d	0.01	0.88	c	0.96	1.11	c	0.41	0.35	cd
Gymno Carpo	0.08	0.25	c	0.97	0.29	d	1.10	0.51	c	2.32	0.52	d	1.26	0.72	d	2.07	0.88	c	0.72	1.11	c	1.22	0.35	c
Malta	0.23	0.25	c	1.22	0.29	cd	0.72	0.51	c	1.63	0.52	de	1.14	0.72	d	1.01	0.88	c	0.65	1.11	c	0.94	0.35	cd
Morado	0.02	0.25	c	0.51	0.29	def	0.61	0.51	c	0.79	0.52	e	1.25	0.72	d	1.19	0.88	c	0.52	1.11	c	0.70	0.35	cd
Nudosa	0.68	0.25	c	2.38	0.29	b	9.20	0.51	b	16.72	0.52	b	19.64	0.72	a	23.46	0.88	a	10.88	1.11	b	11.85	0.35	a
Skinners Court	0.47	0.25	c	0.58	0.29	def	0.65	0.51	c	0.73	0.52	e	0.21	0.72	d	0.11	0.88	c	0.16	1.11	c	0.42	0.35	cd
Zastron	1.78	0.25	b	3.20	0.29	a	8.14	0.51	b	19.05	0.52	a	6.93	0.72	c	8.15	0.88	b	14.66	1.11	a	8.85	0.35	b
Mean/year	**0.67**			**1.19**			**3.00**			**5.12**			**3.90**			**4.30**			**4.33**			**3.19**		
CV (%)	**90.15**			**59.15**			**38.29**			**22.56**			**41.00**			**45.75**			**57.34**			**24.36**		

fy= fruit yield

Different letters in the same column (year) represent significant differences at P>0.05 by t probabilities of pair-wise differences if the F-test was significant in the

The best fit for this set of data was the AMMI 2 model where the interaction was partitioned by PCA (principal component analysis) into two interactive principal components (IPCA). IPCA1 explained 51.6% and IPCA2 34.7% of the G X E interaction sum of squares, while the residual (noise) was only 4.7% of the treatment sum of squares and thus ignored. Due to the relatively major magnitude of IPCA1 and IPCA2, both principal components will be interpreted and discussed. Figure 5.3 shows the AMMI model 2 plot for the 11 cultivar yield performance. Distinctive patterns (clusters) are identifiable, with the *O. ficus-indica* species ("Malta", "Algerian", "Morado" and "Gymno Carpo") as a group yielding well above the mean in quadrant II, while the *O. fusicaulis* cultivars ("Direkteur", "Fusicaulis" and "Blue Motto") as well as "Skinners Court" performing below the mean yield of 5.29 t ha^{-1} in quadrant IV. "Nudosa", "Zastron" and "American Giant" as unidentified species, yield relatively well in quadrant III.

Just by considering the IPCA1 scores, "Direkteur", "Fusicaulis", "Skinners Court" and "Blue Motto" appear to be the most stable cultivars (IPCA1 score approaching zero) over the range of environments. In contrast, the most unstable cultivars were "American Giant", "Nudosa", "Algerian", "Gymno Carpo", "Zastron", "Malta"" and to a lesser extent "Morado" which all have a IPCA1 score >1.5 (+ or -).

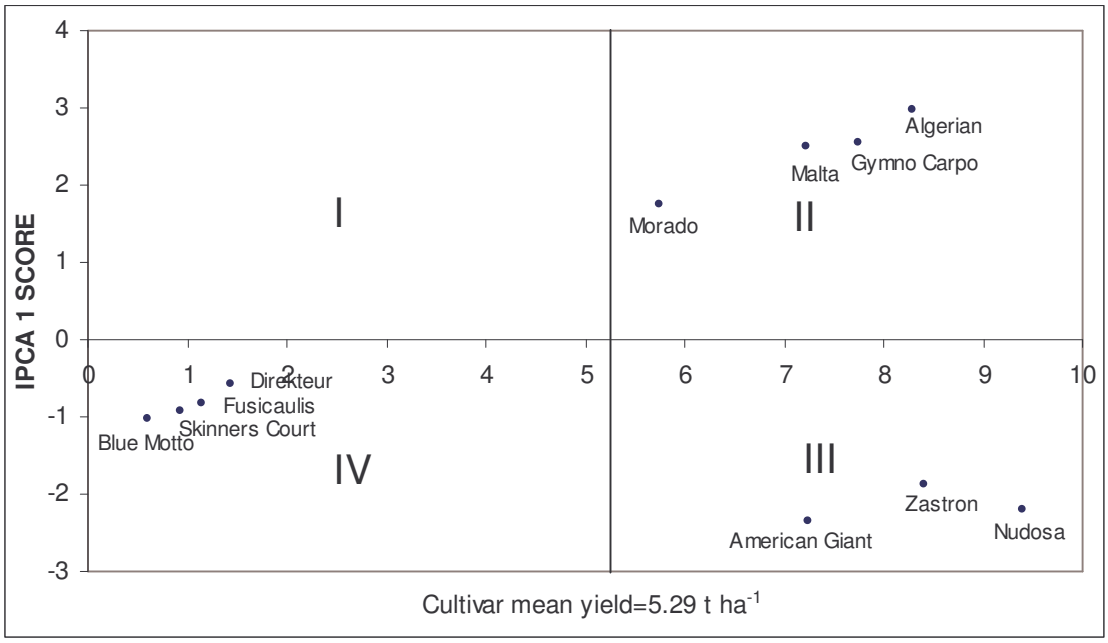

Figure 5.3 AMMI model 2 plot of fruit yield for 11 cactus pear cultivars in Limpopo: 1994/5 to 2000/1 seasons

In the interpretation of the AMMI analysis, the genotype main effect should also be considered. In Table 5.5, the environments were ranked from high to low according to IPCA1 score. In each environment the five best performing cultivars were ranked in order from high to low. "Algerian" occupied nine, "Nudosa" eight and "Zastron" four first places over the 21 environments. "Gymno Carpo" and "American Giant" occupied most second places, while "Morado" and "Malta" also ranked relatively high. "Algerian", "Gymno Carpo" and "Malta" are the best performers in the hot low-altitude area, while "Nudosa", "Zastron" and "Algerian" occupied most of the top places in the cool mid-altitude area. In the cold high-altitude area only "Nudosa", "Zastron" and "American Giant" yielded well, while most *O. ficus-indica* species performed poorly in this environment.

Since a measure may be needed to quantify and rank cactus pear cultivars in terms of yield stability, the following proposed equation of Purchase *et al*. (2000) was used:

$$\text{AMMI Stability Value (ASV)} = \sqrt{\left[\frac{\text{IPCA1sumofsquares}}{\text{IPCA2sumofsquares}}(\text{IPCA1score})\right]^2 + [\text{IPCA2score}]^2}$$

Table 5.5 AMMI best five cultivars selected for fruit yield over 21 environments: 1994/5-2000/1

ENVIRONMENT	YIELD (t ha^{-1})	SCORE	1st	2nd	3rd	4th	5th
1999/2000M	16.680	2.030	NUD	ALG	G/CAR	MAL	MOR
1998/9L	6.301	1.818	ALG	G/CAR	MAL	MOR	NUD
1994/5M	6.559	1.495	ALG	G/CAR	MAL	MOR	ZAS
1998/9M	10.345	1.334	ALG	NUD	G/CAR	MAL	MOR
1996/7L	5.067	1.310	ALG	G/CAR	MAL	MOR	ZAS
1999/2000L	5.411	1.224	ALG	G/CAR	MAL	MOR	ZAS
1997/8L	6.783	1.170	ALG	G/CAR	MAL	MOR	ZAS
1994/5L	2.389	0.658	ALG	G/CAR	MAL	ZAS	MOR
1995/6L	2.066	0.491	ALG	G/CAR	MAL	ZAS	MOR
2000/1L	2.579	0.295	ALG	G/CAR	ZAS	MAL	MOR
1997/8M	9.981	0.248	NUD	ALG	G/CAR	MAL	ZAS
1995/6M	1.819	0.138	ZAS	ALG	G/CAR	MAL	A/GIAN
1996/7M	7.626	0.054	NUD	ALG	ZAS	G/CAR	MAL
2000/1M	5.054	-0.218	ZAS	A/GIAN	ALG	G/CAR	MAL
1995/6H	1.078	-0.554	ZAS	A/GIAN	G/CAR	ALG	MAL
1994/5H	0.612	-0.653	ZAS	A/GIAN	G/CAR	MAL	ALG
1996/7H	3.000	-1.701	NUD	ZAS	A/GIAN	G/CAR	ALG
1998/9H	3.905	-2.109	NUD	A/GIAN	ZAS	ALG	G/CAR
1999/2000H	4.302	-2.125	NUD	A/GIAN	ZAS	ALG	G/CAR
2000/1H	4.327	-2.405	NUD	ZAS	A/GIAN	FUS	S/COUR
1997/8H	5.123	-2.501	NUD	A/GIAN	ZAS	FUS	DIR

The ASV (AMMI Stability Value) is the distance from zero in a two dimensional scattergram of IPCA1 scores against IPCA2 scores. Since the IPCA1 score contributes more to the G X E sum of squares, it was weighted by the proportional difference between IPCA1 and IPCA2 scores in order to compensate for the relative contribution of IPCA1 and IPCA2 scores to total G X E sum of squares.

The yield stability of the eleven cactus pear cultivars tested is indicated in Table 5.6. All three *O. fusicaulis* species ("Direkteur", "Fusicaulis" and "Blue Motto") proved to be highly stable in terms of fruit yield in all environments; however, yield levels were unacceptably low for commercial fruit production purposes. On the other hand, "Nudosa", which has the highest mean yield, proved to be the most unstable of all cultivars tested. Of the potential commercial cultivars, "Morado" and "Zastron" also seem to be relatively stable, while still producing good fruit yields. The aim, size and target market of the farming operation will ultimately determine which cultivar to plant within that environment. For example, small subsistence farmers that are generally more risk averse may rather choose a cultivar with a low yield but better stability for own consumption (Sinebo, 2005), whereas commercial farmers may choose less stable cultivars but with a higher fruit yield of a particular internal colour to suit market demand.

Table 5.6 AMMI Stability Value (ASV) for mean fruit yield (t ha^{-1}) per cultivar: 1994/5-2000/1 season

CULTIVAR	YIELD (t ha^{-1})	IPCA1	IPCA2	ASV
Direkteur	1.439	-0.572	1.385	1.632
Fusicaulis	1.143	-0.831	1.417	1.893
Blue Motto	0.605	-1.031	2.034	2.561
Skinners Court	0.931	-0.913	2.175	2.575
Morado	5.741	1.750	-0.226	2.652
Zastron	8.413	-1.881	-0.074	2.841
American Giant	7.235	-2.348	-0.577	3.591
Malta	7.214	2.509	-0.273	3.797
Gymno Carpo	7.740	2.561	-0.539	3.904
Algerian	8.288	2.964	-0.915	4.567
Nudosa	9.398	-2.208	-4.407	5.526

The primary measure of adaptability of a cultivar to a particular area is its fruit yield potential (Wessels, 1988d). Fruit yield in cactus pear is determined by the mean number of fruits remaining on the plant after fruit thinning, multiplied by the mean fruit mass. The value obtained is then multiplied by the number of plants per hectare (in this instance 1000) to arrive at the fruit yield per hectare.

When compared to fruit yields obtained by Wessels (1988d) with 21 cultivars over two production years in the Pretoria area, some striking similarities with the results of this study are evident. As the Pretoria area is largely similar in terms of environmental factors to the mid-altitude area, direct comparisons would therefore be valid. This author, however, did not indicate plant age and whether fruit thinning and irrigation were practiced. Nevertheless, seven cultivars used in this investigation were included in the study of Wessels (1988d), and ranked from high to low according to mean fruit yields obtained over two seasons: "Algerian"(16.42 t ha^{-1}), "Morado" (15.36 t ha^{-1}), "Nudosa" (10.35 t ha^{-1}), "Blue Motto" (7.02 t ha^{-1}), "Direkteur" (5.33 t ha^{-1}) "Skinners Court" (0.85 t ha^{-1}) and "Fusicaulis" (0.53 t ha^{-1}). With the exception of "Morado" which was found in this study to have a medium yielding potential, the ranking is very similar to that found by Wessels (1988d). There is general agreement between the studies that "Blue Motto"," Direkteur"," Fusicaulis" and "Skinners Court" are all low yielding, indicating that it is a genetic trait rather than a G X E.

Fruit yields of cactus pear across the world and in country terms, are very variable (Pimienta-Barrios, 1994; Inglese *et al*., 1995a,). In South Africa, a number of researchers have reported fruit yields of the most commonly grown cultivars for mature plants since the late seventies to mid 2000. For comparative purposes, fruit yields obtained in South Africa are shown in Table 5.7.

According to Barbera (1995) and Inglese (1995) yield variability is due to orchard design and management rather than environmental constraints. This may be an oversimplification of the problem since large variations in fruit yields are regularly observed even in well-managed commercial orchards. Since orchard practices employed in this study were uniform between trial sites and closely simulated to those of industry, the great variability in fruit yield obtained between sites was clearly due to different environmental conditions.

Even though the plants were clonally propagated, productivity at plant level seems to vary greatly. This situation was illustrated by Wessels *et al*. (1997) who showed that daughter plants from a high-yielding clone consistently produced higher fruit yields, while daughter plants from a low-yielding clone produced low fruit yields over a three-year period.

Table 5.7 Cactus pear fruit yield reported in South Africa from 1979 to 2006

Area	Yield (t ha^{-1})		Cultivar		Plant spacing		Reported by
	Highest	Lowest	High	Low	In row and between row (m)	Population (plants ha^{-1})	
Alice, Eastern Cape	7.50	0.60	Algerian	Guayaquil	4x5	500	Brutsch (1979)
Pretoria, Gauteng	30.0	10.0	Algerian	Corfu	3x4	833	Wessels (1988a,d)
Pretoria, Gauteng	32.33	0.10	Algerian	Corfu	3x4	833	Wessels (1989)
Groot Marico, North West	4.0	2.0	Gymno Carpo	Gymno Carpo	1.7x5	1176	Claassens & Wessels (1997)
Pretoria, Gauteng	13.12	3.44	Malta	American Giant	2.5x5	800	Van der Merwe *et al.* (1997)
Mokopane, Limpopo	30.67	4.15	Gymno Carpo	Skinners Court	2x5	1000	Potgieter & Mkhari (2002)
Bloemfontein, Free State	34.50	20.0	Skinners Court	Skinners Court	2x6	835	Buitendag (2004)
Mokopane, Phalaborwa, Monsterlus, Limpopo	9.12	0.59	Nudosa	Blue Motto	2x5	1000	Potgieter & Smith (2006)
Mokopane, Limpopo	30.67	4.97	Gymno Carpo	Skinners Court	2x5	1000	Oelofse *et al.* (2006)

Results in this study confirm the findings of Brutsch (1979) but with even higher coefficient of variation values. Over the seven production years, CV values ranged from 116.77% in the hot low-altitude area to 17.58% in the cool mid-altitude area. This was due to very high and very low yields recorded for cultivars in the same environment. However, despite the high CV values, the F probability in the ANOVA still indicates significant differences for cultivars and environments for all years and areas. The problem of high CV values seems not be limited to cactus pear as Human (1994) reported a CV of 39.1% for fruit yield in grapefruit cultivar / rootstock trials in Malelane, Mpumalanga.

The adaptation of different cultivars of a single genus (as is the case with cactus pear) to different environmental conditions is similar to the situation of sweet oranges in citrus where “Navel” cultivars produce higher yields in cooler areas and “Valencia” cultivars prefer warmer climates (Agrometeorological Section, 1988).

5.2.4 Cumulative fruit yield

5.2.4.1 Hot low-altitude area

Although annual fruit yield performance is important for all crops, the cumulative yield in permanent crops is probably more important as it determines the economic break-even point from planting to maturity. Farmers prefer a cultivar that bears consistently, even if it may be at a lower yield than a cultivar that bears well in one year and poorly in the next as this pattern negatively affects the cash flow position of the enterprise. The cumulative fruit yield of all cultivars in the low-altitude area is shown in Figure 5.4. Cumulative yields ranged from 66.02 t ha^{-1} for “Algerian” to 0.64 t ha^{-1} for “Blue Motto” over the seven production years. In addition to “Algerian”, the most productive cultivars, “Gymno Carpo”, “Malta” and “Morado” gave cumulative fruit yields of 63.30, 62.70 and 44.50 t ha^{-1} respectively. Interestingly, all four of these cultivars are *O. ficus-indica* species. This clearly shows the good adaptability of these species to the hot low-lying area of Limpopo. In contrast, all three *O. fusicaulis* species (“Blue Motto”, “Fusicaulis” and “Direkteur”) produced the lowest cumulative fruit yields in this environment, showing their relative unsuitability for this area.

“Nudosa” is clearly a cultivar that produces little fruit in the early years after establishment (1994/5-1996/7), but thereafter produces well as the plant matures. This indicates that “Nudosa” has a substantially longer vegetative phase than most other adapted cultivars in this area. This phenomenon, as discussed earlier in the Introduction (Section 5.2), is an important characteristic to consider in cactus pear fruit production as cultivars with a short vegetative phase are usually preferred, although the eventual cumulative yield is a better barometer on which to base cultivar choice. By comparison, all the *O. ficus-indica* species have virtually no vegetative period and all produced relatively well from the first production year onwards. These results are in agreement with the findings of Inglese *et al*. (2002a) who stated that plants begin to bear fruit from the first or second production year, as is the case with South African cactus pear cultivars.

"Gymno Carpo" produced 6.70 t ha^{-1} in the first production year (1994/5), substantially higher than what is expected of a cultivar of four years (Table 3.9). "Algerian", "American Giant", "Gymno Carpo" and "Malta" all produced very low fruit yields in production year seven, while "Direkteur", "Fusicaulis", "Morado", "Nudosa" and "Zastron" performed notably better. Fruit production between 1996/7 (year 3) and 1999/2000 (year 6) were comparatively better, than in the first two production seasons (1994/5, 1995/6) and the last season (2000/1), showing that environmental conditions were more favourable for fruit production in this low-altitude area from year 3-6.

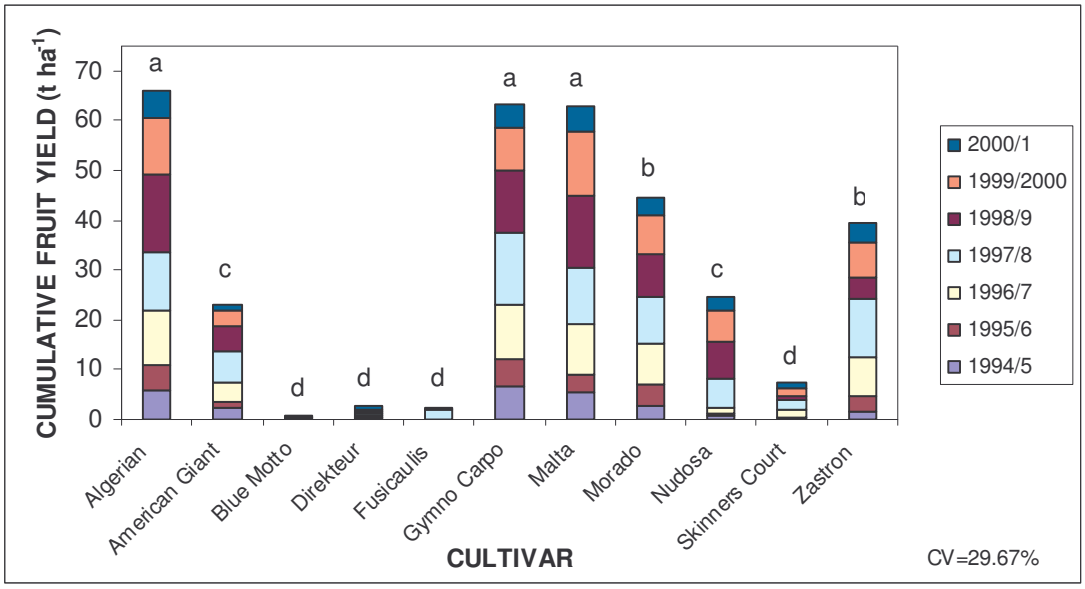

Figure 5.5 Cumulative fruit yield (t ha^{-1}) for cactus pear cultivars from 1994/5 to 2000/1 in the hot low-altitude (Nondweni) area. Different letters indicate statistical significance at p=0.05

5.2.4.2 Cool mid-altitude area

Figure 5.6 indicates the cumulative fruit yield of the eleven cultivars in the mid-altitude area. In general, accumulated fruit yields in the mid-altitude were substantially higher than in both the low and high-altitude areas, showing the suitability of this environment for fruit production of all cultivars. This seems reasonable as climatic conditions in this area are very similar to that of the interior plateau of Mexico from where most *Opuntia* species originated and which is described as a cool region with a comparatively "fair" (moderate) climate (Griffiths & Hare, 1907). All three *O. fusicaulis* cultivars produced very low accumulated fruit yields over the seven production years in the mid-altitude

area, although "Skinners Court" (a diamond shaped cladode type) produced the lowest accumulated fruit yield of only 9.41 t ha^{-1} over seven years, they will not be recommended for commercial fruit production. Cultivars that accumulated the highest fruit yield were "Algerian" (100.31 t ha^{-1}), followed by "Gymno Carpo" with 90.73 t ha^{-1}, "Nudosa" with 89.58 t ha^{-1} and "Malta" with 82.18 t ha^{-1}.

The highest annual fruit yield for all the cultivars occurred during the 6th production year (1999/2000) (Figure 5.6). The 1995/6 (second production year) and 2000/2001(seventh production year) seasons' fruit yield for all cultivars were substantially lower. "Nudosa" had a comparatively longer vegetative period than other adapted cultivars in this environment, as was also the case in the low-altitude area. This observation indicates that this is indeed a cultivar characteristic. However, when the cumulative fruit yield for "Nudosa" is compared with all the other cultivars, it becomes evident that although it produced little fruit in the initial two production years, it produced the third highest cumulative yield (89.58 t ha^{-1}) over all production years thereby compensating for this negative trait. This observation illustrates the value of evaluating cactus pear cultivars from establishment to maturity rather than only at the full mature plant stage.

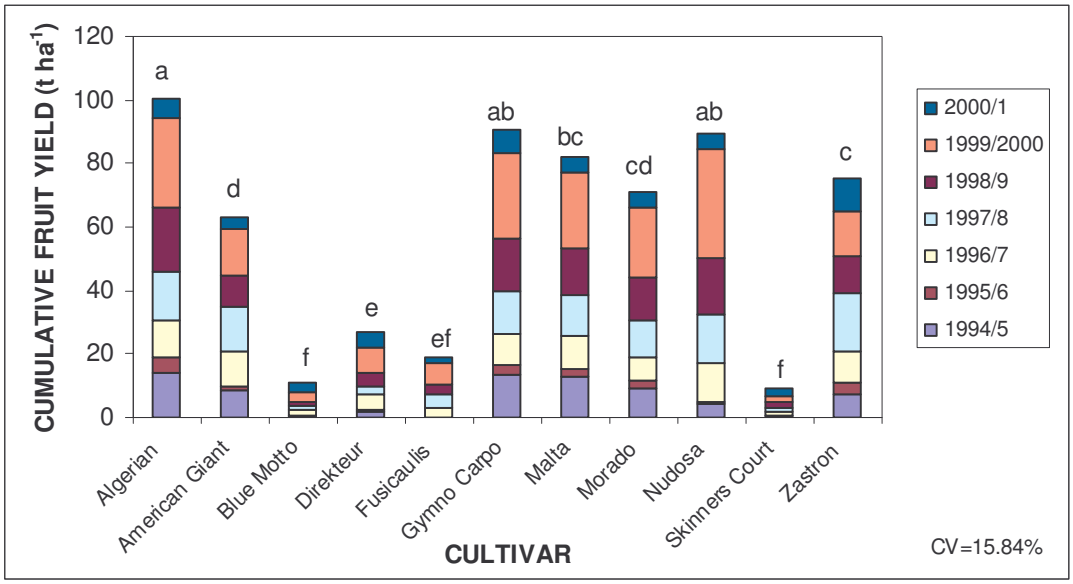

Figure 5.6 Cumulative fruit yield (t ha^{-1}) of cactus pear cultivars from 1994/5 to 2000/1 in the mid-altitude (Gillemberg) area. Different letters indicate statistical significance at p=0.05.

5.2.4.3 Cold high-altitude area

When the cumulative fruit yields of all cultivars were compared in the high-altitude area a clear pattern became evident (Figure 5.7). Only three cultivars produced well in this environment characterised by acid soils, cold winters and lower mean temperatures during the FDP than the other two areas. "Nudosa", "American Giant" and "Zastron" with 82.97, 65.59 and 61.92 t ha^{-1} respectively were the only cultivars that produced meaningful fruit yields over the seven production years. "Direkteur" produced only 0.91 t ha^{-1} from 1994/5 to 2000/2001, clearly showing its low fruit production potential in this environment. As in the other two areas, "Nudosa" showed its true fruit production potential from the third production (1996/7) year onwards, out performing all the cultivars by the seventh production year in terms of cumulative fruit yield. "American Giant" and to a lesser extent, "Zastron" consistently produced good fruit yields from the first production year onwards without any evidence of yield variability, displaying good adaptability to this environment.

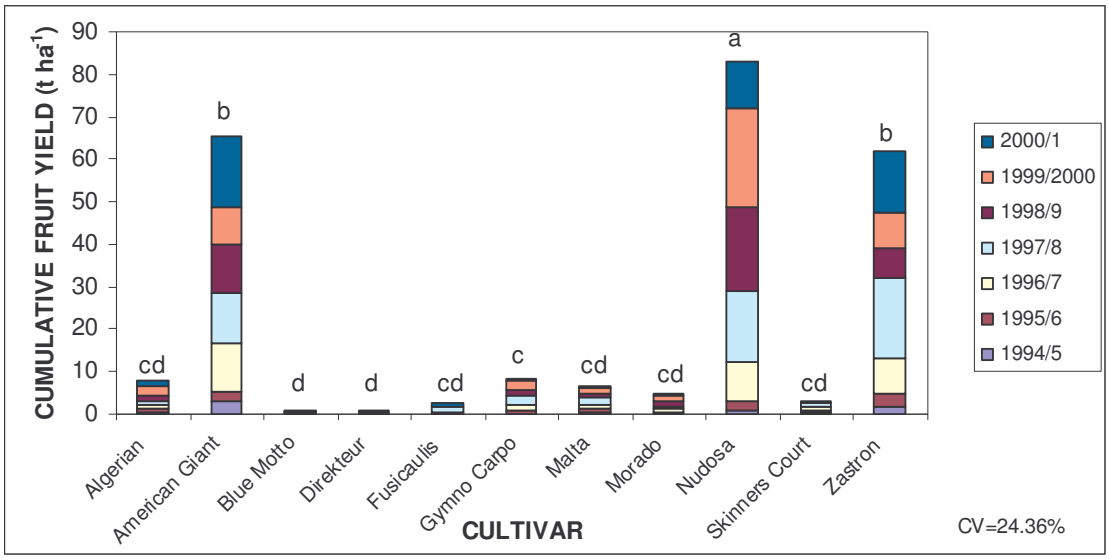

Figure 5.7 Cumulative fruit yield (t ha^{-1}) from 1994/5-2000/1 season for cactus pear cultivars in the high-altitude (Zaaiplaas) area. Different letters indicate statistical significance at p=0.05.

5.2.4.4 Cultivar cumulative fruit yield

The cumulative fruit yields of all cultivars for seven production years and in three areas are shown in Figure 5.8. Statistically significant differences (p=0.05) were evident between the cultivars tested. Although "Nudosa" with 197.35 t ha^{-1} produced the highest

cumulative yield, it was not significantly different from the 176.67 t ha^{-1} of "Zastron". Seven of the cultivars produced cumulative fruit yields above the mean yield for the trial of 111.01 t ha^{-1}. "Blue Motto" (12.71 t ha^{-1}), "Skinners Court" (19.56 t ha^{-1}), "Fusicaulis" (24.0 t ha^{-1}) and "Direkteur" (30.22 t ha^{-1}) had the lowest cumulative yields and should not be recommended for commercial cultivation in any of these production areas of Limpopo Province.

Six of the eleven cultivars evaluated produced mean annual fruit yields in excess of 20 t ha^{-1} over the seven production years. On average, "Nudosa" had the highest mean fruit yield per year attaining 28.19 t ha^{-1}, followed by "Zastron" (25.24 t ha^{-1}), "Algerian" (24.86 t ha^{-1}), "Gymno Carpo" (23.22 t ha^{-1}), "American Giant" (21.70 t ha^{-1}) and "Malta" (21.64 t ha^{-1}). These fruit yields can be regarded as excellent for dry-land conditions. All the *O. ficus-indica* cultivars performed well in contrast to the *O. fusicaulis* cultivars that performed far below the mean cumulative yield. These results indicate the unsuitability of *O. fusicaulis* cultivars as fresh fruit cultivars in Limpopo Province in general.

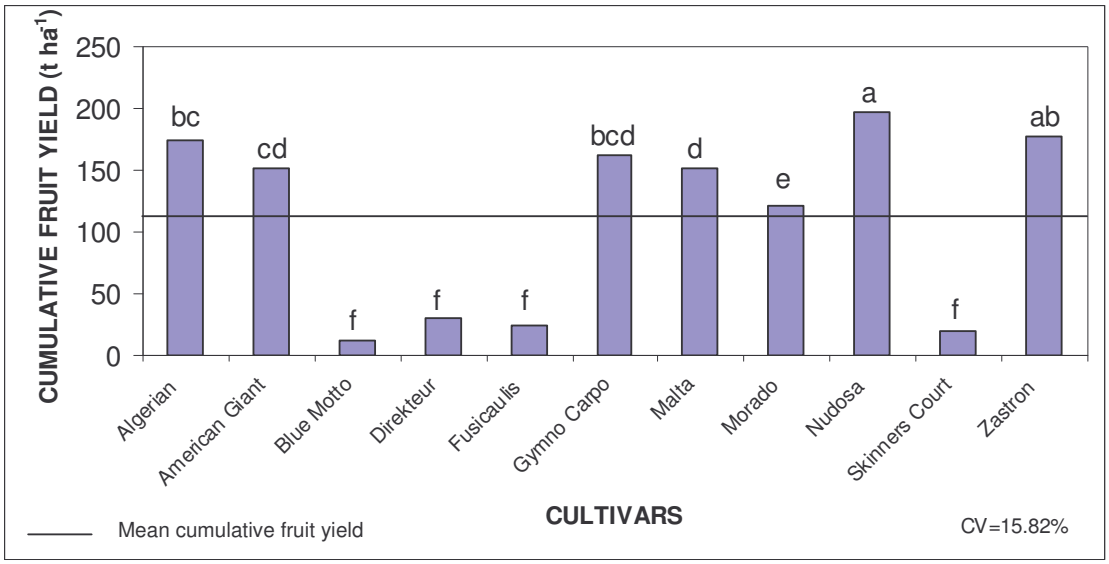

Figure 5.8 Cumulative fruit yield (t ha^{-1}) of cactus pear cultivars over seven production years and three areas. Different letters indicate statistical significance at p=0.05

Despite designing the experiment to have four data plants, of which the mean values were used per plot at five replications in each site, high coefficient of variation (CV) values were obtained for most of the reproductive measurements, indicating a high degree of variability in the response of cultivars. It is generally expected that clonally propagated plants will have low variation between daughter plants of the same clone;

this is clearly not the case in cactus pear. However, in spite of the high degree of variation, probability values of the ANOVA showed statistically significant differences (p=0.05) between treatments in the majority of cases. It seems unlikely that any further increases in the number of plants per plot or replications would reduce the CV substantially. Practical and financial implications of decreasing the CV should be borne in mind, as these field trials were already relatively large and expensive to maintain.

5.3 Environmental effects on reproductive development

5.3.1 Number of fruit set

Statistically significant differences were observed between sites over the seven production years for the number of fruit set (Figure 5.9). However, this trend was less distinct than that observed for the two aforementioned parameters. Fruit number over all three sites decreased in production year two and six. During year 7 there was no significant difference in performance between sites. In general, fruit number was highest in the cool mid-altitude site, in agreement with a higher number of fertile cladodes as discussed previously (section 4.2.2). The number of fruit set was lowest in the cold high-altitude site, where only three cultivars performed satisfactorily, indicating that environmental conditions were not conducive for the production of high fruit numbers by all cultivars.

A high number of fruit that set per plant is desirable from a fruit yield viewpoint. Fruit mass is larger on cladodes that set high numbers of fruit as compared to those that set lower fruit numbers (Inglese *et al*., 1995b). According to these authors this is due to the high amount of assimilates present in cladodes with many fruits, which after thinning produces larger fruits. On a practical level however, a high fruit load is viewed as negative trait since it increases the labour costs associated with fruit thinning which is a highly labour intensive activity.

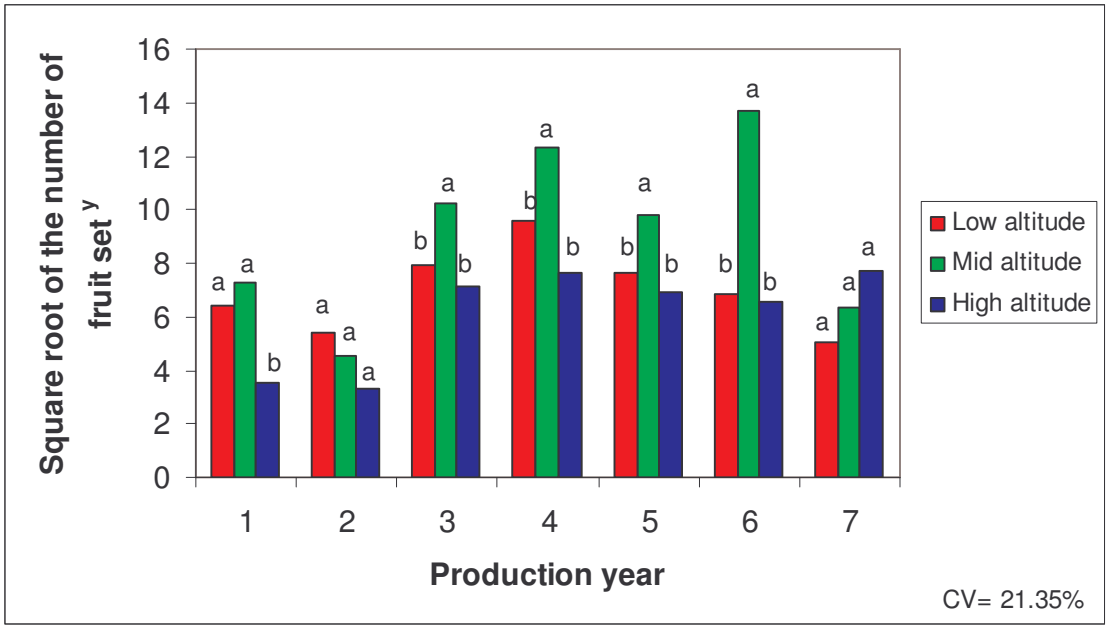

Figure 5.9 Square root of the total number of fruit set of cactus pear cultivars over seven production years in three locations. Different letters in the same year represent significant differences at P>0.05 when the F probability was significant in the ANOVA. [y] Values presented are square root transformed data $y=\sqrt{(x+0.05)}$

5.3.2 Number of fruit left after thinning

As expected, the general trend in Figure 5.10 followed that for the total number of fruit set rather closely. With the exception of the second and seventh production years, mean fruit number after thinning (transformed data) over all cultivars for the seven production years was significantly higher in the cool mid-altitude site than in the other two areas. Overall, the mean number of fruit left after thinning was higher in the hot low-altitude site than in the cold high-altitude site. Fewer cultivars performed satisfactorily in the cold high-altitude area and environmental conditions were probably unfavourable for fruit induction. The mean number of fruit that remained on the plant after thinning is a good indication of the expected yield as these two variables are strongly positively correlated.

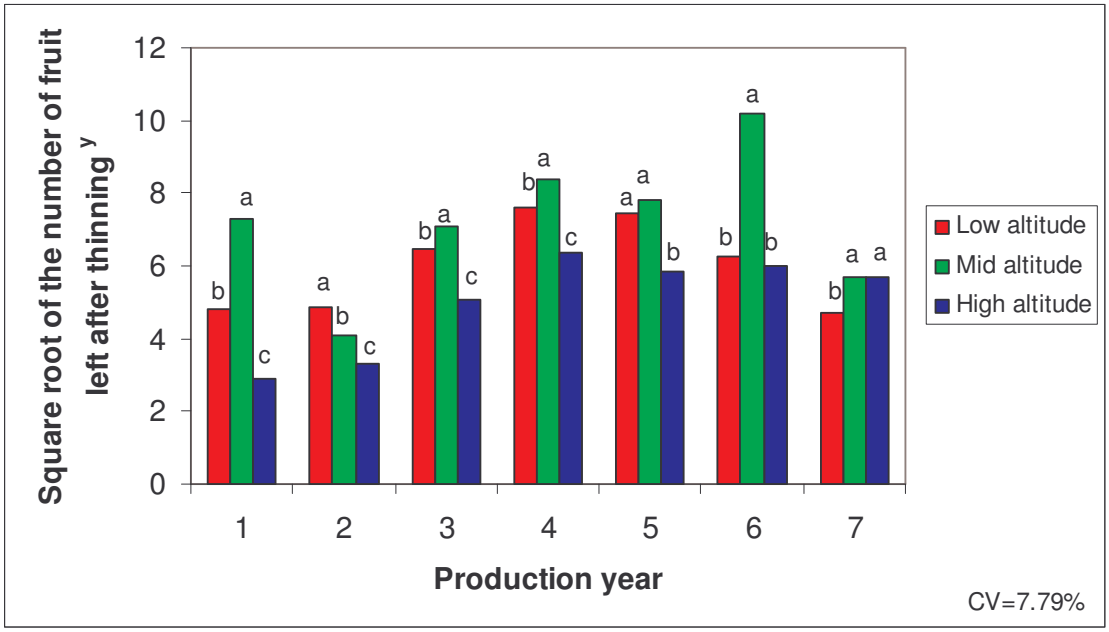

Figure 5.10 Square root of the mean number of fruit left after thinning of cactus pear cultivars over seven production years in three locations. Different letters in the same year represent significant differences at P>0.05 when the F probability was significant in the ANOVA. [y] Values presented are square root transformed data y=√(x+0.05)

5.3.3 Fruit yield

Due to the strong positive relationship between mean number of fruit left after thinning and fruit yield, it is evident that the area with the highest number of fruit left after thinning will also have the highest fruit yield (Figure 5.11). Fruit yields in the cool mid-altitude area were statistically significantly higher (p=0.05) than in the other two areas with the exception of the second production year. This is an indication that environmental conditions in this area are likely to be conducive to high cactus pear fruit yields. In particular, fruit yields of the sixth production year in the cool mid-altitude area were at least double that of any of the other two areas. Over the seven production years, the ranges of fruit yields over all cultivars were as follows: hot low-altitude: 2.27 – 6.78 t ha^{-1}; cool mid-altitude: 1.82 – 16.68 t ha^{-1} and cold high-altitude: 0.67 - 5.12 t ha^{-1}.

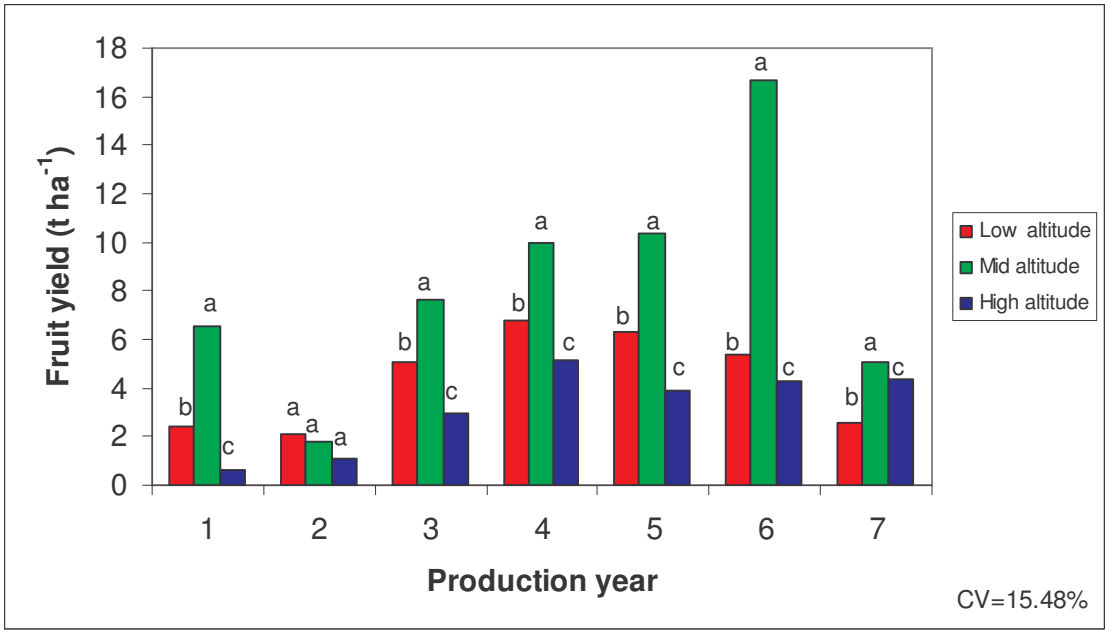

Figure 5.11 Fruit yield of cactus pear cultivars over 7 production years in three locations. Different letters in the same year represent significant differences at P>0.05 when the F probability was significant in the ANOVA

5.3.4 AMMI analysis of fruit yield per environment

The AMMI results present a clear picture of fruit yield per environment (Figure 5.12). Although the cold high-altitude (H) areas are generally better endowed in terms of natural resources (high rainfall and good soil depth), average fruit yield was lowest (3.1 t ha^{-1}) in this environment. This indicates that with a few exceptions, this environment is generally not suitable for commercial cactus pear fruit production. Acid sandy soils, cold winter conditions and cool summer daytime temperatures are possibly factors that negatively influenced fruiting in cactus pear. Fruit yields were also generally low (4.3 t ha^{-1}) in the sub-tropical hot low-altitude (L) environment with its high summer temperatures and low rainfall, indicating that this is a marginal fruit production area under rain-fed conditions. High vegetative growth possibly competed with resources for reproductive development. The highest fruit yields (8.2 t ha^{-1}) were obtained in the cool mid-altitude (M) environment at an altitude of 1 100 m.a.s.l. with cool winters and warm summers.

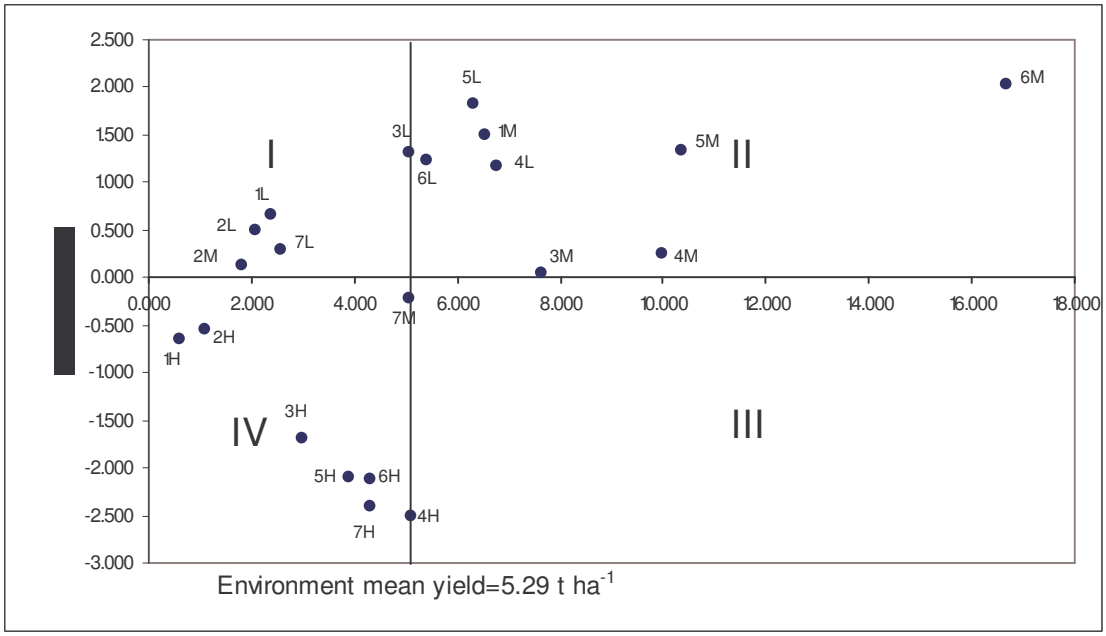

Figure 5.12 AMMI model 2 plot for cactus pear fruit yield over 21 environments in Limpopo: 1994/5-2000/1 seasons. The figure indicates the production year while the letter indicates the area (L= hot low-altitude, M= cool mid-altitude and H= cold high-altitude)

As is the case with many other permanent fruit tree crops, high and low bearing patterns were detected for all cactus pear cultivars in all three agro-climatic zones. Generally, fruit yield decreased in year two (except in H), increased over year three and four, decreased in year five (except in M), increased in year six (except in L) and decreased again in year seven. Although the cause of this varying bearing pattern is not known, it has been reported in Sicily (Barbera *et al.*, 1991) and South Africa (Brutsch, 1979). The possibilities that environmental factors could be the cause of the large seasonal variation in fruit yield rather than alternate bearing *per se* is also not clear and needs to be investigated.

5.4 Conclusions

Statistically significant differences between cultivars, environments and production years for the number of fruit set were evident in this study. The *O. ficus-indica* cultivars set high numbers of fruit in the warmer environments (hot low-altitude and cool mid-altitude area). The suitability of the cool mid-altitude area to induce cladode fertility over a wider range of cultivars is also evident. In the cold high-altitude area, only “American Giant”, “Zastron” and to a lesser extent “Nudosa” seem to be adapted to this environment from

the point of view of the number of fruit set. These cultivars are the only ones that showed adaptability to this environment. It is thus evident that none of the candelabra growth habit types (*O. fusicaulis*) and "Skinners Court" are suitable for cultivation in this cold high-altitude environment with acid soils as seen by the low numbers of fruit left after thinning. "Nudosa", "Zastron" and "American Giant" are well adapted to colder conditions with acid soils. It is unfortunate in field trials such as these that it is not possible to separate the effects of high-altitude and lower temperature from that of the acid soil conditions as it remains unclear which environmental variable is responsible for yield differences between cultivars. For this reason, it would be important to establish a trial under neutral soil pH conditions.

Large differences between cultivars, production years and environments in terms of fruit yield were evident in this study. Fruit yield in the three areas closely followed the trend for mean number of fertile cladodes, mean number of fruit set and mean number of fruit left after thinning, showing the likelihood of these variables being positively related and that they could be used in future as possible yield predicting tool or index. In the hot low-altitude area "Algerian", "Gymno Carpo", "Malta", "Morado" and "Zastron" produced satisfactory fruit yields. In the cool mid-altitude environment, most cultivars that produced few fruit in other areas produced more fruit, showing that environmental conditions in general were more favourable for fruit production at this cool mid-altitude than in either the low and high-altitude areas. Only "Nudosa", Zastron" and "American Giant" were capable of producing fruit yields of acceptable quantity, while all other cultivars performed very poorly in the cold high-altitude, acid soil area. Even under dry-land conditions, these results show that fruit yields higher than the minimum norm as recommended by Potgieter & Mkhari (2002) and the 10 t ha^{-1} which were considered above average by Wessels (1988a;d) are attainable. It is clear that fruit productivity of cactus pear in Limpopo is comparable with cactus pear production in other parts of South Africa and may even exceed yields of many other fruit crops in semi-arid environments such as pistachio, almond, carob and olive (Barbera, 1995).

The AMMI analysis as a statistical tool is recommended for studies of this nature largely because of its strong visual effect in clustering cultivars for recommendation purposes. However, the ASV is of less use as high yield stability becomes less important if the fruit yield potential is below acceptable economic norms. The use of cumulative yield from establishment to maturity in permanent crops is recommended as an important

additional criterion for cultivar recommendation purposes. “Nudosa” is clearly a low producer in the early production years but outperformed most cultivars on the basis of cumulative yield over seven years. “Morado”, the current standard cultivar in the fresh fruit industry produced moderate fruit yields. A replacement white flesh cultivar with a higher yield potential and firmer fruit pulp portion should be sought. “Fusicaulis”, “Skinners Court”, “Blue Motto”, and “Direkteur” are all low fruit yielder’s and as such should not be recommended for commercial fruit production purposes in Limpopo Province.

CHAPTER 6

RELATIONSHIPS BETWEEN ENVIRONMENTAL FACTORS AND FRUIT YIELD COMPONENTS

Fruit yield is influenced by both the cultivar and environmental factors. Knowledge of differences in the fruit yield components of the various cultivars will enable scientists to determine whether they react similarly or not. On the basis of the strength of the relationships between cultivars environmental factors it may be possible to identify those factors that have the largest influence on fruit yield. The specific objectives of this chapter were to determine if any relationship is evident for cultivar fruit yield and the number of cladodes left after pruning, number of fertile cladodes, number of fruit set and number of fruit left after thinning. Lastly the relationship between all fruit yield components and environmental variables or indices will be determined.

6.1 Relationships between environmental factors and genotypes

The relationships between fruit yield and the yield components for each cultivar over all three areas are shown in Table 6.1. All yield components were positively correlated with fruit yield, although the strength of the relationships differed between parameters and within cultivars. “American Giant”, “Blue Motto”, “Fusicaulis” and “Skinners Court” showed no relationship between fruit yield and the number of cladodes left after pruning. Generally, of the all parameters the mean number of cladodes left after pruning had the weakest correlation to fruit yield and ranged from the strongest (r=0.534 *) for “Zastron” to the weakest (r=0.346 ns) for “American Giant”. “American Giant”, “Blue Motto”, “Fusicaulis” and “Skinners Court” showed no relationship between fruit yield and the number of cladodes left after pruning. This suggests that fruit yield increased with the number of cladodes left after pruning. However due to the relatively weak relationship between variables, the number of cladodes left after pruning should generally be considered a poor indicator of fruit yield.

In contrast, the number of fertile cladodes showed a strong to very strong relationship with fruit yield, indicating that as the number of fertile cladodes increased, fruit yield would increase linearly. Correlation coefficients between the number of fertile cladodes ranged from r=0.942 *** for “Fusicaulis” to r=0.803 *** for “Zastron”. Similarly, the total number of fruit set (before fruit thinning), were generally strongly correlated to fruit yield

Table 6.1 Linear correlation coefficients (r) relationships between fruit yield for cactus pear cultivars and other yield components from 1994 to 2001 over all three areas for the environmental adaptability study

Cultivar	Cladodes left after pruning (clp)	Fertile cladodes (cf)	Total number of fruit set (fs)	Fruit left after thinning (fat)
Algerian	0.507 *	0.858 ***	0.938 ***	0.963 ***
American Giant	0.346 ns	0.842 ***	0.938 ***	0.969 ***
Blue Motto	0.369 ns	0.924 ***	0.278 ns	0.975 ***
Direkteur	0.470 *	0.931 ***	0.740 ***	0.951 ***
Fusicaulis	0.403 ns	0.942 ***	0.705 ***	0.960 ***
Gymno Carpo	0.513 *	0.819 ***	0.865 ***	0.950 ***
Malta	0.466 *	0.834 ***	0.886 ***	0.954 ***
Morado	0.485 *	0.872 ***	0.922 ***	0.953 ***
Nudosa	0.524 *	0.909 ***	0.850 ***	0.952 ***
Skinners Court	0.432 ns	0.891 ***	0.442 *	0.940 ***
Zastron	0.534 *	0.803 ***	0.925 ***	0.984 ***

ns= non-significant; *= 0.05; ***= 0.001 level of significance

with the exception of “Blue Motto” (r=0.278 ns) and “Skinners Court” (r=0.442 *), which both had low fruit yield potential anyway. This implies that, with the exception of the last two cultivars, an increase in the total number of fruits set results in an increase in fruit yield. Similarly, as the number of fruits left after thinning increased, fruit yield will also increase in a linear manner for the cultivars included in this study. Across all cultivars, the number of fruit left after thinning shows a strong positive relationship with fruit yield, meaning that it will give a good indication of expected fruit yield.

When the data for all areas, years, and cultivars were pooled and yield variables correlated with one another, the following results were evident (Table 6.2). Fruit yield was very strongly (r=0.935 ***) related to the number of fruit left after thinning, strongly related with the number of fertile cladodes (r=0.863 ***), fairly strongly related to the total number of fruit set (r=0.774 ***) and relatively weakly related to the number of cladodes left after pruning (r=0.529 ***). The strong correlation between the number of fruits left after thinning and fruit yield occurs because virtually all set cactus pear fruit develop to maturity. Fruitlets will only abort if a cold spell occurs just after reproductive bud appearance (late spring) (Potgieter, personal observation). The number of fruit left after thinning was also very strongly related to the number of fertile cladodes (r=0.927 ***), suggesting that an increase in the number of fertile cladodes will lead to an increase in

the number of fruit left after thinning. Similarly, it seems that as the number of fruit set increases, so would the number of fruit left after thinning. Inglese *et al*. (1995b) noted that an increase in the number of fruit set increases the assimilate status of the fruiting cladode. Therefore, after thinning more assimilates would thus be available to fewer organs (fruit) and as a result should lead to increased fruit mass (Inglese *et al*., 1995b).

Table 6.2 Linear relationships between all cactus pear fruit yield variables for all cultivars, areas and production years combined

Parameter	Fruit yield (fy)	Cladodes left after pruning (clp)	Fertile cladodes (cf)	Total number of fruit set (fs)	Number of fruit after thinning (fat)
Fruit yield (fy)	-				
Cladodes left after pruning (clp)	0.529 ***	-			
Fertile cladodes (cf)	0.863 ***	0.701 ***	-		
Total number of fruit set (fs)	0.774 ***	0.493 ***	0.689 ***	-	
Number of fruit after thinning (fat)	0.935 ***	0.568 ***	0.927 ***	0.769 ***	-

Value shown is the correlations coefficient (r)

***=0.001 level of significance

6.2 Relationships between environmental factors and fruit yield components

6.2.1 Number of cladodes left after pruning (clp)

Linear correlations between all environmental variables and the five fruit yield components are given in Table 6.3. Of all the soil related factors, applied nitrogen (AppN) shows the strongest relationship (r=0.623 ***) with the mean number of cladodes left after pruning, followed by soil magnesium level (Mg), which was negatively correlated (r=-0.299 ***). The negative relationship between soil Mg (Mg) was unexpected as Mg levels were not excessively high according to the norms in any of the trial sites. This indicates that increments in soil Mg levels had a suppressive effect on the mean number of cladodes left after pruning.

The positive relationship between applied N (AppN) and number of cladodes left after pruning was expected as Nobel (1995) and Nobel *et al*. (1987) have shown that N fertilisation increases biomass production (cladodes) in cactus pear. An increase in the level of applied N will therefore result in a higher number of cladodes left after pruning.

Table 6.3 Linear correlation coefficients (r) relationships between environmental factors and yield components from 1994 to 2001 over all three areas for the environmental adaptability study

Description of environmental variable	Abbr	fy		clp		cf		fs		fat	
Altitude	Alt	-0.073	ns	-0.226	**	-0.146	*	-0.155	ns	-0.146	*
Latitude	Lat	-0.210	ns	-0.147	*	-0.228	**	-0.306	***	-0.263	***
Longitude	Long	-0.233	***	0.241	***	-0.098	ns	-0.225	**	-0.164	*
Mean min. temp.: Apr-Aug	Tn1	0.152	*	0.417	***	0.226	**	0.239	***	0.194	**
Mean min. temp.: May-Aug	Tn2	0.132	ns	0.383	***	0.201	**	0.206	**	0.179	*
Mean min. temp.: Apr-Mar	Tn4	0.109	ns	0.263	***	0.177	*	0.212	**	0.179	*
Mean max. temp.: May-Aug	Tx2	0.157	*	0.269	***	0.204	**	0.248	***	0.207	**
Mean max. temp.: Apr-Mar	Tx4	0.129	ns	0.195	**	0.179	*	0.230	***	0.195	**
Mean ave. temp.: Aug-Mar	Tave3	0.109	ns	0.180	*	0.166	*	0.218	**	0.185	**
Richardson CU: Apr-Aug	RC1	-0.170	*	-0.323	***	-0.228	**	-0.266	***	-0.220	**
Richardson CU: Apr-Mar	RC4	-0.173	*	-0.245	***	-0.219	**	-0.271	***	-0.230	***
Infruitec CU: Apr-Aug	IC1	-0.204	**	-0.349	***	-0.254	***	-0.294	***	-0.240	***
Infruitec CU: Apr-Mar	IC4	-0.201	**	-0.283	***	-0.240	***	-0.293	***	-0.245	***
Positive CU: Apr-Aug	PC1	-0.223	**	-0.301	***	-0.264	***	-0.319	***	-0.267	***
Positive CU: Apr-Mar	PC4	-0.219	**	-0.272	***	-0.253	***	-0.314	***	-0.263	***
Day-length: Apr-Aug	DL1	0.234	***	0.130	ns	0.234	***	0.325	***	0.279	***
Day-length: May-Aug	DL2	0.222	**	0.145	*	0.238	***	0.317	***	0.272	***
Day-length: Aug-Mar	DL3	-0.214	**	-0.122	ns	-0.211	**	-0.286	***	-0.251	***
Day-length: Apr-Mar	DL4	0.020	ns	-0.078	ns	0.007	ns	0.072	ns	0.012	ns
Precipitation: May-Aug	rain2	-0.047	ns	0.230	***	0.052	ns	-0.056	ns	-0.052	ns
Precipitation: Aug-Mar	rain3	-0.144	*	0.082	ns	-0.093	ns	-0.237	***	-0.197	**
Precipitation: Apr-Mar	rain4	-0.147	*	0.137	ns	-0.073	ns	-0.237	***	-0.198	**
TT, BT 0°C: May-Aug	HU0_2	0.154	*	0.305	***	0.207	**	0.241	***	0.203	**
TT, BT 0°C: Aug-Mar	HU0_3	0.112	ns	0.182	**	0.169	*	0.219	**	0.187	**
TT, BT 0°C: April-Mar	HU0_4	0.127	ns	0.224	**	0.183	**	0.228	**	0.194	**
TT, BT 5°C: May-Aug	HU5_2	0.153	*	0.305	***	0.207	**	0.241	***	0.203	**
TT, BT 5°C: Aug-Mar	HU5_3	0.112	ns	0.181	**	0.169	*	0.219	**	0.187	**
TT, BT 5°C: Apr-Mar	HU5_4	0.127	ns	0.224	**	0.183	**	0.228	**	0.194	**
TT, BT 10°C: May-Aug	HU10_2	0.147	*	0.302	***	0.202	**	0.233	***	0.196	**
TT, BT 10°C: Aug-Mar	HU10_3	0.112	ns	0.182	**	0.168	*	0.219	**	0.186	**
TT, BT 10°C: Apr-Mar	HU10_4	0.124	ns	0.221	**	0.180	*	0.225	**	0.191	**
TT, BT 15°C: May-Aug	HU15_2	0.103	ns	0.285	***	0.158	*	0.179	*	0.154	*
TT, BT 15°C: Aug-Mar	HU15_3	0.105	ns	0.177	*	0.163	*	0.213	**	0.181	**
TT, BT 15°C: Apr-Mar	HU15_4	0.105	ns	0.204	**	0.163	*	0.206	**	0.176	*
Solar radiation: May-Aug	Rad2	0.309	***	-0.033	ns	0.211	**	0.311	***	0.229	**
Solar radiation: Aug-Mar	rad3	0.287	***	-0.100	ns	0.206	**	0.309	***	0.211	**
Solar radiation: Apr-Mar	rad4	0.305	***	-0.105	ns	0.211	**	0.321	***	0.225	**
Wind speed: Aug-Mar	WS3	-0.178	*	-0.310	***	-0.240	***	-0.278	***	-0.241	***
Wind speed: Apr-Mar	WS4	-0.127	ns	-0.206	**	-0.182	**	-0.206	**	-0.192	**
Max. RH: Apr-Mar	RHx4	-0.121	ns	0.280	***	0.080	ns	-0.093	ns	-0.129	ns
Min. RH: Apr-Mar	RHn4	-0.008	ns	0.321	***	0.128	ns	0.039	ns	-0.042	ns
Pot. ET: Apr-Mar	ETo4	0.135	ns	-0.292	***	-0.012	ns	0.111	ns	0.140	*
Max. ET: Apr-Mar	ETx4	0.061	ns	0.181	**	0.125	ns	0.152	*	0.143	*
Min. ET: Apr-Mar	ETn4	0.209	**	0.426	***	0.265	***	0.292	***	0.228	**
Frost days: April-Mar	frost4	-0.190	**	-0.287	***	-0.233	***	-0.278	***	-0.235	***
Soil pH (water)	pH(H_2O)	0.111	ns	0.001	ns	0.110	ns	0.153	*	0.157	*
Soil phosphorus	P	0.411	***	-0.009	ns	0.280	***	0.464	***	0.383	***
Soil potassium	K	-0.019	ns	0.033	ns	0.047	ns	-0.009	ns	0.009	ns
Soil calcium	Ca	0.109	ns	0.113	ns	0.118	ns	0.149	*	0.153	*
Soil magnesium	Mg	0.082	ns	-0.299	***	-0.003	ns	0.086	ns	0.120	ns
Soil resistance	Resist	-0.185	**	-0.096	ns	-0.202	**	-0.256	***	-0.185	**
Applied nitrogen	AppN	0.193	**	0.623	***	0.322	***	0.359	***	0.183	**

TT=Thermal time; BT=Base temperature; CU=chill unit; RH=Relative Humidity; ET=evapotranspiration
1=Apr-Aug; 2=May-Aug; 3=Aug-Mar; 4=Apr-Mar

However, Potgieter & Mkhari (2000) showed that high N levels (200 kg ha^{-1}) caused excessive vegetative growth in the sub-tropical areas of Limpopo, complicating orchard management practices such as pruning and insect control and raising input costs. These findings suggest that fertilisation in cactus pear should be done in conjunction with consideration of other environmental factors, such as high mean temperatures, that may positively influence vegetative growth.

In a study of the effect of day/night temperatures on cactus pear vegetative growth, Nobel (1995) found that maximal daily net CO_2 uptake and thus maximum vegetative growth occurs near day/night temperatures of 25/15^{o}C. When the day/night temperatures were raised to 35/25^{o}C, daily net CO_2 uptake decreased to 60% of its normal maximal value and decreased to zero at high day/night temperatures of 44/34^{o}C.

In this study the number of number of cladodes left after pruning displayed a temperature-dependent response as is indicated by the number and strength of relationships with all temperature related factors. In general, the chilling measurements were all negatively correlated, while all heat unit measurements were positively correlated with the number of cladodes left after pruning. Increments in temperature stimulated vegetative growth, corroborating earlier findings that vegetative growth was highest in the hot low-altitude site when compared to the other two sites of lower mean temperatures. However, lower temperature is generally not viewed as a major limiting factor of the daily net CO_2 uptake in cactus pear (Nobel, 1995). Whiley *et al*. (1989) showed that when mango trees were grown at 30/25^{o}C (day/night), significantly lower starch concentrations were recorded than at 15/10^{o}C where minimal vegetative growth occurred. This could explain the lower fruit yield of cactus pear cultivars in the hot low-lying sub-tropical areas as compared to higher yields in the cool mid-altitude area where colder winter temperature arrested vegetative growth completely. At the hot low-altitude area, minimum temperatures in winter were probably still too high to induce dormancy, depleting the reserves for fruiting due to the competitive effect of vegetative growth.

Minimum evapotranspiration potential (ETo) from April to March (ETn4) also showed a highly significant positive relationship with number of number of cladodes left after pruning in agreement with the findings that this yield component is positively affected by higher temperatures. At sites with a higher ETo rate from April to March, one would therefore expect that more cladodes will be left after pruning.

6.2.2 Number of fertile cladodes (cf)

The mean number of fertile cladodes was significantly negatively correlated to the amount of winter chilling accumulated, both in the period April to August (period 1) and over the whole year (period 4). The mean number of fertile cladodes was also significantly negatively correlated to the number of frost days in the year (frost4), although the relationships were generally weak. This suggests that as chilling increased, the number of fertile cladodes decreased. Although a definite winter chilling requirement for cactus pear has never been quantified (Inglese *et al*., 1995a, 2002a), some researchers believe that floral bud burst is positively influenced by low winter temperatures (Wessels, 1988a, 1989; Nerd & Mizrahi, 1995b; 1997). Since floral bud burst normally occurs at the end of winter in each hemisphere, it may merely be coincidental that bud burst is preceded by chilling. However, it is well known that in the sub-tropical areas of Limpopo, floral budburst occurs at any time of the year and is not only limited to after winter (Potgieter, personal observation). This finding is supported by Inglese (1995), who reported that in the low chill (<100 units) areas of Argentina cactus pear plants flowered several times in a season without a prior chilling period.

Working with detached cladodes in an elaborate trial where a number of environmental factors were tested, Guttermann (1995) reported that cladodes produced significantly more fruit with 8 h of solar radiation outdoors, at cool temperatures, than with similar solar radiation in a heated greenhouse. Since the response of detached cladodes versus whole plants can be vastly different due to the multitude of factors that influence plant growth and development, Guttermann's results may not be applicable to field grown plants.

The inverse relationship observed between chilling and cladode fertility is important as it shows for the first time that cactus pear cultivars in South Africa do not need chilling to become fertile. Therefore, contrary to popular belief, this plant does not react like a true deciduous tree crop with a requirement for a certain amount of chilling to break dormancy. Similarly, Pimienta-Barrios & Del Castillo (2002) noted that flower bud initiation may not be reliant on a single environmental factor such as chilling and suggest the involvement of other physiological and climatological factors in reproductive bud break.

Day-length during April to August (DL1) and May to August (DL2) were both positively related to the number of fertile cladodes, but as was indicated previously, the range of day-lengths in this trial was very narrow due to the relatively short distances between sites, that it would not have any practical implications. Contrary to the observations of Wessels (1988e), these findings illustrate that neither day-length nor chilling triggers floral bud initiation in cactus pear in South Africa. However, Nerd & Mizrahi (1995b) noted that low temperatures and increasing day-length induced flower production in Israel.

The amount of applied nitrogen (AppN) showed the strongest correlation (r=0.322 ***) with number of fertile cladodes, although the relationship was weak. It nevertheless means that as the amount of N applied is increased, so will number of fertile cladodes. This finding shows that N influences both the vegetative (number of cladodes left after pruning) and reproductive (number of fertile cladodes) growth of the plant. As such, the importance of N in a fertiliser programme should be appreciated. However, N concentrations higher than 2.2% in 2 and 3 year old cladodes may reduce cladode fertility and reduce fruit colour development (Inglese *et al*., 2002a). Soil P level played a lesser role in cladode fertility than applied N and showed a weak correlation (r=0.280 ***).

Although a substantial amount of information is available on the role of plant nutrients on vegetative growth (cladodes) in cactus pear, fewer investigations have been done on their effect on the reproductive responses of the plant. As a result current fertilisation recommendations do not relate to any specific biological or technical information (Inglese *et al*., 1995a).

6.2.3 Number of fruit set (fs)

A pattern similar to that observed when the environmental factors influencing fruit yield were analysed emerged with the number of fruit set (Table 6.3). Winter chilling during all periods of the year was negatively correlated with the number of fruit set; confirming that increased chilling causes a reduction in the number of fruit set. Heat units received for all periods were positively correlated to the number of fruit set, indicating that high temperatures were needed for the plant to become fertile. The number of fruit set was also positively influenced by the amount of solar radiation received since solar radiation from May to August (rad2), August to March (rad3) and the whole year (rad4) all showed statistically significant positive relationships with the number of fruit set. A higher

number of fruit was set in the cool mid-altitude area despite the observed lower number of number of cladodes left after pruning, smaller canopy volume and thus bearing surface. This may be explained by the colder winters of the cool mid-altitude area which generally have longer winters where trees become dormant; enabling the accumulation of assimilates for better fruit set and growth (Agrometeorological Section, 1988).

Both soil P level and applied N were positively related to number of fruit set in cactus pear. Soil P level had a stronger correlation (r=0.464) with the number of fruit set than applied N (r=0.359), although both relationships were fairly weak. Similar results were found by Pimienta-Barrios (1994), where nitrogen did not increase fruit yield significantly, but applied P showed the strongest yield increase.

Although some research on the influence of fertilisers on fruit yield in cactus pear has been done both locally and internationally, the results are inconsistent. In addition, different species and conditions were used and as such the relevance of these investigations to South African conditions is questionable. In a fertiliser trial in a semi-arid region of South Africa, Claassens & Wessels (1997) reported optimum fruit yield at 0.94-0.96% and 15% for N and P, respectively, in the terminal cladodes of cactus pear. These authors recommend N applications of 30-60 kg N ha^{-1} and 16 kg P ha^{-1} to obtain high fruit yields. As it is unlikely that any response would be found on soils high in plant nutrients, the results of these fertiliser trials should be evaluated against existing soil levels of the elements and not by responses obtained alone.

6.2.4 Number of fruit left after thinning (fat)

The number of fruit left after thinning was positively influenced by soil P level as shown by the relationship with a correlation coefficient of r=0.383 ***. The number of fruit left after thinning is thus expected to increase with increasing P soil levels. A positive relationship between P and fruit yield has been shown by a number of researchers (Gathaara *et al*., 1989; Nerd *et al*., 1989; Pimienta-Barrios, 1994; Claassens & Wessels, 1997), however according to Nobel (1995) P, K and B are rarely major limiting factors in cactus pear growth. In most South African soils however, P levels are inherently low and therefore may be limiting plant growth and fruit yields in cactus pear. The remainder of the soil related factors were either weakly correlated or showed no significant relationship with the number of fruit left after thinning.

Although most relationships were statistically significant, the climatic factors in general showed weak relationships with the number of fruit left after thinning. Increased winter chilling resulted in a decrease in the number of fruit left after thinning, as was the scenario in all of the other fruit yield components, indicating that chilling negatively influenced fruiting in cactus pear. In contrast, all heat units had a positive effect on the number of fruit left after thinning.

6.2.5 Fruit yield (fy)

Generally, weak relationships were evident between climatic variables and fruit yield. Of these, solar radiation received from May to August (rad2), August to March (rad 3) and the whole year (rad 4) showed highly significant positive correlations with fruit yield at r=0.309 ***, r=0.287 *** and r=0.305 ***, respectively. As solar radiation levels increase, fruit yield is expected to increase. This confirms the findings of Wessels (1988c) that areas falling in the mist belts (cold high-altitude area) will not qualify for commercial cultivation, as production potential will be too low due to lower solar radiation levels. Full exposure of cladodes to solar radiation is important to ensure high CO_2 uptake and fertility (Pimienta, 1990; Inglese, 1995). In lower plant density populations limited shading of cladodes occurs and fruit production per plant can be substantial (Wessels, 1988a; 1989). Therefore, pruning is an important horticultural practice that can be used to control fruiting in cactus pear. Plant spacing and pruning (Garcia de Cortazar & Nobel, 1992) are thus two horticultural methods that can be used to reduce shading of cladodes. Although more plants per hectare would maximize fruit productivity, it must be weighed against potential shading and ultimate reduction of solar radiation intercepted by the cladodes that will decrease CO_2 fixation and plant fertility (Nobel, 1995).

Topographical and other practical considerations permitting, row orientation should be N-S to maximise solar radiation interception (Inglese, 1995). Due to practical considerations (field dimensions), only plant rows in the high-altitude area were orientated N-S, while in both the low and mid-altitude areas they were orientated E-W. Due to the high solar radiation received in South Africa, it is doubtful if row orientations would have any meaningful influence on fruit yield. However, day-length showed a highly significant relationship (r=0.234 ***) with fruit yield. The latitude range between experimental sites was too narrow to generate any meaningful influence in practical terms and can therefore be ignored.

Under dry-land conditions, it is expected that precipitation (rain) will play an important role in fruit yield, however, from these trials, rainfall before the FDP (rain2), rainfall during the FDP (rain3) and for the whole year (rain4) all showed a negative relationship with fruit yield although the correlations were weak. The fact that rainfall negatively influenced fruit yield is possibly due to the effect of reduced solar radiation during overcast conditions when it rains, as shown above. This aspect should be investigated in future.

Soil P levels (P) were highly significantly positively correlated (r=0.411) with fruit yield, meaning that as soil P levels increased so would fruit yield. Both soil resistance (Resist) with r=-0.185 ** and applied nitrogen (AppN) with r=0.193 ** were significantly correlated with fruit yield, although the relationships were very weak. Soil K, Ca and Mg under these conditions were not correlated with fruit yield as was expected, possibly due to adequate soil levels. Galizzi *et al*. (2004) working with eight-year-old plants in Argentina and applying different combinations of N, P, K and Mg, reported a relatively high mean fruit yield of 19.5 t ha $^{-1}$. The highest mean yield obtained was with a combination of N (100 kg ha $^{-1}$), P (50 kg ha^{-1}) and K (100 kg ha $^{-1}$) that resulted in 27.0 t ha^{-1}: These researchers did not find any significant response to N, P, K and Mg in fruit yield. However, scrutiny of their soil analysis results before planting indicates that levels of the cations (P, K, and Mg) were all high, hence the non-response observed.

The relationships between soil pH and, fruit yield, number of cladodes left after pruning, and number of fertile cladodes was non-significant. In addition the relationship between soil pH and, fruit thinned, and number of fruit left after thinning (r=0.157 *) was very weakly correlated (r=0.153 *). This indicates that in this combined analysis, the fruit yield of cultivars in general were not negatively affected by low soil pH. However, as the vegetative growth and development of certain cultivars in the cold high-altitude site were severely stunted, regression analysis should be performed on individual cultivars in future to establish if soil pH affects vegetative and reproductive growth.

6.3 Conclusions

Cactus pear cultivars used in this study reached full maturity at approximately the fifth production year. Orchard practices, in particular pruning, should be done so that as many terminal cladodes as possible are exposed to full solar radiation to enable them to become fertile. Environmental conditions in the cool mid-altitude experimental site are conducive to cladode fertility and high fruit yield. High temperatures and excessive

vegetative growth in the hot low-altitude area negatively influenced fruit yield. Likewise, most cultivars with the exception of “American Giant”, “Nudosa” and “Zastron” had low fruit yields in the cold high-altitude area. The number of cladodes left after pruning is weakly correlated with fruit yield and can therefore be eliminated as a predictor of eventual fruit yield. This result is to be expected, especially for older plants, because not all cladodes left after pruning are terminal or sub-terminally borne and therefore would not be fertile and contribute to fruit yield. Thus, fruit yield for most cultivars is a function of the number of fertile cladodes, the number of fruits set on these fertile cladodes, the number of fruit left after thinning and mass of the individual fruit.

Both vegetative and reproductive growth were stimulated by solar radiation. As a xerophyte that originates from the semi-arid areas of Mexico, this finding is to be expected, and perhaps implies that pruning is the most important orchard practice to maintain cladode fertility. The inverse relationship observed between chilling and cladode fertility and fruit yield is important as it shows for the first time that cactus pear cultivars in South Africa do not need chilling to become fertile and produce high fruit yields.

In general, the role of climatic factors in determining fruit yield in cactus pear is still largely unclear. Although applied N favoured vegetative growth (number of cladodes left after pruning), it was also important for cladode fertility and consequently high fruit yield. In addition to applied N, soil P also played a crucial role in the number of fruit set and fruit yield. However, due to the lack of agreement among researchers on the role of plant nutrients in cactus pear, pot experiments with macro and micro elements need to be performed to corroborate these findings. There is the possibility that the cactus pear species used in this study have different environmental requirements for high fruit yield. It is therefore recommended as a matter of priority that in future studies the different species be evaluated separately.

CHAPTER 7

STEP-WISE REGRESSION ANALYSIS OF FRUIT YIELD COMPONENTS

The relationships established in the previous chapter demonstrated that the fruit yield of individual cultivars was correlated to specific yield components. Moreover relationships were evident for cactus pear fruit yield components and environmental variables. However, from these correlations it is not clear as to which of the environmental factors affected fruit yield components the most. The specific objectives of this chapter were to construct regression best fit models for each of the fruit yield components, to determine which of the environmental variables contributed the most to the variance observed.

7.1 Step-wise regression analysis of fruit yield variables

Equations of good fit were calculated using the step-wise multiple linear regression analysis for all five fruit yield characteristics and 23 of the 52 environmental factors studied. Environmental factors not included in the models had either very little or no effect on fruit yield in cactus pear. Step-wise regression is basically the iterative application of forward selection of variables and backward exclusion steps (Scian & Bouza, 2005). This technique was used to select those variables that contributed significantly to variation in the response of the dependant variable (fruit yield) and not necessarily to accurately estimate or specify a complete model. Five regression models were constructed based on correlations between fruit quality and environmental variables from the previous section. Relative contributions (RC %) of each of the environmental factors to variation in fruit yield variables are summarised in Table 7.1.

Table 7.1 Relative contribution (RC %) of selected environmental factors to fruit yield in cactus pear

Period	Description of environmental variable	Environmental variable abbreviation	Number of cladodes left after pruning (clp)	Fertile cladodes (cf)	Number of fruit set (fs)	Number of fruit after thinning (fat)	Fruit yield (fy)
April-August (1)	Infruitec chilling unit	IC1	17.2				
	Day-length	DL1		0.5			
May-August (2)	Precipitation	rain2	0.1				
	Solar radiation	Rad2			1.1		
	Day-length	DL2			0.4		
August-March (3)	Mean daily temperature	Tave3	2.7				0.4
	Wind speed	WS3	1.5		0.1		
	Day-length	DL3					1.8
April-March (4)	Precipitation	rain4			2.2	0.7	
	Wind speed	WS4			1.3		
	Max. Relative Humidity	RHx4		0.4			
	Max. evapotranspiration	ETx4					1.0
	Min. evapotranspiration	ETn4		0.3	0.2		
	Frost days	frost4	0.2				
	Richardson chilling units	RC4			4.5		0.5
	Altitude	Alt	0.1	0.3			0.8
Soil factors	Soil pH (water)	pH (H_2O)		0.5			0.1
	Soil phosphorus	P	0.3	13.1	21.1	14.3	17.0
	Soil potassium	K		2.1		0.1	
	Soil calcium	Ca			0.3		
	Soil magnesium	Mg	4.4				
	Soil resistance	Resist			0.9		
	Applied nitrogen	AppN	39.4	11.0	21.9	7.0	8.3
		Percentage variance accounted for (r^2)	**65.9**	**28.2**	**54.0**	**22.1**	**29.9**
		Standard error of observations	1.45	1.49	3.12	3.05	5.66

RC %= Relative contribution of each of the selected independent variables to variations of the dependent variable

7.1.1 Number of cladodes left after pruning (clp)

Applied N contributed nearly 40% to the total explained variability in the number of cladodes left after pruning. Infruitec chilling units (IC1) received from April to August contributed 17.2%, and mean temperature during May to August (Tave3) a further 2.7% to the variability (Table 7.1) The six remaining environmental variables contributed minimally to the total variability of 65.9% of variance explained. It seems that vegetative growth is strongly influenced by the amount of N applied and the accompanying temperatures during the pre-fruit development period (pre-FDP), indicating that these factors strongly influence the vegetative development of the plant and ultimately its fruit bearing surface.

7.1.2 Number of fertile cladodes (cf)

From Table 7.1 it is evident that eight environmental factors influenced the mean number of fertile cladodes. Of these, soil P level contributed 13.1% and applied N 11.0% of the total variability explained by the model. Soil K level contributed 2.1%. These results indicate that plant nutrients are the most pertinent in elucidating the variability of the number of fertile cladodes. Five other environmental factors contributed insignificantly to the total variance (28.2%) explained by the model. An increase in the number of fertile cladodes may positively influence yield increases and as such, it is important to identify the environmental variables that affect them. Similarly, greater attention should in future be given to the fertilisation programme for cactus pear as a fruit crop since increases in yield could result from its optimisation.

7.1.3 Number of fruit set (fs)

The number of fruit set is strongly influenced by applied N and soil P levels as was the case with other yield variables (Table 7.1). Together, these two elements contributed 43% to the total variability (54%) that was explained by the model. On its own, applied N contributed 21.9%, while soil P levels accounted for 21.1% of the variability explained by the model. Annual Richardson chilling unit accumulation and rainfall contributed a small proportion to the total variability observed.

7.1.4 Number of fruit left after thinning (fat)

The number of fruit left after thinning was largely affected by soil P level and applied N. Soil P contributed 14.3% of the 22.1% variance explained for the number of fruit left after thinning. In contrast, applied N during the growing season, contributed 7.0% to the variance for this variable, indicating that P and N nutrients are important determinants of the number of fruit left after thinning. Only four environmental variables explained 22.1% of the variability for this parameter.

7.1.5 Fruit yield (fy)

Using the step-wise linear regression model (Table 7.1) it was established that eight environmental factors affected cactus pear fruit yield in the Limpopo Province. Of these, soil P levels contributed the most (17.0%) and applied N (8.3%) the next most important in explaining the variance observed in fruit yield. The remaining six factors individually contributed less than 2% to the variance. The model for fruit yield explained less than 30% of the observed variance in fruit yield in these trials. From these results, it is evident that fruit yield was largely affected by the plant nutrient status of the soils and in particular by soil P levels and applied N.

7.2 Conclusions

Vegetative growth and development of cactus pear is strongly influenced by the amount of N applied and the accompanying mean temperatures from May to August (pre-FDP), indicating that these factors strongly influence the vegetative development of the plant and ultimately its fruit bearing surface. The number of fruit set in cactus pear orchards in Limpopo was mainly influenced by applied N and soil P levels, with Richardson chilling and rainfall for the season being of minor effect. Likewise, soil P and applied N are important determinants of the number of fruit left after thinning. These regression models clearly demonstrate that in general soil P levels contributed the most to three of the yield components while applied N was most relevant to the remaining two. By finding optimal levels of these two plant nutrients, fruit yield in cactus pear may be able to be increased. These regressions also shows that soil pH contributes very little or not at all to variation in any of the yield components. However, as these analyses were done on a combined cultivar basis, it may be possible that individual cultivars are sensitive to high or low soil pH. Soil pH level would also influence the availability of plant nutrients. For example at a low soil pH, soil P would be less available to plants than at a

neutral soil pH. For this reason, fertiliser pot trials at different soil pH levels need to be conducted.

Farmers would be well advised to give attention to the fertiliser programme to increase fruit yields. As most South African virgin soils are relatively low in P, this element needs to be applied to increase fruit yield. The interaction between plant nutrients is also important and a well-balanced fertiliser programme should be recommended. Future research on soil pH preferences and fertilisation under irrigated and dry-land conditions in all parts of South Africa should receive priority.

CHAPTER 8

GENERAL CONCLUSIONS AND MANAGEMENT RECOMMENDATIONS

Although commercial cactus pear fruit production in South Africa is a relatively new activity, the industry is expanding rapidly, making scientifically based information on the reproductive biology of the plant critical. The cultivars that are used originate from the original Burbank plant material that was imported as cladodes and from spontaneous crossings that developed from this material over time, to such an extent that more than 70 cultivars are currently recognised. Approximately 1 500 ha of spineless cactus pear is planted for fruit production, most of which is located in the sub-tropical areas of Limpopo. Conditions in these warmer areas are vastly different from the area where cultivar recommendations were originally made for cactus pear in South Africa. As a result many cultivars grow well but produce little or no fruit, showing a possible G X E interaction. Limited information has been available on the response of South African cultivars to environmental factors influencing fruit yield.

Significant differences were evident between the eleven cultivars and between diverse environments and production years in terms of fruit yield and its components. Different cactus pear cultivars and more specifically different species tend to be adapted to different agro-climatic areas. Previous cultivar recommendations, specifically those solely based on plant morphology, are thus not accurate in determining environmental suitability for fruit yield of cactus pear in Limpopo. Results from this study demonstrate clearly that environmental factors have a definite influence on fruit yield in this crop and showed the existence of a strong G X E interaction between the eleven cultivars tested and the environmental conditions at the three selected sites. Broad cultivar adaptation was only seen in “Zastron” and to a lesser extent “Nudosa” and “Algerian”, while all others showed strong G X E interaction for fruit yield. This strong G X E interaction indicates that the opportunity exists to select the correct cultivar for virtually any environment in Limpopo. Fruit yield was shown to be strongly correlated to the number of fertile cladodes, total number of fruit set and number of fruit left after thinning. Due to the strong negative relationship of cumulative chilling with cladode fertility, it is clear that no chilling requirement exists for the cultivars tested in this study.

The AMMI model as a statistical technique proved to be successful in summarising patterns and relationships of cultivars and environments and is therefore recommended for similar trials. The step-wise multiple regression analysis identified a number of environmental variables as being important in achieving high fruit yield. These variables are:

- applied N > 100 kg^{-1} ha^{-1} year,
- soil P > 20 mg kg^{-1} ,
- soil K > 80 mg kg^{-1},.
- soil Mg >100 mg kg^{-1},
- total Richardson chilling unit accumulation from April to March of between -4 000 and -6 000,
- mean daily temperature > 22°C from August to March (FDP).

The environmental variables of the cool mid-altitude site in Limpopo were the most similar to the climatic profile of environmental variables important for high fruit yield. This is possibly also the reason higher fruit yields were obtained for most of the cultivars at this site as compared to the two other sites. Although vegetative development was in general less vigorous than in the hot low-altitude area, the differences in fruit yield can be explained by temperature differences between these sites. It is known that maximum net CO_2 uptake occurred at day/night temperatures of 25/15°C (Nobel, 1995). When the day/night temperature was raised to 35/25°C as was the case in the hot low-altitude area, daily net CO_2 uptake decreases to 60% of its maximum value and decreases further to zero at higher day/night temperatures of 44/34°C (Nobel, 1995). Areas with milder temperatures could thus be expected to have higher fruit yield than those with high temperatures due to respiratory losses.

Fruit yield in cactus pear is a function of the number of fertile cladodes on the plant after pruning, the number of fruit left after thinning and fruit mass. Fruit productivity of cactus pear in this study was high considering that plants were grown under dry-land conditions. Fruit yields obtained with adapted cultivars compare favourably and even exceed that of many other parts of the world, showing that productivity of the local cultivars can be adequate if good orchard management is practiced. This study has contributed towards alleviating the gap in research results on annual fruit yields of orchards from planting to maturity and cumulative fruit yields which are important in cultivar selection during planning of a new orchard.

These results will enable economists to develop accurate gross margin analyses for cactus pear enterprises. Minimum criteria should be adapted to include cumulative fruit yields from orchard establishment to maturity (production year 5) for evaluation purposes. It is proposed that cumulative fruit yields at a plant age of 5 years should be a minimum of 50.0 t ha^{-1}, 60.0 t ha^{-1} in year 6 and 70.0 t ha^{-1} in year 8. The scientific value of cultivar assessment trials in diverse environments should not be underestimated although it is time consuming, costly and logistically difficult.

Cultivar recommendations for the three areas in terms of fruit yield are as follows:

- **Hot low-altitude**: “Algerian”, “Gymno Carpo”, “Malta”, “Morado”, “Zastron”
- **Cool mid-altitude**: “Algerian”, “Gymno Carpo”, “Malta”, “Morado”, “Nudosa”, “Zastron”
- **Cold high-altitude**: “American Giant”, “Nudosa”, “Zastron”

The cultivars “Direkteur”, “Blue Motto”, “Fusicaulis” and “Skinners Court” are not recommended for fresh fruit production in any of the areas due to their inherent poor fruiting ability.

All orchard practices must be geared toward attaining the highest possible number of fertile cladodes, highest number of fruit left per cladode and highest fruit mass. The following orchard practices that may affect fruit yield should receive research attention in future. Increased fruit yield can possibly be achieved by:

- **Pruning**: winter pruning to ensure maximum solar radiation interception on terminal cladodes and summer pruning to reduce unnecessary sinks of plant reserves,
- **Fruit thinning**: to 50 mm between fruits and a maximum of 8 fruits per cladode with a reduction to 6 fruits per cladode in areas that receive less than 400 mm rainfall $year^{-1}$,
- **Minimum norms for fertilisation**: applied N > 100 kg^{-1} ha^{-1} year, soil P >20 mg kg^{-1}, soil K > 80 mg kg^{-1}, soil Mg >100 mg kg^{-1}

Cactus pear plants can be considered fully mature from the fifth production year onwards and orchard practices such as pruning and fertilisation should be adapted accordingly to ensure the production of high fruit yields.

Although the most important effects on cactus pear fruit yield were soil related and not climatic, this may solely be because soil nutrient levels in this trial were below the optimum levels. Liebig's law of the minimum states that, plant growth and development is controlled not by the total amount of resources available but by the most limiting of these resources. The appearance of a completely different set of environmental factors in the regression model is thus to be expected when the plant nutrient status of the soils is optimal. Therefore, caution and common sense must be used in the interpretation of these results as they only hold true for a very specific set of circumstances and cannot be extrapolated to other production areas.

Although the soil and climatic factors that influence the reproductive growth and development of cactus pear in Limpopo have been identified, quantification of those factors is needed. For example, the amount of heat units required for high fruit yields in each area and possibly for each cultivar or species need to be known. Similar trials in other environments of South Africa need to be performed to add to the current level of knowledge on the factors that influence reproductive processes in cactus pear. It is unfortunate that in field trials such as these it is not possible to separate the effects of altitude and temperature from that of soil nutrient levels and soil pH. For this reason, it would be important to establish a pot trial under different soil nutrient levels and soil pH conditions to determine responses of individual cultivars. A more detailed analysis of each of the climatic parameters on a weekly basis instead of using the four periods described in this study may provide more information on how these factors influence reproductive development of the plant. Future research should entail the development of statistical models based on weather station data and actual yields obtained under commercial conditions. Such models could be used for yield forecasting to streamline exports and to extrapolate crop yields for other areas of South Africa.

The general opinion that it is impossible to grow a fruit crop from establishment to maturity in Limpopo under dry-land conditions and without supplementary irrigation has been disproved. This study showed that the plant can survive very adverse environmental conditions such as the severe drought of 1992/3. Economically viable fruit yields can be obtained, provided the correct cultivar is matched to the specific environment.

The plant growth habit changed dramatically from an upright habit in the hot low-altitude area to the prostrate type in the high-altitude site. This phenomenon is confirmed by findings that suggest that the genetic system exhibits phenotypic plasticity (Pimienta-Barrios & Del Castillo, 2002), possibly as an adaptive strategy for survival. This phenotypic plasticity is part of the reason for the confusion regarding the taxonomy of the plant which has largely been based on morphological traits.

Similar to other new crops, a wide range of research aspects needs attention in cactus pear. Only eleven of the more than 70 available cultivars were evaluated in this study. It may be possible that higher yielding cultivars within the South African cactus pear germplasm exist that should also be characterised. Data of all cultivars were pooled in the correlation matrix and step-wise regression analysis performed. Therefore, the possibility exists that species and individual cultivars may react differently to environmental conditions and should therefore be individually correlated with all these factors. Scientific information on orchard management practices is limited. Local orchard management recommendations are mostly based on observations and few have been scientifically proven. Selected aspects that need urgent research attention to increase fruit yield are:

- pruning: timing and intensity for both winter and summer,
- fruit thinning: timing and intensity,
- plant spacing: according to growth habit of cultivar,
- row orientation effects on fruit yield,
- starch accumulation in the plant during different times of the year and correlation with reproductive processes and orchard practices,
- plant nutrient studies: response to macro and microelement under varying environmental conditions and, soil pH and salinity effects on reproductive development.
- evaluation of the complete South African germplasm collection for cultivars adapted to diverse environmental conditions,
- reasons for high fruit yield variability within a clone,
- controlled experiments examining the effect of climatic factors on cactus pear flowering.

This study proved that commercial fruit production under dry-land conditions in Limpopo is possible. However, plant survival under drought conditions can be augmented by the incorporation of water-harvesting and/or mulching techniques. No information on these aspects in respect of cactus pear cultivation is available in South Africa. Given the low rainfall and scarce water resources in this country, future research on this topic is appropriate. A complete field evaluation to determine the true fruiting potential of the cultivars within the South African germplasm in diverse environments is also needed. However, on its own fruit yield performance is not adequate to make cultivar recommendations, since fruit quality (fruit mass, peel thickness, pulp percentage and TSS) and reproductive phenology also play equally important roles in the final decision. Matching a cultivar to the correct production area could lead to higher fruit yields.

Sustainable development of the semi-arid areas of Limpopo will ultimately depend on the identification and implementation of sustainable agricultural systems. These systems should be based on the choice of suitable intervention strategies in accordance with the limited natural resources of the area. The use of cactus pear as a multipurpose crop is an option that clearly requires consideration. However, research into its potential uses is imperative if it is to become as important as it should be in reducing poverty and contributing towards sustainable agricultural systems in the semi-arid parts of Limpopo.

Based on the results of this study, the null hypothesis that there is no difference in fruit yield components of eleven cactus pear cultivars planted at three different agro-climatic areas in Limpopo Province is thus rejected.

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APPENDIX 3.1

SEASONAL GUIDE FOR THE CULTIVATION OF SPINELESS CACTUS PEAR FOR FRUIT PRODUCTION PURPOSES

Successful cactus pear farming, like all other farming operations, requires proper planning. The aim of this seasonal guide is to help producers to plan ahead, in an attempt to perform the required action at the most appropriate time. Proper planning will improve production, reduce losses due to practices being carried out untimely and will ultimately increase profitability of the cactus pear enterprise.

The table below indicates the most appropriate time at which a specific task should be performed. Producers are advised to use this guide along with the production guidelines for fruit production (available from the South African Cactus Pear Growers Association).

TASK					M	O	N	T	H			
	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.
SOIL PREPARATION AND PLANTING												
Terrain identification/selection								X	X	X		
Soil sampling and analysis		X	X									
Pre-plant fertilisation and soil preparation			X	X								
Plant material ordering/procurement	X	X	X									
Planting/filling in				X	X	X						
Irrigation				X	X							
YOUNG PLANTINGS (0-2 YEARS)												
Weed control					X	X	X	X	X	X	X	
Pest control: cochineal	X	X	X	X	X	X	X	X	X	X	X	X
cactus pear moth				X	X	X	X	X	X	X	X	
Irrigation (optional)		X	X	X								
Soil sampling and analysis		X	X									
Fertilisation: nitrogen					X			X				
Fruit/flower removal (year 0-1)			X	X	X	X						
Fruit/flower thinning (year 2)			X	X								
Pruning	X	X									X	X
Fire breaks									X	X	X	
Orchard sanitation	X	X	X	X	X	X	X	X	X	X	X	X
ESTABLISHED ORCHARDS (>3 YEARS)												
Weed control					X	X	X	X	X	X		
Pest control: cochineal	X	X	X	X	X	X	X	X	X	X	X	X
cactus pear moth				X	X	X	X	X	X	X	X	
Irrigation		X	X	X								
Soil sampling and analysis		X	X									
Fertilisation: nitrogen					X			X				
phosphorus					X							
potassium					X							
lime						X	X					
Fruit/flower thinning			X	X	X							
Cladode thinning			X	X	X							
Pruning	X	X									X	X
Orchard sanitation	X	X	X	X	X	X	X	X	X	X	X	X
Harvesting						X	X	X	X	X		
Fire breaks									X	X	X	
Winter production: nitrogen								X				
fruit/flower thinning										X	X	
harvesting			X	X								
Scozzolatura: flower removal			X	X								
fruit/flower thinning						X	X					
harvesting									X	X		

Appendix 3.2

Appendix 3.2.1

Top soil (0-300 mm) analysis results and fertiliser applications from 1993/4 to 2000/1 on the hot low-altitude (Nondweni) cactus pear experimental site in Limpopo

Hot Low-altitude (Nondweni)								
Soil analysis/year	**pH**	**P**	**K**	**Ca**	**Mg**	**Na**	**Resistance**	**Conductivity**
Units/Method	water	(mg/kg) Bray 1	(mg/kg) Ammonium acetate				ohm	mS m^{-1}
1993/4	6.3	19	154	2223	298	53	-	370
1994/5	6.0	18	175	1145	95	20	-	133
1995/6	6.3	12	128	670	132	46	3400	-
1996/7	5.9	10	274	623	106	-	1600	-
1997/8	5.7	13	82	748	89	-	3000	-
1998/9	5.8	19	151	760	129	-	2800	-
1999/2000	6.0	27	107	917	120	22	1200	-
2000/01	5.9	11	99	866	107	15	3000	-
Fertiliser application (kg/ha)	**N**		**P**	**K**	**Lime**			
Source	Ammonium sulphate (21% N)	LAN (28% N)	Super phosphate (10.5% P)	Potassium chloride (50% K)	Dolomite ($Ca,Mg(CO_3)_2$)	Calcite ($CaCO_3$)	Gypsum ($CaSO_2.2H_2O$)	
1993/4	20						1000	
1994/5	40							
1995/6	60		20	40				
1996/7	100		15					
1997/8	120		20	67				
1998/9		100	13					
1999/2000		100		60				
2000/01		100						

Appendix 3.2.2

Top soil (0-300 mm) analysis results and fertiliser applications from 1993/4 to 2000/1 on the cool mid-altitude (Gillemberg) cactus pear experimental site in Limpopo

Cool mid-altitude (Gillemberg)								
Soil analysis/year	**pH**	**P**	**K**	**Ca**	**Mg**	**Na**	**Resistance**	**Conductivity**
Units/Method	water	(mg/kg) Bray 1	(mg/kg) Ammonium acetate				ohm	mS m^{-1}
1993/4	6.9	39	125	1035	341	37		221
1994/5	5.9	39	84	681	182	15		188
1995/6	6.6	23	85	691	162	41	3000	
1996/7	5.5	24	86	556	141		1600	
1997/8	5.9	33	58	507	117		2800	
1998/9	5.7	32	153	545	115		3000	
1999/2000	5.8	37	93	732	115	12	1400	
2000/01	5.7	21	68	519	100	14	2400	
Fertiliser application (kg/ha)	**N**		**P**	**K**	**Lime**			
Source	Ammonium sulphate (21% N)	LAN (28% N)	Super phosphate (10.5% P)	Potassium chloride (50% K)	Dolomite ($Ca,Mg(CO_3)_2$)	Calcite ($CaCO_3$)	Gypsum ($CaSO_2.2H_2O$)	
1993/4	20							
1994/5	40				1000			
1995/6	60	10	100					
1996/7	100				1000			
1997/8	120		20	100				
1998/9		100			2000			
1999/2000		100		60	2000			
2000/01		100		100				

Appendix 3.2.3

Top soil (0-300 mm) analysis results and fertiliser applications from 1993/4 to 2000/1 on the

Cold high-altitude (Zaaiplaas)								
Soil analysis/year	**pH**	**P**	**K**	**Ca**	**Mg**	**Na**	**Resistance**	**Conductivity**
Units/Method	water	(mg/kg) Bray 1	(mg/kg) Ammonium acetate				ohm	mS m^{-1}
1993/4	4.7	4	123	47	18	17		52
1994/5	4.8	9	82	191	90	13		115
1995/6	4.9	1	104	232	61	27	3400	
1996/7	4.7	6	78	152	39		3000	
1997/8	4.5	10	73	169	27		3000	
1998/9	4.6	7	98	124	18		4000	
1999/2000	4.9	12	69	437	31	5	1800	
2000/01	4.5	4	55	197	41	7	3400	
Fertiliser application (kg/ha)	**N**		**P**	**K**	**Lime**			
Source	Ammonium sulphate (21% N)	LAN (28% N)	Super phosphate (10.5% P)	Potassium chloride (50% K)	Dolomite ($Ca,Mg(CO_3)_2$)	Calcite ($CaCO_3$)	Gypsum ($CaSO_2.2H_2O$)	
1993/4	20		40		3000			
1994/5	40		30	80	2000			
1995/6	80	10	20	80	1000			
1996/7	120		30	80	2000			
1997/8	120		20	100	3000			
1998/9		120	20	100	3000			
1999/2000		120	20	100	3000			
2000/01		120	30					

cold high-altitude (Zaaiplaas) cactus pear experimental site in Limpopo

Appendix 3.2

Appendix 3.2.1

Top soil (0-300 mm) analysis results and fertiliser applications from 1993/4 to 2000/1 on the hot low-altitude (Nondweni) cactus pear experimental site in Limpopo

Hot Low-altitude (Nondweni)								
Soil analysis/year	**pH**	**P**	**K**	**Ca**	**Mg**	**Na**	**Resistance**	**Conductivity**
Units/Method	water	(mg/kg) Bray 1	(mg/kg) Ammonium acetate				ohm	mS m^{-1}
1993/4	6.3	19	154	2223	298	53	-	370
1994/5	6.0	18	175	1145	95	20	-	133
1995/6	6.3	12	128	670	132	46	3400	-
1996/7	5.9	10	274	623	106	-	1600	-
1997/8	5.7	13	82	748	89	-	3000	-
1998/9	5.8	19	151	760	129	-	2800	-
1999/2000	6.0	27	107	917	120	22	1200	-
2000/01	5.9	11	99	866	107	15	3000	-
Fertiliser application (kg/ha)	**N**		**P**	**K**	**Lime**			
Source	Ammonium sulphate (21% N)	LAN (28% N)	Super phosphate (10.5% P)	Potassium chloride (50% K)	Dolomite ($Ca,Mg(CO_3)_2$)	Calcite ($CaCO_3$)	Gypsum ($CaSO_2.2H_2O$)	
1993/4	20						1000	
1994/5	40							
1995/6	60		20	40				
1996/7	100		15					
1997/8	120		20	67				
1998/9		100	13					
1999/2000		100		60				
2000/01		100						

Appendix 3.2.2

Top soil (0-300 mm) analysis results and fertiliser applications from 1993/4 to 2000/1 on the cool mid-altitude (Gillemberg) cactus pear experimental site in Limpopo

Cool mid-altitude (Gillemberg)								
Soil analysis/year	**pH**	**P**	**K**	**Ca**	**Mg**	**Na**	**Resistance**	**Conductivity**
Units/Method	water	(mg/kg) Bray 1	(mg/kg) Ammonium acetate				ohm	mS m^{-1}
1993/4	6.9	39	125	1035	341	37		221
1994/5	5.9	39	84	681	182	15		188
1995/6	6.6	23	85	691	162	41	3000	
1996/7	5.5	24	86	556	141		1600	
1997/8	5.9	33	58	507	117		2800	
1998/9	5.7	32	153	545	115		3000	
1999/2000	5.8	37	93	732	115	12	1400	
2000/01	5.7	21	68	519	100	14	2400	
Fertiliser application (kg/ha)	**N**		**P**	**K**	**Lime**			
Source	Ammonium sulphate (21% N)	LAN (28% N)	Super phosphate (10.5% P)	Potassium chloride (50% K)	Dolomite ($Ca,Mg(CO_3)_2$)	Calcite ($CaCO_3$)	Gypsum ($CaSO_2.2H_2O$)	
1993/4	20							
1994/5	40				1000			
1995/6	60	10	100					
1996/7	100				1000			
1997/8	120		20	100				
1998/9		100			2000			
1999/2000		100		60	2000			
2000/01		100		100				

Appendix 3.2.3

Top soil (0-300 mm) analysis results and fertiliser applications from 1993/4 to 2000/1 on the

Cold high-altitude (Zaaiplaas)								
Soil analysis/year	**pH**	**P**	**K**	**Ca**	**Mg**	**Na**	**Resistance**	**Conductivity**
Units/Method	water	(mg/kg) Bray 1	(mg/kg) Ammonium acetate				ohm	mS m^{-1}
1993/4	4.7	4	123	47	18	17		52
1994/5	4.8	9	82	191	90	13		115
1995/6	4.9	1	104	232	61	27	3400	
1996/7	4.7	6	78	152	39		3000	
1997/8	4.5	10	73	169	27		3000	
1998/9	4.6	7	98	124	18		4000	
1999/2000	4.9	12	69	437	31	5	1800	
2000/01	4.5	4	55	197	41	7	3400	
Fertiliser application (kg/ha)	**N**		**P**	**K**	**Lime**			
Source	Ammonium sulphate (21% N)	LAN (28% N)	Super phosphate (10.5% P)	Potassium chloride (50% K)	Dolomite ($Ca,Mg(CO_3)_2$)	Calcite ($CaCO_3$)	Gypsum ($CaSO_2.2H_2O$)	
1993/4	20		40		3000			
1994/5	40		30	80	2000			
1995/6	80	10	20	80	1000			
1996/7	120		30	80	2000			
1997/8	120		20	100	3000			
1998/9		120	20	100	3000			
1999/2000		120	20	100	3000			
2000/01		120	30					

cold high-altitude (Zaaiplaas) cactus pear experimental site in Limpopo

Appendix 3.3

Weather measurements and statistics computed on cactus pear trial sites in Limpopo

(a) Rainfall:
  (i) amount (mm/24 h)
  (ii) intensity (mm/hour)
(b) Temperature:
  (i) minimum (^{o}C)
  (ii) maximum (^{o}C)
(c) Solar radiation (MJ m^{-2} s^{-1})
(d) Wind:
  (i) speed (ms^{-1})
  (ii) direction
(e) Relative humidity (RH):
  (i) minimum (%)
  (ii) maximum (%)
(f) Evaporation:
  (i) daily (mm)
(g) Accumulated chilling units (Richardson, Infruitec, Positive)
(h) Accumulated heat units (base temperature at: 0, 5, 10, 15 ^{o}C)
(i) Day length (h)

Climatic statistics were computed for four different phenological periods. These periods are:

- May to August, (minimum temperature, Richardson chill units, Infruitec and Positive chill units)
- April to August, **(**rainfall, temperature (Tmin, Tmax), heat unit at base: 0, 5, 10, 15 ^{0}C and radiation)
- August to March (rainfall, average temperature, heat units at base: 0, 5, 10, 15 ^{0}C, wind speed and radiation)
- April to following March (i.e. for the entire year: rainfall, temperatures, wind speed, relative humidity, solar radiation, frost days, heat units, chill units and evapotranspiration.

Appendix 3.4

Explanation of the method employed to patch weather data in cactus pear trial sites, Limpopo (Rademeyer & Potgieter, 2007)

Basic graphical quality control was done on the three study sites to remove all suspicious data. Gaps in the data due to the removal of the suspicious data were patched using interpolation techniques.

Two interpolation techniques were used. The first technique was employed on station 30090 (Gillemberg, cool mid-altitude) while the second technique was employed to patch the missing data at stations 30091 (Nondweni, hot low-altitude) and 30092 (Zaaiplaas, cold high-altitude). A short description of these techniques follows:

To patch station 30090 a nearby station was used. The nearest station utilized for this filling in of missing data was the one at the Polokwane (Pietersburg) weather office of the South African Weather Service (Figure 3.4.1). An altitude adjustment was made from the control to the target station during this patching procedure.

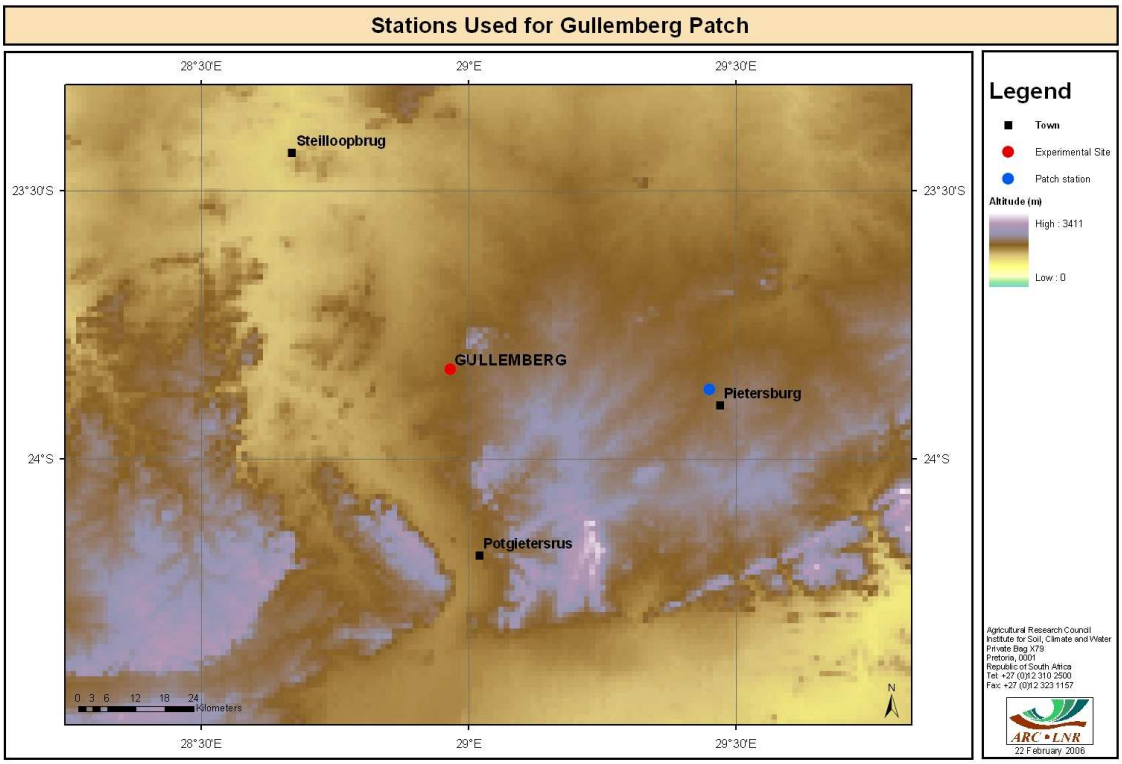

Figure 3.4.1 Location of the Polokwane (Pietersburg) weather office used to patch missing and suspicious data of the Gillemberg (cool mid-altitude) experimental site

For the filling in of missing data at stations 30091 and 30092 a weighted average technique was employed. The value at the target station was determined as follows:

$$\text{target} = \frac{\sum_{i=1}^{n} W(d_i) \quad \text{temp}_i}{\sum_{i=1}^{n} W(d_i)} \quad \text{where} \quad W(d_i) = b^{\frac{[d_i - d_{(\min)i}]}{d_{(\min)i}}}$$

The weight of the control station is a function of a constant b (chosen as 0.0003 in this case) as well as the distance from the control station to the target station and the minimum distance from any control station to the target station. The following control stations were used for stations 30091 and 30092 during this patching process. Again, an altitude adjustment was applied to compensate for the altitude differences between the various control stations and the desired target station.

To patch station 30091, (Nondweni, hot low-altitude) the data of the following stations were utilized (Figure 3.4.2):

- 19935 (-23.86 S; 30.32 E; 623 m)
- 19984 (-22.39 S; 30.71 E; 416 m)
- 19983 (-23.04 S; 30.37 E; 649 m)

To patch station 30092, (Zaaiplaas, cold high-altitude) the data of the following stations were utilized (Figure 3.4.3):

- 19998 (-25.78 S; 28.76 E; 1458 m)
- 19931 (-25.13 S; 30.62 E; 2118 m)

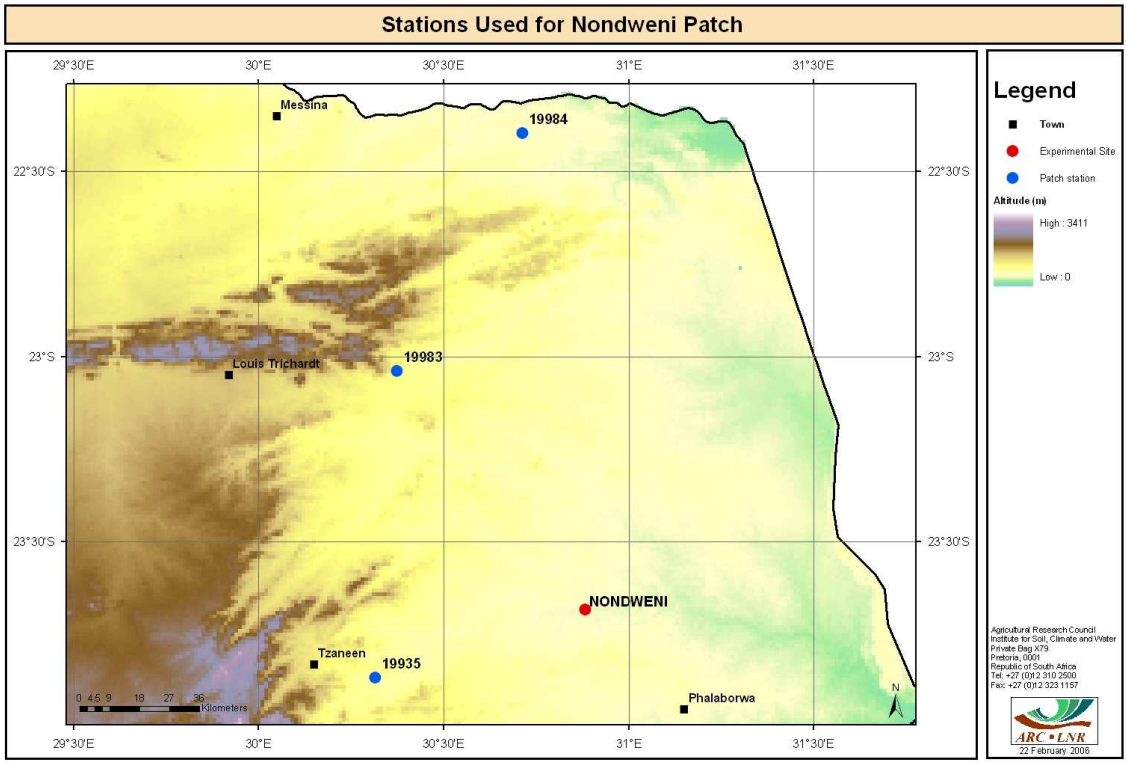

Figure 3.4.2 Location of the three ARC-ISCW weather stations used to patch missing and suspicious data of the Nondweni (hot low-altitude) experimental site

Unfortunately solar radiation data could not be patched in all instances. Due to the great distance between experimental sites and the stations used for patching, missing wind speed data was also not able to be patched.

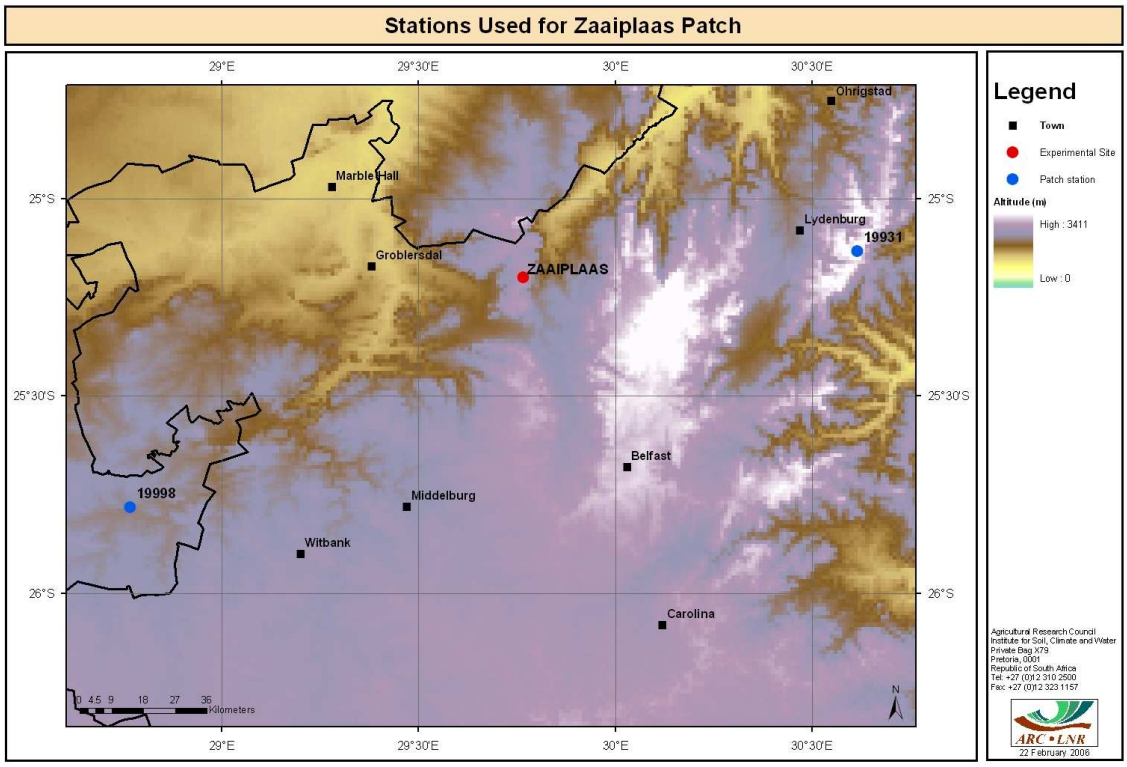

Figure 3.4.3 Location of the two ARC-ISCW weather stations used to patch missing and suspicious data of the Zaaiplaas (cold high-altitude) experimental site

Appendix 3.5

Experimental layout of cactus pear field trial at each of the three agro-climatic areas of Limpopo

(see paragraph 3.5 (p. 36) for explanation of codes)

Block											
i	V2	V8	V11	V10	V4	V1	V7	V12	V5	V6	V3
	1	2	3	4	5	6	7	8	9	10	11
ii	V5	V10	V4	V11	V6	V7	V3	V8	V2	V12	V1
	12	13	14	15	16	17	18	19	20	21	22
iii	V6	V4	V12	V3	V10	V8	V7	V2	V11	V5	V1
	23	24	25	26	27	28	29	30	31	32	33
iv	V6	V5	V12	V3	V8	V4	V1	V10	V2	V11	V7
	34	35	36	37	38	39	40	41	42	43	44
v	V2	V10	V5	V6	V11	V3	V8	V12	V7	V1	V4
	45	46	47	48	49	50	51	52	53	54	55

Legend

V= variety

See variety numbers in paragraph 3.5, p. 11.

Appendix 3.6

Measurements (orchard and laboratory) and data collected on cactus pear trials in Limpopo

No	Measurement
A	**Orchard**
1	Date of floral/reproductive budburst (week/month)
2	Date of 50% anthesis (w/m)
3	No. fruit removed from terminal cladodes by thinning (n)
4	No. fruit removed from sub-terminal cladodes by thinning (n)
5	No. fruit remaining on terminal cladodes after thinning (n)
6	No. fruit remaining on sub-terminal cladodes after thinning (n)
7	No. fertile terminal cladodes (n)
8	No. fertile sub-terminal cladodes (n)
9	Date of 50% fruit ripening (week/month)
	Derived data
10	Total number of fruit/plant (n)
11	Percentage fruit removed on terminal cladodes during thinning (%)
12	Percentage fruit removed on sub-terminal cladodes during thinning (%)
13	Total number of fruit removed by thinning (n)
14	Percentage fruit removed by thinning (%)
15	Percentage fruit remaining on terminal cladodes after thinning (%)
16	Percentage fruit remaining on sub-terminal cladodes after thinning (%)
17	Total number fruit remaining on plant after thinning (n)
18	Percentage fruit remaining after thinning (%)
19	Percentage fertile terminal cladodes after thinning (%)
20	Percentage fertile sub-terminal cladodes after thinning (%)
21	Total number of fertile cladodes after thinning (n)
22	Percentage fertile cladodes remaining after thinning (%)
B	**Laboratory**
1	Fruit mass (g)
2	Grading (%marketable)
3	Fruit width (mm)
4	Fruit length (mm)
5	Flower-end depth (mm)
6	Peelability (index)
7	Peel thickness (mm)
8	Pulp mass (g)
9	Colour of pulp at 50% peel colour break
10	TSS (Brix^{o})
11	No. seeds per fruit (n)
12	Mass of dried seeds (g)
13	Causes of unmarketable %
	Derived data
14	Size grading of marketable %
15	Fruit form index
16	Peel mass (g)
17	Percentage peel (%)
18	Percentage pulp (%)
19	No. seeds per g pulp (n)

Appendix 3.7.1 ANOVA for number of cladodes left after pruning of individual cultivars over production years and areas

JPclleftprunAOV.out

file is JPfyieldAOV.gen

========== CACTUS PEAR ENVIRONMENTAL ADAPTIBILITY: FRUIT YIELD

counts transformed to stabilise treatment variances Y = sqrt(X+0.5)

===== clleftprun for AREA 1 and YEAR 1 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.1628	0.0407	0.35	0.839
+ CULT	10	16.6194	1.6619	14.48	<.001
Residual	40	4.5920	0.1148		
Total	54	21.3742	0.3958		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as

summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
CULT		
1	3.930	0.152
2	3.953	0.152
3	3.613	0.152
4	4.335	0.152
5	5.565	0.152
6	4.508	0.152
7	4.125	0.152
8	4.722	0.152
10	4.476	0.152
11	4.936	0.152
12	5.111	0.152

*** Coefficient of variation and standard error of a single unit ***

%cv	se
7.56	0.3388

***** Pairwise differences *****

t probabilities of pairwise differences

1	*			
2	0.912	*		
3	0.147	0.120	*	
4	0.066	0.083	0.002	*

5	0.000	0.000	0.000	0.000	*
6	0.010	0.013	0.000	0.422	0.000
7	0.368	0.429	0.022	0.333	0.000
8	0.001	0.001	0.000	0.078	0.000
10	0.015	0.019	0.000	0.513	0.000
11	0.000	0.000	0.000	0.008	0.005
12	0.000	0.000	0.000	0.001	0.040

	1	2	3	4	5
6	*				
7	0.081	*			
8	0.325	0.008	*		
10	0.881	0.109	0.259	*	
11	0.053	0.001	0.323	0.038	*
12	0.008	0.000	0.077	0.005	0.418

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5

7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR	AREA	REP	CULT	clleftprun	Tclleftprun	FITTED	RESIDUAL
1	1	1	1	15.75	4.031	3.901	0.1306
1	1	2	1	16.00	4.062	4.026	0.0361
1	1	3	1	18.00	4.301	3.950	0.3513
1	1	4	1	15.00	3.937	3.871	0.0660
1	1	5	1	10.50	3.317	3.901	-0.5840
1	1	1	2	16.25	4.093	3.924	0.1683
1	1	2	2	14.50	3.873	4.050	-0.1767
1	1	3	2	13.25	3.708	3.974	-0.2656
1	1	4	2	16.00	4.062	3.895	0.1672
1	1	5	2	15.75	4.031	3.924	0.1067
1	1	1	3	12.25	3.571	3.584	-0.0130
1	1	2	3	15.00	3.937	3.709	0.2280
1	1	3	3	12.00	3.536	3.633	-0.0975
1	1	4	3	10.25	3.279	3.554	-0.2754
1	1	5	3	13.50	3.742	3.584	0.1579
1	1	1	4	18.00	4.301	4.306	-0.0045
1	1	2	4	17.50	4.243	4.431	-0.1884
1	1	3	4	20.00	4.528	4.355	0.1727
1	1	4	4	17.75	4.272	4.276	-0.0041
1	1	5	4	18.25	4.330	4.306	0.0244
1	1	1	5	38.75	6.265	5.536	0.7285
1	1	2	5	31.00	5.612	5.662	-0.0493
1	1	3	5	26.00	5.148	5.586	-0.4379
1	1	4	5	33.75	5.852	5.507	0.3455

1	1	5	5	24.00	4.950	5.537	-0.5868
1	1	1	6	18.25	4.330	4.479	-0.1492
1	1	2	6	21.00	4.637	4.605	0.0321
1	1	3	6	19.25	4.444	4.529	-0.0846
1	1	4	6	18.75	4.387	4.450	-0.0623
1	1	5	6	22.00	4.743	4.479	0.2640
1	1	1	7	19.75	4.500	4.096	0.4043
1	1	2	7	20.75	4.610	4.221	0.3887
1	1	3	7	15.00	3.937	4.145	-0.2080
1	1	4	7	12.75	3.640	4.066	-0.4261
1	1	5	7	15.00	3.937	4.096	-0.1588
1	1	1	8	18.25	4.330	4.693	-0.3626
1	1	2	8	21.75	4.717	4.818	-0.1011
1	1	3	8	20.75	4.610	4.742	-0.1323
1	1	4	8	27.75	5.315	4.663	0.6519
1	1	5	8	21.00	4.637	4.693	-0.0560
1	1	1	10	16.75	4.153	4.447	-0.2939
1	1	2	10	23.25	4.873	4.573	0.3008
1	1	3	10	19.75	4.500	4.497	0.0035
1	1	4	10	17.75	4.272	4.418	-0.1457
1	1	5	10	20.50	4.583	4.447	0.1353
1	1	1	11	21.50	4.690	4.907	-0.2166
1	1	2	11	22.25	4.770	5.032	-0.2627
1	1	3	11	26.50	5.196	4.956	0.2398
1	1	4	11	24.00	4.950	4.878	0.0722
1	1	5	11	25.25	5.074	4.907	0.1673
1	1	1	12	21.50	4.690	5.082	-0.3919
1	1	2	12	24.50	5.000	5.208	-0.2077
1	1	3	12	30.75	5.590	5.132	0.4585
1	1	4	12	21.25	4.664	5.053	-0.3891
1	1	5	12	31.00	5.612	5.082	0.5301

===== clleftprun for AREA 1 and YEAR 2 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.9888	0.2472	0.92	0.460
+ CULT	10	38.6426	3.8643	14.43	<.001
Residual	40	10.7087	0.2677		
Total	54	50.3401	0.9322		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
CULT		
1	4.956	0.231
2	4.804	0.231
3	4.727	0.231

4	6.062	0.231
5	7.307	0.231
6	6.159	0.231
7	5.110	0.231
8	6.649	0.231
10	6.128	0.231
11	6.522	0.231
12	6.652	0.231

*** Coefficient of variation and standard error of a single unit ***

%cv	se
8.75	0.5174

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.645	*			
3	0.488	0.815	*		
4	0.002	0.000	0.000	*	
5	0.000	0.000	0.000	0.000	*
6	0.001	0.000	0.000	0.766	0.001
7	0.641	0.356	0.249	0.006	0.000
8	0.000	0.000	0.000	0.080	0.051
10	0.001	0.000	0.000	0.841	0.001
11	0.000	0.000	0.000	0.167	0.021
12	0.000	0.000	0.000	0.079	0.052

	1	2	3	4	5
6	*				
7	0.003	*			
8	0.142	0.000	*		
10	0.923	0.003	0.119	*	
11	0.274	0.000	0.701	0.235	*
12	0.140	0.000	0.989	0.117	0.694

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5
7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR AREA REP CULT clleftprun Tclleftprun FITTED RESIDUAL

2	1	1	1	22.25	4.770	4.801	-0.0311
2	1	2	1	23.00	4.848	4.956	-0.1086
2	1	3	1	30.25	5.545	4.946	0.5997
2	1	4	1	23.25	4.873	4.877	-0.0035
2	1	5	1	22.00	4.743	5.200	-0.4564
2	1	1	2	20.50	4.583	4.649	-0.0665
2	1	2	2	22.00	4.743	4.805	-0.0611
2	1	3	2	23.00	4.848	4.794	0.0539
2	1	4	2	22.75	4.822	4.725	0.0968
2	1	5	2	24.75	5.025	5.048	-0.0231
2	1	1	3	22.50	4.796	4.572	0.2239
2	1	2	3	24.75	5.025	4.727	0.2975
2	1	3	3	22.50	4.796	4.717	0.0791
2	1	4	3	15.25	3.969	4.648	-0.6793
2	1	5	3	25.00	5.050	4.971	0.0788
2	1	1	4	35.50	6.000	5.906	0.0935
2	1	2	4	35.25	5.979	6.062	-0.0828
2	1	3	4	41.75	6.500	6.051	0.4488
2	1	4	4	32.75	5.766	5.982	-0.2162
2	1	5	4	36.25	6.062	6.305	-0.2433
2	1	1	5	66.25	8.170	7.152	1.0181
2	1	2	5	50.25	7.124	7.307	-0.1835
2	1	3	5	51.75	7.228	7.297	-0.0683
2	1	4	5	58.00	7.649	7.228	0.4206
2	1	5	5	40.00	6.364	7.551	-1.1869
2	1	1	6	31.25	5.635	6.004	-0.3696
2	1	2	6	36.75	6.103	6.160	-0.0565
2	1	3	6	33.50	5.831	6.149	-0.3181
2	1	4	6	44.25	6.690	6.080	0.6092
2	1	5	6	42.25	6.538	6.403	0.1351
2	1	1	7	29.00	5.431	4.955	0.4767
2	1	2	7	30.50	5.568	5.110	0.4576

2	1	3	7	19.25	4.444	5.099	-0.6553
2	1	4	7	20.50	4.583	5.031	-0.4481
2	1	5	7	30.00	5.523	5.354	0.1690
2	1	1	8	39.25	6.305	6.494	-0.1892
2	1	2	8	40.00	6.364	6.649	-0.2854
2	1	3	8	38.25	6.225	6.639	-0.4137
2	1	4	8	49.50	7.071	6.570	0.5011
2	1	5	8	52.50	7.280	6.893	0.3872
2	1	1	10	36.25	6.062	5.972	0.0897
2	1	2	10	41.50	6.481	6.128	0.3528
2	1	3	10	31.25	5.635	6.117	-0.4825
2	1	4	10	35.25	5.979	6.048	-0.0693
2	1	5	10	41.50	6.481	6.371	0.1093
2	1	1	11	33.75	5.852	6.367	-0.5150
2	1	2	11	41.00	6.442	6.523	-0.0808
2	1	3	11	47.75	6.946	6.512	0.4341
2	1	4	11	47.25	6.910	6.443	0.4667
2	1	5	11	41.25	6.461	6.766	-0.3049
2	1	1	12	32.75	5.766	6.497	-0.7306
2	1	2	12	40.50	6.403	6.652	-0.2492
2	1	3	12	48.00	6.964	6.642	0.3226
2	1	4	12	34.25	5.895	6.573	-0.6780
2	1	5	12	67.25	8.231	6.896	1.3352

===== clleftprun for AREA 1 and YEAR 3 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	1.9748	0.4937	1.65	0.182
+ CULT	10	73.1834	7.3183	24.40	<.001
Residual	40	11.9983	0.3000		
Total	54	87.1565	1.6140		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
CULT		
1	5.460	0.245
2	6.234	0.245
3	5.861	0.245
4	7.541	0.245
5	8.944	0.245
6	8.100	0.245
7	5.581	0.245
8	7.911	0.245
10	7.849	0.245
11	7.952	0.245
12	8.101	0.245

*** Coefficient of variation and standard error of a single unit ***

%cv	se
7.57	0.5477

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.031	*			
3	0.254	0.288	*		
4	0.000	0.001	0.000	*	
5	0.000	0.000	0.000	0.000	*
6	0.000	0.000	0.000	0.115	0.019
7	0.729	0.067	0.424	0.000	0.000
8	0.000	0.000	0.000	0.292	0.005
10	0.000	0.000	0.000	0.379	0.003
11	0.000	0.000	0.000	0.242	0.007
12	0.000	0.000	0.000	0.114	0.020

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.590	0.000	*		
10	0.474	0.000	0.859	*	
11	0.673	0.000	0.906	0.768	*
12	0.991	0.000	0.586	0.471	0.670

6 7 8 10 11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5
7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR	AREA	REP	CULT	clleftprun	Tclleftprun	FITTED	RESIDUAL
3	1	1	1	26.25	5.172	5.196	-0.0244
3	1	2	1	25.75	5.123	5.343	-0.2197
3	1	3	1	39.00	6.285	5.535	0.7497
3	1	4	1	29.50	5.477	5.466	0.0116
3	1	5	1	27.00	5.244	5.761	-0.5172
3	1	1	2	34.50	5.916	5.970	-0.0538
3	1	2	2	36.00	6.042	6.117	-0.0751
3	1	3	2	34.75	5.937	6.309	-0.3714

3	1	4	2	40.00	6.364	6.239	0.1249
3	1	5	2	47.25	6.910	6.535	0.3755
3	1	1	3	37.50	6.164	5.597	0.5673
3	1	2	3	33.25	5.809	5.744	0.0657
3	1	3	3	38.25	6.225	5.936	0.2892
3	1	4	3	26.00	5.148	5.866	-0.7185
3	1	5	3	35.00	5.958	6.162	-0.2037
3	1	1	4	51.50	7.211	7.277	-0.0662
3	1	2	4	51.25	7.194	7.424	-0.2302
3	1	3	4	61.50	7.874	7.616	0.2580
3	1	4	4	58.50	7.681	7.547	0.1346
3	1	5	4	59.50	7.746	7.842	-0.0961
3	1	1	5	94.50	9.747	8.680	1.0666
3	1	2	5	80.25	8.986	8.827	0.1593
3	1	3	5	81.25	9.042	9.019	0.0227
3	1	4	5	83.25	9.152	8.949	0.2022
3	1	5	5	60.25	7.794	9.245	-1.4507
3	1	1	6	58.00	7.649	7.836	-0.1872
3	1	2	6	66.25	8.170	7.982	0.1876
3	1	3	6	61.00	7.842	8.174	-0.3322
3	1	4	6	69.75	8.382	8.105	0.2766
3	1	5	6	71.00	8.456	8.401	0.0552
3	1	1	7	27.75	5.315	5.317	-0.0024
3	1	2	7	33.50	5.831	5.464	0.3669
3	1	3	7	24.75	5.025	5.656	-0.6312
3	1	4	7	27.25	5.268	5.587	-0.3188
3	1	5	7	41.33	6.468	5.882	0.5854
3	1	1	8	55.25	7.467	7.647	-0.1809
3	1	2	8	50.50	7.141	7.794	-0.6527
3	1	3	8	59.25	7.730	7.986	-0.2563
3	1	4	8	72.50	8.544	7.917	0.6274
3	1	5	8	74.75	8.675	8.212	0.4625

3	1	1	10	53.75	7.365	7.586	-0.2202
3	1	2	10	66.25	8.170	7.732	0.4378
3	1	3	10	49.00	7.036	7.924	-0.8887
3	1	4	10	59.50	7.746	7.855	-0.1088
3	1	5	10	79.25	8.930	8.150	0.7799
3	1	1	11	51.50	7.211	7.689	-0.4775
3	1	2	11	61.50	7.874	7.835	0.0387
3	1	3	11	74.25	8.646	8.027	0.6185
3	1	4	11	69.50	8.367	7.958	0.4088
3	1	5	11	58.25	7.665	8.253	-0.5885
3	1	1	12	54.50	7.416	7.837	-0.4212
3	1	2	12	62.00	7.906	7.984	-0.0784
3	1	3	12	75.50	8.718	8.176	0.5417
3	1	4	12	55.25	7.467	8.107	-0.6400
3	1	5	12	80.50	9.000	8.402	0.5978

===== clleftprun for AREA 1 and YEAR 4 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	2.2935	0.5734	1.61	0.190
+ CULT	10	64.9083	6.4908	18.27	<.001
Residual	40	14.2147	0.3554		

Total	54	81.4165	1.5077

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
CULT		
1	6.246	0.267
2	6.772	0.267
3	6.437	0.267
4	8.129	0.267
5	9.092	0.267
6	8.488	0.267
7	6.309	0.267
8	8.496	0.267
10	8.815	0.267
11	8.775	0.267
12	8.654	0.267

*** Coefficient of variation and standard error of a single unit ***

%cv	se
7.61	0.5961

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.171	*			
3	0.615	0.380	*		
4	0.000	0.001	0.000	*	
5	0.000	0.000	0.000	0.015	*
6	0.000	0.000	0.000	0.347	0.117
7	0.867	0.227	0.736	0.000	0.000
8	0.000	0.000	0.000	0.337	0.122
10	0.000	0.000	0.000	0.076	0.467
11	0.000	0.000	0.000	0.095	0.405
12	0.000	0.000	0.000	0.172	0.252

	1	2	3	4	5

6	*				
7	0.000	*			
8	0.982	0.000	*		
10	0.391	0.000	0.402	*	
11	0.451	0.000	0.464	0.915	*
12	0.663	0.000	0.678	0.671	0.750

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5
7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR	AREA	REP	CULT	clleftprun	Tclleftprun	FITTED	RESIDUAL
4	1	1	1	37.50	6.164	6.111	0.0531
4	1	2	1	45.25	6.764	6.109	0.6552
4	1	3	1	44.75	6.727	6.109	0.6182
4	1	4	1	33.50	5.831	6.266	-0.4350
4	1	5	1	32.50	5.745	6.636	-0.8916
4	1	1	2	41.75	6.500	6.637	-0.1367
4	1	2	2	43.00	6.595	6.634	-0.0386
4	1	3	2	40.00	6.364	6.634	-0.2700
4	1	4	2	45.50	6.782	6.791	-0.0090
4	1	5	2	57.50	7.616	7.162	0.4542
4	1	1	3	47.50	6.928	6.302	0.6260
4	1	2	3	38.75	6.265	6.300	-0.0346
4	1	3	3	43.25	6.614	6.300	0.3148
4	1	4	3	32.50	5.745	6.457	-0.7123
4	1	5	3	43.50	6.633	6.827	-0.1938
4	1	1	4	63.50	8.000	7.995	0.0055

4	1	2	4	60.25	7.794	7.992	-0.1977
4	1	3	4	64.75	8.078	7.992	0.0859
4	1	4	4	63.50	8.000	8.149	-0.1492
4	1	5	4	76.50	8.775	8.519	0.2556
4	1	1	5	86.75	9.341	8.957	0.3837
4	1	2	5	73.25	8.588	8.955	-0.3667
4	1	3	5	81.25	9.042	8.954	0.0871
4	1	4	5	99.00	9.975	9.112	0.8632
4	1	5	5	72.00	8.515	9.482	-0.9673
4	1	1	6	60.00	7.778	8.353	-0.5751
4	1	2	6	75.00	8.689	8.351	0.3385
4	1	3	6	64.25	8.047	8.351	-0.3038
4	1	4	6	93.50	9.695	8.508	1.1875
4	1	5	6	67.25	8.231	8.878	-0.6471
4	1	1	7	34.50	5.916	6.174	-0.2584
4	1	2	7	41.50	6.481	6.172	0.3089
4	1	3	7	34.25	5.895	6.172	-0.2769
4	1	4	7	34.25	5.895	6.329	-0.4342
4	1	5	7	53.67	7.360	6.699	0.6607
4	1	1	8	73.25	8.588	8.361	0.2267
4	1	2	8	62.50	7.937	8.358	-0.4212
4	1	3	8	66.50	8.185	8.358	-0.1730
4	1	4	8	74.00	8.631	8.516	0.1156
4	1	5	8	83.00	9.138	8.886	0.2519
4	1	1	10	71.75	8.500	8.680	-0.1802
4	1	2	10	90.00	9.513	8.678	0.8355
4	1	3	10	56.75	7.566	8.678	-1.1112
4	1	4	10	72.75	8.559	8.835	-0.2763
4	1	5	10	98.25	9.937	9.205	0.7322
4	1	1	11	72.75	8.559	8.640	-0.0814
4	1	2	11	61.50	7.874	8.637	-0.7634
4	1	3	11	93.25	9.682	8.637	1.0451

4	1	4	11	81.25	9.042	8.795	0.2469
4	1	5	11	75.50	8.718	9.165	-0.4471
4	1	1	12	71.00	8.456	8.519	-0.0632
4	1	2	12	66.75	8.201	8.516	-0.3157
4	1	3	12	71.75	8.500	8.516	-0.0163
4	1	4	12	68.00	8.276	8.674	-0.3971
4	1	5	12	96.25	9.836	9.044	0.7923

===== clleftprun for AREA 1 and YEAR 5 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.8119	0.2030	0.79	0.540
+ CULT	10	71.9377	7.1938	27.92	<.001
Residual	40	10.3068	0.2577		
Total	54	83.0564	1.5381		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as

summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
CULT		
1	6.651	0.227
2	6.322	0.227
3	6.561	0.227
4	9.015	0.227
5	9.228	0.227
6	8.682	0.227
7	6.539	0.227
8	8.385	0.227
10	8.298	0.227
11	8.880	0.227
12	9.241	0.227

*** Coefficient of variation and standard error of a single unit ***

%cv	se
6.36	0.5076

***** Pairwise differences *****

t probabilities of pairwise differences

1	*			
2	0.312	*		
3	0.781	0.461	*	
4	0.000	0.000	0.000	*

5	0.000	0.000	0.000	0.512	*
6	0.000	0.000	0.000	0.305	0.096
7	0.728	0.504	0.944	0.000	0.000
8	0.000	0.000	0.000	0.057	0.012
10	0.000	0.000	0.000	0.031	0.006
11	0.000	0.000	0.000	0.675	0.284
12	0.000	0.000	0.000	0.487	0.967

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.361	0.000	*		
10	0.239	0.000	0.787	*	
11	0.540	0.000	0.131	0.077	*
12	0.089	0.000	0.011	0.005	0.267

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5

7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR	AREA	REP	CULT	clleftprun	Tclleftprun	FITTED	RESIDUAL
5	1	1	1	38.00	6.205	6.691	-0.4860
5	1	2	1	53.25	7.331	6.543	0.7887
5	1	3	1	53.25	7.331	6.714	0.6172
5	1	4	1	38.00	6.205	6.487	-0.2818
5	1	5	1	37.75	6.185	6.823	-0.6381
5	1	1	2	38.75	6.265	6.362	-0.0968
5	1	2	2	37.75	6.185	6.214	-0.0291
5	1	3	2	35.75	6.021	6.385	-0.3644
5	1	4	2	37.00	6.124	6.158	-0.0338
5	1	5	2	48.75	7.018	6.494	0.5241
5	1	1	3	46.25	6.837	6.601	0.2365
5	1	2	3	45.00	6.745	6.453	0.2926
5	1	3	3	46.25	6.837	6.624	0.2132
5	1	4	3	31.75	5.679	6.397	-0.7177
5	1	5	3	44.50	6.708	6.733	-0.0245
5	1	1	4	84.75	9.233	9.055	0.1783
5	1	2	4	74.00	8.631	8.907	-0.2754
5	1	3	4	85.00	9.247	9.078	0.1684
5	1	4	4	76.00	8.746	8.851	-0.1041
5	1	5	4	84.50	9.220	9.187	0.0329
5	1	1	5	95.00	9.772	9.267	0.5049
5	1	2	5	83.50	9.165	9.119	0.0458
5	1	3	5	87.25	9.367	9.291	0.0767
5	1	4	5	87.75	9.394	9.063	0.3309

5	1	5	5	70.75	8.441	9.399	-0.9583
5	1	1	6	80.50	9.000	8.721	0.2791
5	1	2	6	66.25	8.170	8.573	-0.4028
5	1	3	6	71.00	8.456	8.744	-0.2885
5	1	4	6	86.75	9.341	8.517	0.8241
5	1	5	6	70.75	8.441	8.853	-0.4118
5	1	1	7	43.50	6.633	6.578	0.0550
5	1	2	7	43.25	6.614	6.430	0.1842
5	1	3	7	42.50	6.557	6.602	-0.0442
5	1	4	7	35.25	5.979	6.374	-0.3949
5	1	5	7	47.25	6.910	6.710	0.2000
5	1	1	8	69.25	8.352	8.424	-0.0728
5	1	2	8	63.50	8.000	8.276	-0.2763
5	1	3	8	66.00	8.155	8.448	-0.2930
5	1	4	8	72.75	8.559	8.220	0.3384
5	1	5	8	78.00	8.860	8.556	0.3037
5	1	1	10	67.75	8.261	8.337	-0.0756
5	1	2	10	72.00	8.515	8.189	0.3258
5	1	3	10	57.50	7.616	8.360	-0.7446
5	1	4	10	57.00	7.583	8.133	-0.5499
5	1	5	10	90.00	9.513	8.469	1.0443
5	1	1	11	76.25	8.761	8.919	-0.1584
5	1	2	11	68.25	8.292	8.771	-0.4795
5	1	3	11	86.00	9.301	8.942	0.3581
5	1	4	11	91.75	9.605	8.715	0.8898
5	1	5	11	70.75	8.441	9.051	-0.6100
5	1	1	12	79.00	8.916	9.280	-0.3640
5	1	2	12	79.75	8.958	9.132	-0.1739
5	1	3	12	91.75	9.605	9.304	0.3011
5	1	4	12	76.50	8.775	9.076	-0.3010
5	1	5	12	98.50	9.950	9.412	0.5378

===== clleftprun for AREA 1 and YEAR 6 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.7816	0.1954	0.62	0.654
+ CULT	10	95.3358	9.5336	30.06	<.001
Residual	40	12.6870	0.3172		
Total	54	108.8044	2.0149		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
CULT		
1	7.036	0.252
2	6.545	0.252
3	7.010	0.252

4	9.896	0.252
5	10.140	0.252
6	9.463	0.252
7	7.303	0.252
8	9.150	0.252
10	8.681	0.252
11	9.609	0.252
12	10.039	0.252

*** Coefficient of variation and standard error of a single unit ***

%cv	se
6.53	0.5632

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.176	*			
3	0.942	0.199	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.498	*
6	0.000	0.000	0.000	0.231	0.065
7	0.457	0.039	0.415	0.000	0.000
8	0.000	0.000	0.000	0.043	0.008
10	0.000	0.000	0.000	0.001	0.000
11	0.000	0.000	0.000	0.426	0.144
12	0.000	0.000	0.000	0.691	0.778

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.384	0.000	*		
10	0.034	0.000	0.195	*	
11	0.683	0.000	0.204	0.013	*
12	0.114	0.000	0.017	0.000	0.235

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5
7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR AREA REP CULT clleftprun Tclleftprun FITTED RESIDUAL

6	1	1	1	49.25	7.053	7.003	0.0505
6	1	2	1	51.00	7.176	6.961	0.2155
6	1	3	1	49.00	7.036	7.048	-0.0125
6	1	4	1	41.50	6.481	6.911	-0.4302
6	1	5	1	54.75	7.433	7.256	0.1768
6	1	1	2	40.75	6.423	6.512	-0.0891
6	1	2	2	41.00	6.442	6.470	-0.0276
6	1	3	2	38.25	6.225	6.557	-0.3321
6	1	4	2	40.75	6.423	6.420	0.0028
6	1	5	2	51.50	7.211	6.765	0.4460
6	1	1	3	55.75	7.500	6.977	0.5229
6	1	2	3	53.00	7.314	6.935	0.3793
6	1	3	3	51.00	7.176	7.022	0.1540
6	1	4	3	36.00	6.042	6.885	-0.8436
6	1	5	3	48.75	7.018	7.230	-0.2126
6	1	1	4	97.00	9.874	9.863	0.0111
6	1	2	4	86.50	9.327	9.821	-0.4937
6	1	3	4	108.75	10.452	9.908	0.5439
6	1	4	4	91.50	9.592	9.771	-0.1795
6	1	5	4	104.25	10.235	10.117	0.1182
6	1	1	5	109.75	10.500	10.107	0.3932
6	1	2	5	99.00	9.975	10.065	-0.0898
6	1	3	5	97.50	9.899	10.152	-0.2526
6	1	4	5	112.75	10.642	10.015	0.6270
6	1	5	5	93.25	9.682	10.360	-0.6778
6	1	1	6	88.75	9.447	9.430	0.0172
6	1	2	6	83.75	9.179	9.388	-0.2091
6	1	3	6	86.25	9.314	9.475	-0.1613
6	1	4	6	108.00	10.416	9.338	1.0783
6	1	5	6	79.75	8.958	9.683	-0.7251
6	1	1	7	47.75	6.946	7.270	-0.3240
6	1	2	7	62.75	7.953	7.228	0.7249

6	1	3	7	63.50	8.000	7.315	0.6846
6	1	4	7	43.75	6.652	7.178	-0.5261
6	1	5	7	48.00	6.964	7.524	-0.5594
6	1	1	8	89.00	9.460	9.117	0.3437
6	1	2	8	70.75	8.441	9.075	-0.6337
6	1	3	8	84.00	9.192	9.162	0.0304
6	1	4	8	80.00	8.972	9.025	-0.0526
6	1	5	8	93.25	9.682	9.370	0.3123
6	1	1	10	75.25	8.703	8.648	0.0558
6	1	2	10	79.50	8.944	8.606	0.3387
6	1	3	10	61.75	7.890	8.693	-0.8030
6	1	4	10	62.75	7.953	8.556	-0.6027
6	1	5	10	97.75	9.912	8.901	1.0111
6	1	1	11	85.75	9.287	9.577	-0.2895
6	1	2	11	89.67	9.496	9.534	-0.0387
6	1	3	11	94.50	9.747	9.622	0.1250
6	1	4	11	109.25	10.476	9.485	0.9916
6	1	5	11	81.25	9.042	9.830	-0.7884
6	1	1	12	86.25	9.314	10.006	-0.6918
6	1	2	12	95.50	9.798	9.964	-0.1657
6	1	3	12	101.00	10.075	10.051	0.0237
6	1	4	12	96.50	9.849	9.914	-0.0650
6	1	5	12	124.00	11.158	10.259	0.8988

===== clleftprun for AREA 1 and YEAR 7 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	1.2544	0.3136	1.05	0.396
+ CULT	10	93.2018	9.3202	31.07	<.001
Residual	40	12.0003	0.3000		
Total	54	106.4565	1.9714		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
CULT		
1	7.350	0.245
2	6.454	0.245
3	7.212	0.245
4	10.217	0.245
5	10.216	0.245
6	9.763	0.245
7	7.415	0.245
8	9.334	0.245
10	8.687	0.245
11	9.362	0.245
12	9.857	0.245

*** Coefficient of variation and standard error of a single unit ***

%cv	se
6.28	0.5477

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.013	*			
3	0.692	0.035	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.992	*
6	0.000	0.000	0.000	0.198	0.198
7	0.853	0.008	0.562	0.000	0.000
8	0.000	0.000	0.000	0.015	0.015
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.018	0.018
12	0.000	0.000	0.000	0.305	0.305

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.223	0.000	*		
10	0.003	0.001	0.069	*	
11	0.254	0.000	0.934	0.058	*
12	0.788	0.000	0.139	0.002	0.161

6 7 8 10 11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5
7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR	AREA	REP	CULT	clleftprun	Tclleftprun	FITTED	RESIDUAL
7	1	1	1	49.00	7.036	7.343	-0.3072
7	1	2	1	62.75	7.953	7.325	0.6280
7	1	3	1	61.50	7.874	7.236	0.6376
7	1	4	1	50.50	7.141	7.211	-0.0691
7	1	5	1	45.00	6.745	7.635	-0.8893
7	1	1	2	36.25	6.062	6.447	-0.3848
7	1	2	2	41.75	6.500	6.429	0.0709
7	1	3	2	41.50	6.481	6.341	0.1402

7	1	4	2	38.50	6.245	6.315	-0.0697
7	1	5	2	48.25	6.982	6.739	0.2434
7	1	1	3	56.25	7.533	7.205	0.3285
7	1	2	3	56.75	7.566	7.187	0.3794
7	1	3	3	58.00	7.649	7.098	0.5501
7	1	4	3	38.00	6.205	7.073	-0.8677
7	1	5	3	50.00	7.106	7.497	-0.3903
7	1	1	4	105.75	10.308	10.210	0.0981
7	1	2	4	100.75	10.062	10.192	-0.1296
7	1	3	4	101.00	10.075	10.103	-0.0286
7	1	4	4	95.75	9.811	10.077	-0.2667
7	1	5	4	116.75	10.828	10.501	0.3267
7	1	1	5	114.50	10.724	10.209	0.5144
7	1	2	5	103.75	10.210	10.192	0.0187
7	1	3	5	95.00	9.772	10.103	-0.3306
7	1	4	5	112.75	10.642	10.077	0.5648
7	1	5	5	94.25	9.734	10.501	-0.7672
7	1	1	6	89.50	9.487	9.756	-0.2690
7	1	2	6	92.75	9.657	9.738	-0.0814
7	1	3	6	99.25	9.987	9.649	0.3381
7	1	4	6	106.75	10.356	9.624	0.7326
7	1	5	6	86.50	9.327	10.048	-0.7203
7	1	1	7	60.25	7.794	7.407	0.3868
7	1	2	7	52.25	7.263	7.390	-0.1267
7	1	3	7	43.75	6.652	7.301	-0.6490
7	1	4	7	46.67	6.868	7.275	-0.4071
7	1	5	7	71.67	8.495	7.699	0.7960
7	1	1	8	87.33	9.372	9.327	0.0452
7	1	2	8	73.00	8.573	9.309	-0.7356
7	1	3	8	82.00	9.083	9.220	-0.1372
7	1	4	8	88.50	9.434	9.194	0.2397
7	1	5	8	103.67	10.206	9.618	0.5880

7	1	1	10	71.75	8.500	8.680	-0.1795
7	1	2	10	79.25	8.930	8.662	0.2685
7	1	3	10	62.75	7.953	8.573	-0.6202
7	1	4	10	64.50	8.062	8.547	-0.4850
7	1	5	10	99.25	9.987	8.971	1.0162
7	1	1	11	91.50	9.592	9.355	0.2364
7	1	2	11	85.00	9.247	9.337	-0.0908
7	1	3	11	90.00	9.513	9.249	0.2643
7	1	4	11	92.75	9.657	9.223	0.4337
7	1	5	11	77.00	8.803	9.647	-0.8436
7	1	1	12	87.50	9.381	9.850	-0.4689
7	1	2	12	92.25	9.631	9.832	-0.2013
7	1	3	12	91.25	9.579	9.743	-0.1648
7	1	4	12	97.75	9.912	9.717	0.1946
7	1	5	12	115.75	10.782	10.142	0.6404

===== clleftprun for AREA 2 and YEAR 1 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.17499	0.04375	0.48	0.750
+ CULT	10	11.26970	1.12697	12.38	<.001
Residual	40	3.64065	0.09102		

Total	54	15.08533	0.27936

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
CULT		
1	3.749	0.135
2	2.762	0.135
3	3.077	0.135
4	3.490	0.135
5	4.343	0.135
6	3.733	0.135
7	3.301	0.135
8	3.769	0.135
10	4.232	0.135
11	3.862	0.135
12	3.960	0.135

*** Coefficient of variation and standard error of a single unit ***

%cv	se
8.24	0.3017

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.000	*			
3	0.001	0.107	*		
4	0.183	0.000	0.036	*	
5	0.003	0.000	0.000	0.000	*
6	0.936	0.000	0.001	0.210	0.003
7	0.024	0.007	0.248	0.326	0.000
8	0.914	0.000	0.001	0.152	0.005
10	0.015	0.000	0.000	0.000	0.562
11	0.555	0.000	0.000	0.058	0.016
12	0.275	0.000	0.000	0.018	0.051

	1	2	3	4	5

6	*				
7	0.029	*			
8	0.852	0.019	*		
10	0.013	0.000	0.020	*	
11	0.503	0.005	0.628	0.060	*
12	0.243	0.001	0.324	0.162	0.613

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5
7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR	AREA	REP	CULT	clleftprun	Tclleftprun	FITTED	RESIDUAL
1	2	1	1	14.00	3.808	3.739	0.0691
1	2	2	1	14.50	3.873	3.742	0.1311
1	2	3	1	15.50	4.000	3.749	0.2511
1	2	4	1	13.25	3.708	3.845	-0.1371
1	2	5	1	10.75	3.354	3.668	-0.3143
1	2	1	2	4.50	2.236	2.752	-0.5161
1	2	2	2	6.00	2.550	2.755	-0.2057
1	2	3	2	7.25	2.784	2.762	0.0216
1	2	4	2	8.50	3.000	2.859	0.1415
1	2	5	2	10.00	3.240	2.682	0.5586
1	2	1	3	9.75	3.202	3.067	0.1344
1	2	2	3	8.00	2.915	3.070	-0.1547
1	2	3	3	7.75	2.872	3.077	-0.2049
1	2	4	3	10.75	3.354	3.174	0.1806
1	2	5	3	8.75	3.041	2.997	0.0447
1	2	1	4	11.50	3.464	3.480	-0.0164

1	2	2	4	15.00	3.937	3.484	0.4535
1	2	3	4	11.75	3.500	3.491	0.0094
1	2	4	4	11.25	3.428	3.587	-0.1590
1	2	5	4	9.25	3.122	3.410	-0.2875
1	2	1	5	18.25	4.330	4.333	-0.0034
1	2	2	5	14.50	3.873	4.337	-0.4636
1	2	3	5	18.25	4.330	4.344	-0.0135
1	2	4	5	22.50	4.796	4.440	0.3559
1	2	5	5	18.75	4.387	4.263	0.1244
1	2	1	6	12.50	3.606	3.724	-0.1180
1	2	2	6	12.50	3.606	3.727	-0.1211
1	2	3	6	14.50	3.873	3.734	0.1393
1	2	4	6	13.75	3.775	3.830	-0.0550
1	2	5	6	14.00	3.808	3.653	0.1548
1	2	1	7	10.50	3.317	3.291	0.0259
1	2	2	7	10.00	3.240	3.294	-0.0535
1	2	3	7	11.25	3.428	3.301	0.1270
1	2	4	7	10.50	3.317	3.397	-0.0806
1	2	5	7	9.75	3.202	3.220	-0.0188
1	2	1	8	15.75	4.031	3.759	0.2718
1	2	2	8	10.25	3.279	3.762	-0.4837
1	2	3	8	11.50	3.464	3.769	-0.3053
1	2	4	8	18.25	4.330	3.866	0.4644
1	2	5	8	13.50	3.742	3.689	0.0528
1	2	1	10	17.25	4.213	4.222	-0.0087
1	2	2	10	22.75	4.822	4.225	0.5970
1	2	3	10	16.25	4.093	4.232	-0.1392
1	2	4	10	16.00	4.062	4.328	-0.2662
1	2	5	10	15.25	3.969	4.151	-0.1828
1	2	1	11	16.50	4.123	3.852	0.2706
1	2	2	11	18.00	4.301	3.856	0.4456
1	2	3	11	15.50	4.000	3.863	0.1374

1	2	4	11	12.25	3.571	3.959	-0.3882
1	2	5	11	10.50	3.317	3.782	-0.4655
1	2	1	12	14.25	3.841	3.950	-0.1093
1	2	2	12	14.00	3.808	3.953	-0.1451
1	2	3	12	15.00	3.937	3.960	-0.0230
1	2	4	12	15.50	4.000	4.056	-0.0563
1	2	5	12	17.25	4.213	3.879	0.3336

===== clleftprun for AREA 2 and YEAR 2 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.0718	0.0179	0.07	0.990
+ CULT	10	6.7826	0.6783	2.72	0.012
Residual	40	9.9580	0.2489		
Total	54	16.8123	0.3113		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as

summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
CULT		
1	4.822	0.223
2	3.841	0.223
3	4.316	0.223
4	4.562	0.223
5	4.881	0.223
6	4.552	0.223
7	4.228	0.223
8	4.530	0.223
10	5.145	0.223
11	4.266	0.223
12	4.826	0.223

*** Coefficient of variation and standard error of a single unit ***

%cv	se
10.98	0.4989

***** Pairwise differences *****

t probabilities of pairwise differences

1	*			
2	0.003	*		
3	0.117	0.140	*	
4	0.415	0.028	0.441	*

5	0.850	0.002	0.081	0.317	*
6	0.398	0.030	0.459	0.975	0.303
7	0.067	0.227	0.781	0.296	0.045
8	0.360	0.035	0.503	0.919	0.272
10	0.311	0.000	0.012	0.072	0.408
11	0.086	0.186	0.873	0.354	0.058
12	0.987	0.003	0.114	0.408	0.861

	1	2	3	4	5
6	*				
7	0.310	*			
8	0.943	0.345	*		
10	0.067	0.006	0.058	*	
11	0.369	0.905	0.408	0.008	*
12	0.391	0.065	0.354	0.317	0.084

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5

7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR	AREA	REP	CULT	clleftprun	Tclleftprun	FITTED	RESIDUAL
2	2	1	1	25.75	5.123	4.802	0.3214
2	2	2	1	27.00	5.244	4.782	0.4617
2	2	3	1	22.25	4.770	4.802	-0.0323
2	2	4	1	20.25	4.555	4.885	-0.3294
2	2	5	1	19.00	4.416	4.837	-0.4215
2	2	1	2	12.25	3.571	3.821	-0.2504
2	2	2	2	13.50	3.742	3.801	-0.0597
2	2	3	2	11.00	3.391	3.821	-0.4299
2	2	4	2	15.50	4.000	3.904	0.0964
2	2	5	2	19.75	4.500	3.856	0.6436
2	2	1	3	28.00	5.339	4.297	1.0419
2	2	2	3	15.50	4.000	4.277	-0.2769
2	2	3	3	16.25	4.093	4.297	-0.2039
2	2	4	3	17.25	4.213	4.379	-0.1661
2	2	5	3	15.00	3.937	4.332	-0.3950
2	2	1	4	19.75	4.500	4.542	-0.0421
2	2	2	4	25.25	5.074	4.522	0.5521
2	2	3	4	24.75	5.025	4.542	0.4829
2	2	4	4	17.75	4.272	4.625	-0.3526
2	2	5	4	15.00	3.937	4.577	-0.6404
2	2	1	5	19.75	4.500	4.862	-0.3618
2	2	2	5	22.25	4.770	4.842	-0.0724
2	2	3	5	21.50	4.690	4.862	-0.1713
2	2	4	5	30.00	5.523	4.944	0.5783

2	2	5	5	23.75	4.924	4.897	0.0273
2	2	1	6	19.25	4.444	4.533	-0.0885
2	2	2	6	18.25	4.330	4.513	-0.1827
2	2	3	6	22.75	4.822	4.533	0.2893
2	2	4	6	20.25	4.555	4.615	-0.0599
2	2	5	6	20.75	4.610	4.568	0.0418
2	2	1	7	16.25	4.093	4.208	-0.1156
2	2	2	7	16.50	4.123	4.189	-0.0654
2	2	3	7	17.50	4.243	4.208	0.0344
2	2	4	7	20.00	4.528	4.291	0.2369
2	2	5	7	16.75	4.153	4.244	-0.0903
2	2	1	8	21.50	4.690	4.510	0.1803
2	2	2	8	13.25	3.708	4.490	-0.7823
2	2	3	8	19.25	4.444	4.510	-0.0659
2	2	4	8	28.25	5.362	4.593	0.7693
2	2	5	8	19.25	4.444	4.545	-0.1014
2	2	1	10	18.25	4.330	5.126	-0.7957
2	2	2	10	36.00	6.042	5.106	0.9354
2	2	3	10	23.50	4.899	5.126	-0.2268
2	2	4	10	21.50	4.690	5.208	-0.5180
2	2	5	10	32.75	5.766	5.161	0.6051
2	2	1	11	24.00	4.950	4.246	0.7036
2	2	2	11	15.75	4.031	4.226	-0.1953
2	2	3	11	18.00	4.301	4.246	0.0551
2	2	4	11	17.75	4.272	4.329	-0.0567
2	2	5	11	13.75	3.775	4.282	-0.5066
2	2	1	12	17.25	4.213	4.806	-0.5931
2	2	2	12	19.50	4.472	4.786	-0.3143
2	2	3	12	25.25	5.074	4.806	0.2683
2	2	4	12	21.50	4.690	4.889	-0.1983
2	2	5	12	31.75	5.679	4.842	0.8374

===== clleftprun for AREA 2 and YEAR 3 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.4688	0.1172	0.29	0.881
+ CULT	10	15.0040	1.5004	3.74	0.001
Residual	39	15.6531	0.4014		
Total	53	31.1259	0.5873		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
CULT		
1	5.637	0.319
2	4.085	0.283
3	5.297	0.283

4	5.972	0.283
5	5.279	0.283
6	5.926	0.283
7	4.926	0.283
8	5.085	0.283
10	5.705	0.283
11	4.932	0.283
12	5.625	0.283

*** Coefficient of variation and standard error of a single unit ***

%cv	se
11.93	0.6335

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.001	*			
3	0.431	0.004	*		
4	0.438	0.000	0.100	*	
5	0.407	0.005	0.964	0.092	*
6	0.503	0.000	0.124	0.909	0.114
7	0.104	0.042	0.360	0.013	0.384
8	0.204	0.017	0.600	0.033	0.631
10	0.874	0.000	0.314	0.509	0.294
11	0.107	0.041	0.368	0.013	0.391
12	0.976	0.000	0.418	0.392	0.393

	1	2	3	4	5
6	*				
7	0.017	*			
8	0.042	0.693	*		
10	0.585	0.059	0.130	*	
11	0.018	0.986	0.704	0.061	*
12	0.457	0.089	0.186	0.842	0.092

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5
7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR	AREA	REP	CULT	clleftprun	Tclleftprun	FITTED	RESIDUAL

3	2	1	1	35.50	6.000	5.598	0.4018
3	2	2	1	33.50	5.831	5.565	0.2657
3	2	3	1	29.75	5.500	5.553	-0.0527
3	2	4	1	*	*	5.848	*
3	2	5	1	24.75	5.025	5.640	-0.6147
3	2	1	2	15.00	3.937	4.046	-0.1088
3	2	2	2	12.75	3.640	4.013	-0.3728
3	2	3	2	13.50	3.742	4.000	-0.2587
3	2	4	2	18.00	4.301	4.295	0.0057
3	2	5	2	22.75	4.822	4.087	0.7346
3	2	1	3	41.50	6.481	5.258	1.2226
3	2	2	3	19.50	4.472	5.225	-0.7530
3	2	3	3	28.25	5.362	5.213	0.1493
3	2	4	3	27.75	5.315	5.508	-0.1927
3	2	5	3	23.25	4.873	5.300	-0.4262
3	2	1	4	37.25	6.144	5.933	0.2108
3	2	2	4	42.25	6.538	5.900	0.6380
3	2	3	4	40.25	6.384	5.888	0.4958
3	2	4	4	30.25	5.545	6.183	-0.6377
3	2	5	4	27.25	5.268	5.975	-0.7069
3	2	1	5	22.75	4.822	5.240	-0.4185
3	2	2	5	32.50	5.745	5.207	0.5372
3	2	3	5	22.25	4.770	5.195	-0.4251
3	2	4	5	38.00	6.205	5.490	0.7148
3	2	5	5	23.25	4.873	5.282	-0.4084
3	2	1	6	26.75	5.220	5.887	-0.6671
3	2	2	6	34.50	5.916	5.854	0.0618
3	2	3	6	38.25	6.225	5.842	0.3832
3	2	4	6	36.50	6.083	6.137	-0.0541
3	2	5	6	38.00	6.205	5.929	0.2762
3	2	1	7	20.33	4.564	4.887	-0.3234
3	2	2	7	23.00	4.848	4.854	-0.0067

3	2	3	7	24.25	4.975	4.842	0.1331
3	2	4	7	28.00	5.339	5.137	0.2015
3	2	5	7	23.75	4.924	4.929	-0.0044
3	2	1	8	31.00	5.612	5.046	0.5661
3	2	2	8	17.75	4.272	5.013	-0.7415
3	2	3	8	17.50	4.243	5.001	-0.7583
3	2	4	8	35.25	5.979	5.296	0.6830
3	2	5	8	28.00	5.339	5.088	0.2507
3	2	1	10	25.75	5.123	5.666	-0.5430
3	2	2	10	43.00	6.595	5.634	0.9619
3	2	3	10	29.00	5.431	5.621	-0.1896
3	2	4	10	27.50	5.292	5.916	-0.6246
3	2	5	10	36.75	6.103	5.708	0.3953
3	2	1	11	32.25	5.723	4.893	0.8298
3	2	2	11	24.25	4.975	4.860	0.1149
3	2	3	11	20.00	4.528	4.847	-0.3198
3	2	4	11	23.75	4.924	5.143	-0.2182
3	2	5	11	20.00	4.528	4.934	-0.4067
3	2	1	12	19.00	4.416	5.586	-1.1703
3	2	2	12	23.00	4.848	5.553	-0.7056
3	2	3	12	40.25	6.384	5.541	0.8429
3	2	4	12	35.00	5.958	5.836	0.1223
3	2	5	12	42.25	6.538	5.628	0.9107

===== clleftprun for AREA 2 and YEAR 4 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	1.7236	0.4309	2.15	0.093
+ CULT	10	22.0597	2.2060	10.99	<.001
Residual	40	8.0299	0.2007		
Total	54	31.8132	0.5891		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
CULT		
1	6.441	0.200
2	5.571	0.200
3	6.593	0.200
4	6.950	0.200
5	7.738	0.200
6	7.332	0.200
7	6.180	0.200
8	7.045	0.200
10	7.792	0.200
11	6.699	0.200
12	7.193	0.200

*** Coefficient of variation and standard error of a single unit ***

%cv	se
6.52	0.4480

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.004	*			
3	0.594	0.001	*		
4	0.080	0.000	0.215	*	
5	0.000	0.000	0.000	0.008	*
6	0.003	0.000	0.013	0.185	0.159
7	0.364	0.038	0.153	0.010	0.000
8	0.039	0.000	0.119	0.740	0.019
10	0.000	0.000	0.000	0.005	0.850
11	0.368	0.000	0.711	0.380	0.001
12	0.011	0.000	0.040	0.396	0.062

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.317	0.004	*		
10	0.112	0.000	0.012	*	
11	0.031	0.075	0.229	0.000	*
12	0.627	0.001	0.603	0.041	0.089

6 7 8 10 11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5
7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR	AREA	REP	CULT	clleftprun	Tclleftprun	FITTED	RESIDUAL
4	2	1	1	39.50	6.325	6.271	0.0532
4	2	2	1	46.50	6.856	6.233	0.6231
4	2	3	1	37.75	6.185	6.428	-0.2437
4	2	4	1	43.25	6.614	6.572	0.0427
4	2	5	1	38.25	6.225	6.700	-0.4753
4	2	1	2	27.75	5.315	5.402	-0.0867
4	2	2	2	25.50	5.099	5.363	-0.2640
4	2	3	2	28.50	5.385	5.559	-0.1737

4	2	4	2	31.25	5.635	5.702	-0.0675
4	2	5	2	40.75	6.423	5.831	0.5919
4	2	1	3	57.75	7.632	6.423	1.2087
4	2	2	3	32.75	5.766	6.385	-0.6184
4	2	3	3	46.00	6.819	6.580	0.2386
4	2	4	3	39.50	6.325	6.724	-0.3992
4	2	5	3	40.75	6.423	6.852	-0.4297
4	2	1	4	47.50	6.928	6.781	0.1476
4	2	2	4	54.50	7.416	6.742	0.6744
4	2	3	4	50.75	7.159	6.938	0.2213
4	2	4	4	44.00	6.671	7.081	-0.4101
4	2	5	4	42.75	6.576	7.210	-0.6331
4	2	1	5	51.25	7.194	7.569	-0.3751
4	2	2	5	57.25	7.599	7.530	0.0692
4	2	3	5	57.00	7.583	7.726	-0.1430
4	2	4	5	61.75	7.890	7.869	0.0206
4	2	5	5	70.50	8.426	7.998	0.4283
4	2	1	6	53.75	7.365	7.163	0.2030
4	2	2	6	49.00	7.036	7.124	-0.0881
4	2	3	6	54.75	7.433	7.320	0.1135
4	2	4	6	51.25	7.194	7.463	-0.2691
4	2	5	6	57.75	7.632	7.591	0.0407
4	2	1	7	30.25	5.545	6.011	-0.4656
4	2	2	7	34.50	5.916	5.972	-0.0560
4	2	3	7	40.00	6.364	6.168	0.1960
4	2	4	7	42.00	6.519	6.311	0.2080
4	2	5	7	42.50	6.557	6.440	0.1176
4	2	1	8	50.25	7.124	6.875	0.2484
4	2	2	8	39.75	6.344	6.837	-0.4924
4	2	3	8	47.25	6.910	7.032	-0.1224
4	2	4	8	56.75	7.566	7.176	0.3906
4	2	5	8	52.50	7.280	7.304	-0.0243

4	2	1	10	49.50	7.071	7.623	-0.5516
4	2	2	10	63.00	7.969	7.584	0.3848
4	2	3	10	62.00	7.906	7.780	0.1260
4	2	4	10	63.25	7.984	7.923	0.0613
4	2	5	10	64.00	8.031	8.052	-0.0204
4	2	1	11	47.75	6.946	6.529	0.4171
4	2	2	11	41.00	6.442	6.490	-0.0483
4	2	3	11	44.50	6.708	6.686	0.0220
4	2	4	11	45.50	6.782	6.829	-0.0472
4	2	5	11	43.25	6.614	6.958	-0.3437
4	2	1	12	38.25	6.225	7.024	-0.7989
4	2	2	12	45.75	6.801	6.985	-0.1843
4	2	3	12	47.75	6.946	7.181	-0.2347
4	2	4	12	60.25	7.794	7.324	0.4700
4	2	5	12	66.75	8.201	7.453	0.7478

===== clleftprun for AREA 2 and YEAR 5 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.9483	0.2371	0.76	0.559
+ CULT	10	30.6448	3.0645	9.79	<.001
Residual	40	12.5257	0.3131		

Total	54	44.1188	0.8170

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
CULT		
1	7.413	0.250
2	5.467	0.250
3	7.094	0.250
4	8.454	0.250
5	7.868	0.250
6	7.784	0.250
7	7.166	0.250
8	8.023	0.250
10	7.504	0.250
11	7.087	0.250
12	7.932	0.250

*** Coefficient of variation and standard error of a single unit ***

%cv	se
7.53	0.5596

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.000	*			
3	0.373	0.000	*		
4	0.005	0.000	0.000	*	
5	0.206	0.000	0.035	0.106	*
6	0.300	0.000	0.058	0.066	0.815
7	0.489	0.000	0.840	0.001	0.054
8	0.092	0.000	0.012	0.231	0.663
10	0.799	0.000	0.254	0.011	0.310
11	0.363	0.000	0.983	0.000	0.033
12	0.150	0.000	0.023	0.148	0.857

	1	2	3	4	5

6	*				
7	0.088	*			
8	0.503	0.020	*		
10	0.433	0.345	0.150	*	
11	0.056	0.826	0.012	0.246	*
12	0.679	0.036	0.798	0.233	0.022

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5
7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR	AREA	REP	CULT	clleftprun	Tclleftprun	FITTED	RESIDUAL
5	2	1	1	55.75	7.500	7.242	0.2578
5	2	2	1	64.75	8.078	7.341	0.7365
5	2	3	1	45.75	6.801	7.359	-0.5583
5	2	4	1	60.25	7.794	7.511	0.2835
5	2	5	1	47.00	6.892	7.612	-0.7195
5	2	1	2	26.75	5.220	5.296	-0.0758
5	2	2	2	26.00	5.148	5.395	-0.2472
5	2	3	2	32.00	5.701	5.413	0.2881
5	2	4	2	27.00	5.244	5.564	-0.3205
5	2	5	2	35.75	6.021	5.665	0.3555
5	2	1	3	64.50	8.062	6.923	1.1389
5	2	2	3	40.00	6.364	7.022	-0.6585
5	2	3	3	51.25	7.194	7.040	0.1535
5	2	4	3	50.25	7.124	7.192	-0.0680
5	2	5	3	44.75	6.727	7.293	-0.5659
5	2	1	4	74.00	8.631	8.283	0.3485

5	2	2	4	78.75	8.902	8.382	0.5203
5	2	3	4	78.00	8.860	8.400	0.4603
5	2	4	4	62.00	7.906	8.551	-0.6457
5	2	5	4	63.00	7.969	8.652	-0.6835
5	2	1	5	59.25	7.730	7.697	0.0328
5	2	2	5	58.75	7.697	7.796	-0.0987
5	2	3	5	55.00	7.450	7.814	-0.3641
5	2	4	5	67.50	8.246	7.966	0.2806
5	2	5	5	67.00	8.216	8.066	0.1494
5	2	1	6	58.25	7.665	7.614	0.0513
5	2	2	6	64.25	8.047	7.713	0.3341
5	2	3	6	64.25	8.047	7.730	0.3163
5	2	4	6	55.00	7.450	7.882	-0.4323
5	2	5	6	59.00	7.714	7.983	-0.2693
5	2	1	7	39.75	6.344	6.995	-0.6508
5	2	2	7	49.75	7.089	7.094	-0.0054
5	2	3	7	52.50	7.280	7.112	0.1682
5	2	4	7	56.00	7.517	7.264	0.2531
5	2	5	7	57.25	7.599	7.364	0.2349
5	2	1	8	66.00	8.155	7.853	0.3021
5	2	2	8	50.25	7.124	7.952	-0.8278
5	2	3	8	53.25	7.331	7.969	-0.6380
5	2	4	8	77.00	8.803	8.121	0.6823
5	2	5	8	75.25	8.703	8.222	0.4815
5	2	1	10	43.00	6.595	7.333	-0.7376
5	2	2	10	66.75	8.201	7.432	0.7685
5	2	3	10	56.25	7.533	7.450	0.0834
5	2	4	10	53.25	7.331	7.602	-0.2701
5	2	5	10	61.25	7.858	7.702	0.1557
5	2	1	11	51.75	7.228	6.917	0.3118
5	2	2	11	44.25	6.690	7.016	-0.3262
5	2	3	11	48.75	7.018	7.033	-0.0156

5	2	4	11	55.50	7.483	7.185	0.2982
5	2	5	11	48.75	7.018	7.286	-0.2682
5	2	1	12	45.50	6.782	7.761	-0.9790
5	2	2	12	58.25	7.665	7.860	-0.1955
5	2	3	12	63.25	7.984	7.878	0.1062
5	2	4	12	63.00	7.969	8.030	-0.0611
5	2	5	12	85.25	9.260	8.131	1.1295

===== clleftprun for AREA 2 and YEAR 6 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	3.2463	0.8116	2.63	0.049
+ CULT	10	37.9708	3.7971	12.29	<.001
Residual	40	12.3539	0.3088		
Total	54	53.5710	0.9921		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as

summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
CULT		
1	7.959	0.249
2	5.927	0.249
3	7.662	0.249
4	9.261	0.249
5	8.651	0.249
6	8.560	0.249
7	7.802	0.249
8	8.647	0.249
10	8.126	0.249
11	7.805	0.249
12	8.668	0.249

*** Coefficient of variation and standard error of a single unit ***

%cv	se
6.86	0.5557

***** Pairwise differences *****

t probabilities of pairwise differences

1	*			
2	0.000	*		
3	0.405	0.000	*	
4	0.001	0.000	0.000	*

5	0.056	0.000	0.008	0.091	*
6	0.095	0.000	0.015	0.053	0.797
7	0.659	0.000	0.692	0.000	0.020
8	0.057	0.000	0.008	0.088	0.987
10	0.637	0.000	0.195	0.002	0.143
11	0.665	0.000	0.687	0.000	0.021
12	0.050	0.000	0.007	0.099	0.962

	1	2	3	4	5
6	*				
7	0.037	*			
8	0.807	0.021	*		
10	0.223	0.364	0.146	*	
11	0.038	0.990	0.021	0.367	*
12	0.761	0.018	0.951	0.131	0.019

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5

7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR	AREA	REP	CULT	clleftprun	Tclleftprun	FITTED	RESIDUAL
6	2	1	1	64.00	8.031	7.918	0.1135
6	2	2	1	71.50	8.485	7.617	0.8680
6	2	3	1	53.00	7.314	7.824	-0.5095
6	2	4	1	67.00	8.216	8.104	0.1113
6	2	5	1	59.50	7.746	8.329	-0.5834
6	2	1	2	31.75	5.679	5.886	-0.2073
6	2	2	2	29.75	5.500	5.586	-0.0858
6	2	3	2	35.50	6.000	5.792	0.2076
6	2	4	2	34.75	5.937	6.073	-0.1359
6	2	5	2	42.00	6.519	6.298	0.2213
6	2	1	3	81.75	9.069	7.622	1.4476
6	2	2	3	45.00	6.745	7.321	-0.5758
6	2	3	3	56.00	7.517	7.528	-0.0112
6	2	4	3	53.75	7.365	7.808	-0.4430
6	2	5	3	57.50	7.616	8.033	-0.4176
6	2	1	4	93.75	9.708	9.220	0.4883
6	2	2	4	86.25	9.314	8.920	0.3944
6	2	3	4	86.25	9.314	9.126	0.1878
6	2	4	4	83.75	9.179	9.407	-0.2280
6	2	5	4	76.75	8.789	9.632	-0.8425
6	2	1	5	68.25	8.292	8.610	-0.3189
6	2	2	5	68.50	8.307	8.310	-0.0034
6	2	3	5	74.25	8.646	8.517	0.1291
6	2	4	5	78.75	8.902	8.797	0.1049

6	2	5	5	82.50	9.110	9.022	0.0882
6	2	1	6	80.33	8.991	8.520	0.4709
6	2	2	6	66.00	8.155	8.219	-0.0644
6	2	3	6	71.75	8.500	8.426	0.0742
6	2	4	6	70.00	8.396	8.706	-0.3100
6	2	5	6	76.25	8.761	8.931	-0.1706
6	2	1	7	46.25	6.837	7.762	-0.9242
6	2	2	7	59.50	7.746	7.461	0.2848
6	2	3	7	60.00	7.778	7.668	0.1103
6	2	4	7	64.75	8.078	7.948	0.1293
6	2	5	7	73.00	8.573	8.173	0.3999
6	2	1	8	72.25	8.529	8.606	-0.0765
6	2	2	8	56.00	7.517	8.305	-0.7888
6	2	3	8	76.75	8.789	8.512	0.2771
6	2	4	8	84.25	9.206	8.793	0.4133
6	2	5	8	84.00	9.192	9.018	0.1748
6	2	1	10	53.25	7.331	8.085	-0.7532
6	2	2	10	65.00	8.093	7.784	0.3090
6	2	3	10	63.25	7.984	7.991	-0.0065
6	2	4	10	72.50	8.544	8.272	0.2725
6	2	5	10	74.75	8.675	8.496	0.1783
6	2	1	11	67.75	8.261	7.764	0.4971
6	2	2	11	48.25	6.982	7.464	-0.4818
6	2	3	11	59.00	7.714	7.671	0.0431
6	2	4	11	68.50	8.307	7.951	0.3555
6	2	5	11	59.75	7.762	8.176	-0.4139
6	2	1	12	61.75	7.890	8.627	-0.7372
6	2	2	12	71.25	8.471	8.327	0.1438
6	2	3	12	64.00	8.031	8.533	-0.5021
6	2	4	12	72.50	8.544	8.814	-0.2699
6	2	5	12	107.75	10.404	9.039	1.3655

===== clleftprun for AREA 2 and YEAR 7 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	1.5169	0.3792	1.78	0.153
+ CULT	10	34.1457	3.4146	15.98	<.001
Residual	40	8.5448	0.2136		
Total	54	44.2073	0.8187		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
CULT		
1	8.038	0.207
2	5.583	0.207
3	7.431	0.207

4	8.949	0.207
5	8.036	0.207
6	8.125	0.207
7	7.786	0.207
8	8.175	0.207
10	7.863	0.207
11	7.501	0.207
12	7.947	0.207

*** Coefficient of variation and standard error of a single unit ***

%cv	se
5.95	0.4622

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.000	*			
3	0.045	0.000	*		
4	0.003	0.000	0.000	*	
5	0.991	0.000	0.045	0.003	*
6	0.766	0.000	0.023	0.007	0.762
7	0.394	0.000	0.232	0.000	0.397
8	0.641	0.000	0.015	0.012	0.638
10	0.554	0.000	0.147	0.001	0.557
11	0.074	0.000	0.811	0.000	0.075
12	0.757	0.000	0.086	0.001	0.761

	1	2	3	4	5
6	*				
7	0.253	*			
8	0.866	0.191	*		
10	0.375	0.793	0.292	*	
11	0.039	0.336	0.027	0.223	*
12	0.545	0.586	0.440	0.776	0.136

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5
7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR AREA REP CULT clleftprun Tclleftprun FITTED RESIDUAL

7	2	1	1	61.75	7.890	7.995	-0.1054
7	2	2	1	67.25	8.231	7.794	0.4368
7	2	3	1	64.75	8.078	7.961	0.1172
7	2	4	1	68.25	8.292	8.167	0.1243
7	2	5	1	58.75	7.697	8.270	-0.5728
7	2	1	2	26.00	5.148	5.541	-0.3934
7	2	2	2	29.25	5.454	5.340	0.1142
7	2	3	2	32.50	5.745	5.507	0.2380
7	2	4	2	31.00	5.612	5.713	-0.1008
7	2	5	2	35.00	5.958	5.816	0.1420
7	2	1	3	74.25	8.646	7.389	1.2569
7	2	2	3	41.75	6.500	7.188	-0.6878
7	2	3	3	54.75	7.433	7.354	0.0788
7	2	4	3	51.75	7.228	7.561	-0.3325
7	2	5	3	53.50	7.348	7.664	-0.3154
7	2	1	4	87.75	9.394	8.906	0.4877
7	2	2	4	79.75	8.958	8.705	0.2529
7	2	3	4	80.00	8.972	8.872	0.1005
7	2	4	4	78.00	8.860	9.078	-0.2184
7	2	5	4	72.75	8.559	9.181	-0.6227
7	2	1	5	56.00	7.517	7.994	-0.4771
7	2	2	5	56.25	7.533	7.793	-0.2594
7	2	3	5	63.75	8.016	7.959	0.0566
7	2	4	5	66.25	8.170	8.166	0.0043
7	2	5	5	79.50	8.944	8.269	0.6756
7	2	1	6	73.67	8.612	8.083	0.5295
7	2	2	6	64.25	8.047	7.882	0.1651
7	2	3	6	63.25	7.984	8.048	-0.0637
7	2	4	6	61.00	7.842	8.255	-0.4126
7	2	5	6	65.75	8.139	8.358	-0.2183
7	2	1	7	51.67	7.223	7.744	-0.5207
7	2	2	7	58.75	7.697	7.543	0.1549

7	2	3	7	59.50	7.746	7.709	0.0371
7	2	4	7	66.75	8.201	7.916	0.2850
7	2	5	7	64.50	8.062	8.019	0.0437
7	2	1	8	69.00	8.337	8.132	0.2042
7	2	2	8	56.00	7.517	7.931	-0.4148
7	2	3	8	61.75	7.890	8.098	-0.2079
7	2	4	8	74.75	8.675	8.304	0.3702
7	2	5	8	71.00	8.456	8.407	0.0483
7	2	1	10	54.00	7.382	7.821	-0.4383
7	2	2	10	61.00	7.842	7.620	0.2226
7	2	3	10	61.25	7.858	7.786	0.0722
7	2	4	10	66.75	8.201	7.993	0.2079
7	2	5	10	64.00	8.031	8.096	-0.0644
7	2	1	11	59.00	7.714	7.459	0.2546
7	2	2	11	49.50	7.071	7.258	-0.1869
7	2	3	11	53.50	7.348	7.424	-0.0759
7	2	4	11	61.75	7.890	7.631	0.2588
7	2	5	11	55.50	7.483	7.734	-0.2507
7	2	1	12	50.00	7.106	7.904	-0.7979
7	2	2	12	62.00	7.906	7.703	0.2025
7	2	3	12	56.00	7.517	7.870	-0.3529
7	2	4	12	61.75	7.890	8.076	-0.1864
7	2	5	12	86.25	9.314	8.179	1.1347

===== clleftprun for AREA 3 and YEAR 1 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	1.35037	0.33759	3.57	0.014
+ CULT	10	8.69694	0.86969	9.20	<.001
Residual	40	3.78205	0.09455		
Total	54	13.82935	0.25610		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
CULT		
1	3.828	0.138
2	3.177	0.138
3	3.492	0.138
4	3.431	0.138
5	3.691	0.138
6	4.128	0.138
7	3.844	0.138
8	3.129	0.138
10	4.449	0.138
11	3.395	0.138
12	3.226	0.138

*** Coefficient of variation and standard error of a single unit ***

%cv	se
8.50	0.3075

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.002	*			
3	0.091	0.113	*		
4	0.048	0.198	0.757	*	
5	0.484	0.012	0.312	0.189	*
6	0.132	0.000	0.002	0.001	0.030
7	0.934	0.001	0.077	0.040	0.435
8	0.001	0.806	0.069	0.127	0.006
10	0.003	0.000	0.000	0.000	0.000
11	0.032	0.268	0.621	0.853	0.136
12	0.004	0.799	0.180	0.299	0.022

	1	2	3	4	5
6	*				
7	0.153	*			
8	0.000	0.001	*		
10	0.107	0.003	0.000	*	
11	0.001	0.026	0.178	0.000	*
12	0.000	0.003	0.617	0.000	0.391

6 7 8 10 11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5
7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR	AREA	REP	CULT	clleftprun	Tclleftprun	FITTED	RESIDUAL
1	3	1	1	14.00	3.808	4.028	-0.2198
1	3	2	1	10.50	3.317	3.969	-0.6519
1	3	3	1	14.75	3.905	3.587	0.3176
1	3	4	1	17.75	4.272	3.795	0.4767
1	3	5	1	14.25	3.841	3.763	0.0774
1	3	1	2	15.25	3.969	3.376	0.5928
1	3	2	2	10.50	3.317	3.317	0.0000
1	3	3	2	8.75	3.041	2.936	0.1058

1	3	4	2	8.25	2.958	3.143	-0.1854
1	3	5	2	6.25	2.598	3.111	-0.5132
1	3	1	3	14.75	3.905	3.691	0.2140
1	3	2	3	11.75	3.500	3.632	-0.1320
1	3	3	3	6.50	2.646	3.251	-0.6052
1	3	4	3	12.00	3.536	3.459	0.0768
1	3	5	3	14.50	3.873	3.427	0.4464
1	3	1	4	14.50	3.873	3.630	0.2425
1	3	2	4	14.25	3.841	3.571	0.2692
1	3	3	4	8.75	3.041	3.190	-0.1489
1	3	4	4	9.25	3.122	3.398	-0.2756
1	3	5	4	10.25	3.279	3.366	-0.0872
1	3	1	5	13.00	3.674	3.890	-0.2161
1	3	2	5	17.25	4.213	3.831	0.3819
1	3	3	5	11.50	3.464	3.450	0.0140
1	3	4	5	11.50	3.464	3.658	-0.1939
1	3	5	5	12.75	3.640	3.626	0.0142
1	3	1	6	17.25	4.213	4.327	-0.1140
1	3	2	6	17.75	4.272	4.268	0.0041
1	3	3	6	16.25	4.093	3.887	0.2058
1	3	4	6	16.25	4.093	4.095	-0.0020
1	3	5	6	15.25	3.969	4.063	-0.0939
1	3	1	7	15.75	4.031	4.044	-0.0125
1	3	2	7	15.25	3.969	3.985	-0.0159
1	3	3	7	14.25	3.841	3.603	0.2371
1	3	4	7	13.50	3.742	3.811	-0.0696
1	3	5	7	12.75	3.640	3.779	-0.1391
1	3	1	8	10.00	3.240	3.328	-0.0874
1	3	2	8	9.00	3.082	3.269	-0.1864
1	3	3	8	8.75	3.041	2.888	0.1538
1	3	4	8	8.50	3.000	3.095	-0.0954
1	3	5	8	10.25	3.279	3.063	0.2155

1	3	1	10	19.50	4.472	4.648	-0.1760
1	3	2	10	23.75	4.924	4.589	0.3354
1	3	3	10	14.75	3.905	4.208	-0.3028
1	3	4	10	18.75	4.387	4.416	-0.0283
1	3	5	10	20.25	4.555	4.384	0.1716
1	3	1	11	13.00	3.674	3.594	0.0799
1	3	2	11	13.75	3.775	3.535	0.2397
1	3	3	11	9.50	3.162	3.154	0.0082
1	3	4	11	12.00	3.536	3.362	0.1736
1	3	5	11	7.50	2.828	3.330	-0.5014
1	3	1	12	9.25	3.122	3.426	-0.3032
1	3	2	12	9.25	3.122	3.367	-0.2441
1	3	3	12	8.50	3.000	2.986	0.0145
1	3	4	12	10.50	3.317	3.193	0.1233
1	3	5	12	12.25	3.571	3.161	0.4095

===== clleftprun for AREA 3 and YEAR 2 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	1.2998	0.3249	2.41	0.065
+ CULT	10	24.9156	2.4916	18.44	<.001
Residual	40	5.4036	0.1351		

Total	54	31.6190	0.5855

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
CULT		
1	4.648	0.164
2	4.268	0.164
3	5.033	0.164
4	5.041	0.164
5	4.786	0.164
6	5.911	0.164
7	4.934	0.164
8	4.586	0.164
10	6.709	0.164
11	4.613	0.164
12	4.554	0.164

*** Coefficient of variation and standard error of a single unit ***

%cv	se
7.34	0.3675

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.110	*			
3	0.106	0.002	*		
4	0.099	0.002	0.972	*	
5	0.555	0.031	0.295	0.280	*
6	0.000	0.000	0.001	0.001	0.000
7	0.226	0.007	0.673	0.649	0.529
8	0.791	0.179	0.062	0.057	0.394
10	0.000	0.000	0.000	0.000	0.000
11	0.879	0.146	0.078	0.073	0.459
12	0.688	0.226	0.046	0.043	0.324

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.142	*		
10	0.001	0.000	0.000	*	
11	0.000	0.174	0.909	0.000	*
12	0.000	0.110	0.891	0.000	0.802

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5
7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR	AREA	REP	CULT	clleftprun	Tclleftprun	FITTED	RESIDUAL
2	3	1	1	21.00	4.637	4.766	-0.1296
2	3	2	1	20.00	4.528	4.808	-0.2799
2	3	3	1	22.50	4.796	4.444	0.3522
2	3	4	1	18.25	4.330	4.481	-0.1504
2	3	5	1	24.00	4.950	4.742	0.2077
2	3	1	2	28.50	5.385	4.386	0.9989
2	3	2	2	17.25	4.213	4.427	-0.2143
2	3	3	2	14.25	3.841	4.063	-0.2229
2	3	4	2	14.00	3.808	4.100	-0.2925
2	3	5	2	16.25	4.093	4.362	-0.2692
2	3	1	3	27.25	5.268	5.151	0.1167
2	3	2	3	25.75	5.123	5.192	-0.0688
2	3	3	3	18.75	4.387	4.828	-0.4409
2	3	4	3	24.50	5.000	4.865	0.1347
2	3	5	3	28.50	5.385	5.127	0.2583
2	3	1	4	30.50	5.568	5.159	0.4087

2	3	2	4	30.50	5.568	5.200	0.3675
2	3	3	4	20.25	4.555	4.836	-0.2811
2	3	4	4	22.50	4.796	4.873	-0.0774
2	3	5	4	21.75	4.717	5.135	-0.4178
2	3	1	5	24.75	5.025	4.905	0.1202
2	3	2	5	27.00	5.244	4.946	0.2982
2	3	3	5	21.50	4.690	4.582	0.1085
2	3	4	5	19.50	4.472	4.619	-0.1467
2	3	5	5	19.75	4.500	4.880	-0.3803
2	3	1	6	33.75	5.852	6.030	-0.1772
2	3	2	6	33.00	5.788	6.071	-0.2828
2	3	3	6	36.00	6.042	5.707	0.3347
2	3	4	6	34.50	5.916	5.744	0.1724
2	3	5	6	35.00	5.958	6.005	-0.0471
2	3	1	7	22.25	4.770	5.052	-0.2828
2	3	2	7	23.75	4.924	5.094	-0.1692
2	3	3	7	23.00	4.848	4.730	0.1180
2	3	4	7	22.00	4.743	4.767	-0.0231
2	3	5	7	28.50	5.385	5.028	0.3571
2	3	1	8	20.50	4.583	4.704	-0.1219
2	3	2	8	17.75	4.272	4.746	-0.4736
2	3	3	8	18.75	4.387	4.382	0.0059
2	3	4	8	19.25	4.444	4.419	0.0256
2	3	5	8	27.00	5.244	4.680	0.5640
2	3	1	10	40.25	6.384	6.827	-0.4437
2	3	2	10	57.50	7.616	6.868	0.7473
2	3	3	10	39.25	6.305	6.504	-0.1997
2	3	4	10	40.50	6.403	6.541	-0.1383
2	3	5	10	46.25	6.837	6.803	0.0344
2	3	1	11	20.25	4.555	4.731	-0.1757
2	3	2	11	23.75	4.924	4.772	0.1523
2	3	3	11	22.25	4.770	4.408	0.3616

2	3	4	11	21.50	4.690	4.445	0.2454
2	3	5	11	16.50	4.123	4.707	-0.5835
2	3	1	12	18.50	4.359	4.672	-0.3135
2	3	2	12	21.00	4.637	4.714	-0.0767
2	3	3	12	17.25	4.213	4.350	-0.1365
2	3	4	12	21.00	4.637	4.386	0.2503
2	3	5	12	23.75	4.924	4.648	0.2764

===== clleftprun for AREA 3 and YEAR 3 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	1.2717	0.3179	1.40	0.251
+ CULT	10	62.9323	6.2932	27.74	<.001
Residual	40	9.0731	0.2268		
Total	54	73.2772	1.3570		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as

summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
CULT		
1	5.143	0.213
2	4.965	0.213
3	5.498	0.213
4	6.138	0.213
5	5.075	0.213
6	7.316	0.213
7	5.492	0.213
8	5.242	0.213
10	8.386	0.213
11	5.127	0.213
12	4.845	0.213

*** Coefficient of variation and standard error of a single unit ***

%cv	se
8.29	0.4763

***** Pairwise differences *****

t probabilities of pairwise differences

1	*			
2	0.557	*		
3	0.246	0.084	*	
4	0.002	0.000	0.040	*

5	0.822	0.717	0.168	0.001	*
6	0.000	0.000	0.000	0.000	0.000
7	0.254	0.088	0.981	0.038	0.174
8	0.745	0.363	0.400	0.005	0.582
10	0.000	0.000	0.000	0.000	0.000
11	0.957	0.593	0.225	0.002	0.863
12	0.328	0.693	0.036	0.000	0.450

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.412	*		
10	0.001	0.000	0.000	*	
11	0.000	0.233	0.705	0.000	*
12	0.000	0.038	0.195	0.000	0.355

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5

7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR	AREA	REP	CULT	clleftprun	Tclleftprun	FITTED	RESIDUAL
3	3	1	1	26.25	5.172	5.278	-0.1056
3	3	2	1	22.50	4.796	5.213	-0.4171
3	3	3	1	26.00	5.148	4.961	0.1865
3	3	4	1	25.75	5.123	4.960	0.1635
3	3	5	1	29.50	5.477	5.304	0.1727
3	3	1	2	39.67	6.338	5.099	1.2385
3	3	2	2	22.50	4.796	5.035	-0.2389
3	3	3	2	19.50	4.472	4.783	-0.3110
3	3	4	2	21.00	4.637	4.782	-0.1449
3	3	5	2	20.50	4.583	5.126	-0.5437
3	3	1	3	32.50	5.745	5.632	0.1121
3	3	2	3	33.00	5.788	5.568	0.2201
3	3	3	3	26.00	5.148	5.316	-0.1684
3	3	4	3	26.75	5.220	5.315	-0.0946
3	3	5	3	30.75	5.590	5.659	-0.0692
3	3	1	4	39.75	6.344	6.272	0.0719
3	3	2	4	38.75	6.265	6.208	0.0573
3	3	3	4	36.25	6.062	5.956	0.1061
3	3	4	4	37.00	6.124	5.955	0.1691
3	3	5	4	34.25	5.895	6.299	-0.4043
3	3	1	5	28.25	5.362	5.209	0.1526
3	3	2	5	31.75	5.679	5.145	0.5343
3	3	3	5	22.50	4.796	4.893	-0.0972
3	3	4	5	23.00	4.848	4.892	-0.0439

3	3	5	5	21.50	4.690	5.236	-0.5457
3	3	1	6	54.75	7.433	7.451	-0.0175
3	3	2	6	46.75	6.874	7.386	-0.5120
3	3	3	6	57.00	7.583	7.134	0.4486
3	3	4	6	56.50	7.550	7.133	0.4170
3	3	5	6	50.50	7.141	7.477	-0.3360
3	3	1	7	28.50	5.385	5.626	-0.2408
3	3	2	7	29.25	5.454	5.561	-0.1070
3	3	3	7	28.00	5.339	5.310	0.0288
3	3	4	7	28.50	5.385	5.308	0.0769
3	3	5	7	34.25	5.895	5.653	0.2421
3	3	1	8	25.00	5.050	5.376	-0.3266
3	3	2	8	21.75	4.717	5.312	-0.5947
3	3	3	8	23.25	4.873	5.060	-0.1867
3	3	4	8	23.50	4.899	5.059	-0.1597
3	3	5	8	44.00	6.671	5.403	1.2676
3	3	1	10	68.75	8.322	8.520	-0.1986
3	3	2	10	89.00	9.460	8.456	1.0048
3	3	3	10	61.75	7.890	8.204	-0.3141
3	3	4	10	59.00	7.714	8.203	-0.4890
3	3	5	10	72.50	8.544	8.547	-0.0031
3	3	1	11	24.50	5.000	5.262	-0.2615
3	3	2	11	27.50	5.292	5.197	0.0947
3	3	3	11	29.75	5.500	4.945	0.5548
3	3	4	11	25.25	5.074	4.944	0.1307
3	3	5	11	22.25	4.770	5.288	-0.5186
3	3	1	12	20.25	4.555	4.980	-0.4243
3	3	2	12	23.25	4.873	4.915	-0.0415
3	3	3	12	19.00	4.416	4.663	-0.2474
3	3	4	12	21.00	4.637	4.662	-0.0250
3	3	5	12	32.50	5.745	5.006	0.7382

===== clleftprun for AREA 3 and YEAR 4 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	1.6654	0.4164	1.86	0.137
+ CULT	10	82.2698	8.2270	36.67	<.001
Residual	40	8.9750	0.2244		
Total	54	92.9103	1.7206		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
CULT		
1	6.193	0.212
2	6.227	0.212
3	6.648	0.212

4	8.042	0.212
5	5.845	0.212
6	7.966	0.212
7	6.400	0.212
8	6.184	0.212
10	9.953	0.212
11	5.984	0.212
12	5.905	0.212

*** Coefficient of variation and standard error of a single unit ***

%cv	se
6.92	0.4737

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.910	*			
3	0.137	0.168	*		
4	0.000	0.000	0.000	*	
5	0.253	0.210	0.011	0.000	*
6	0.000	0.000	0.000	0.799	0.000
7	0.493	0.567	0.413	0.000	0.071
8	0.975	0.886	0.129	0.000	0.265
10	0.000	0.000	0.000	0.000	0.000
11	0.489	0.422	0.032	0.000	0.646
12	0.343	0.289	0.017	0.000	0.842

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.475	*		
10	0.000	0.000	0.000	*	
11	0.000	0.172	0.508	0.000	*
12	0.000	0.106	0.358	0.000	0.794

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5
7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR AREA REP CULT clleftprun Tclleftprun FITTED RESIDUAL

4	3	1	1	39.00	6.285	6.343	-0.0578
4	3	2	1	39.00	6.285	6.161	0.1235
4	3	3	1	39.00	6.285	5.970	0.3151
4	3	4	1	30.75	5.590	6.054	-0.4642
4	3	5	1	42.00	6.519	6.436	0.0834
4	3	1	2	53.00	7.314	6.377	0.9376
4	3	2	2	36.75	6.103	6.196	-0.0922
4	3	3	2	34.50	5.916	6.004	-0.0879
4	3	4	2	37.25	6.144	6.088	0.0556
4	3	5	2	31.50	5.657	6.470	-0.8131
4	3	1	3	38.50	6.245	6.798	-0.5528
4	3	2	3	46.25	6.837	6.616	0.2209
4	3	3	3	38.00	6.205	6.425	-0.2201
4	3	4	3	42.00	6.519	6.509	0.0098
4	3	5	3	54.75	7.433	6.891	0.5421
4	3	1	4	66.25	8.170	8.192	-0.0222
4	3	2	4	64.50	8.062	8.011	0.0513
4	3	3	4	62.00	7.906	7.819	0.0863
4	3	4	4	61.25	7.858	7.904	-0.0458
4	3	5	4	67.00	8.216	8.285	-0.0696
4	3	1	5	37.75	6.185	5.995	0.1896
4	3	2	5	37.75	6.185	5.814	0.3709
4	3	3	5	30.50	5.568	5.622	-0.0545
4	3	4	5	32.75	5.766	5.707	0.0596
4	3	5	5	30.00	5.523	6.088	-0.5655
4	3	1	6	71.00	8.456	8.116	0.3401
4	3	2	6	55.50	7.483	7.934	-0.4510
4	3	3	6	62.50	7.937	7.743	0.1945
4	3	4	6	64.25	8.047	7.827	0.2195
4	3	5	6	62.00	7.906	8.209	-0.3031
4	3	1	7	40.00	6.364	6.550	-0.1860
4	3	2	7	44.25	6.690	6.369	0.3209

4	3	3	7	36.50	6.083	6.177	-0.0943
4	3	4	7	40.00	6.364	6.262	0.1024
4	3	5	7	41.75	6.500	6.643	-0.1431
4	3	1	8	37.67	6.178	6.334	-0.1556
4	3	2	8	29.00	5.431	6.152	-0.7211
4	3	3	8	33.50	5.831	5.961	-0.1300
4	3	4	8	32.00	5.701	6.045	-0.3446
4	3	5	8	60.00	7.778	6.427	1.3512
4	3	1	10	104.00	10.223	10.103	0.1198
4	3	2	10	102.25	10.137	9.921	0.2152
4	3	3	10	93.00	9.670	9.730	-0.0603
4	3	4	10	95.75	9.811	9.814	-0.0036
4	3	5	10	98.00	9.925	10.196	-0.2711
4	3	1	11	33.00	5.788	6.134	-0.3457
4	3	2	11	30.00	5.523	5.952	-0.4296
4	3	3	11	42.00	6.519	5.761	0.7584
4	3	4	11	39.75	6.344	5.845	0.4990
4	3	5	11	32.50	5.745	6.227	-0.4822
4	3	1	12	33.00	5.788	6.055	-0.2671
4	3	2	12	38.75	6.265	5.874	0.3912
4	3	3	12	24.25	4.975	5.682	-0.7073
4	3	4	12	31.75	5.679	5.767	-0.0878
4	3	5	12	46.00	6.819	6.148	0.6709

===== clleftprun for AREA 3 and YEAR 5 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	1.8857	0.4714	1.59	0.197
+ CULT	10	99.9864	9.9986	33.63	<.001
Residual	40	11.8939	0.2973		
Total	54	113.7661	2.1068		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
CULT		
1	6.773	0.244
2	6.181	0.244
3	7.252	0.244
4	9.136	0.244
5	5.551	0.244
6	9.015	0.244
7	6.785	0.244
8	6.661	0.244
10	9.726	0.244
11	6.192	0.244
12	6.125	0.244

*** Coefficient of variation and standard error of a single unit ***

%cv	se
7.55	0.5453

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.094	*			
3	0.173	0.003	*		
4	0.000	0.000	0.000	*	
5	0.001	0.075	0.000	0.000	*
6	0.000	0.000	0.000	0.727	0.000
7	0.972	0.088	0.183	0.000	0.001
8	0.747	0.172	0.094	0.000	0.003
10	0.000	0.000	0.000	0.095	0.000
11	0.100	0.974	0.004	0.000	0.070
12	0.068	0.871	0.002	0.000	0.104

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.722	*		
10	0.046	0.000	0.000	*	
11	0.000	0.094	0.182	0.000	*
12	0.000	0.063	0.128	0.000	0.847

6 7 8 10 11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5
7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR	AREA	REP	CULT	clleftprun	Tclleftprun	FITTED	RESIDUAL
5	3	1	1	47.50	6.928	6.895	0.0330
5	3	2	1	51.25	7.194	6.733	0.4606
5	3	3	1	45.75	6.801	6.556	0.2446
5	3	4	1	41.25	6.461	6.618	-0.1565
5	3	5	1	41.50	6.481	7.063	-0.5818
5	3	1	2	48.50	7.000	6.304	0.6965
5	3	2	2	36.75	6.103	6.141	-0.0381
5	3	3	2	29.25	5.454	5.964	-0.5101

5	3	4	2	38.25	6.225	6.026	0.1987
5	3	5	2	37.00	6.124	6.471	-0.3471
5	3	1	3	49.00	7.036	7.374	-0.3385
5	3	2	3	59.50	7.746	7.212	0.5339
5	3	3	3	43.25	6.614	7.035	-0.4207
5	3	4	3	49.25	7.053	7.097	-0.0435
5	3	5	3	60.50	7.810	7.541	0.2688
5	3	1	4	79.25	8.930	9.258	-0.3281
5	3	2	4	78.00	8.860	9.096	-0.2363
5	3	3	4	85.50	9.274	8.919	0.3543
5	3	4	4	80.25	8.986	8.981	0.0050
5	3	5	4	92.25	9.631	9.426	0.2050
5	3	1	5	32.75	5.766	5.673	0.0933
5	3	2	5	37.75	6.185	5.511	0.6738
5	3	3	5	28.00	5.339	5.334	0.0047
5	3	4	5	27.00	5.244	5.396	-0.1516
5	3	5	5	26.75	5.220	5.840	-0.6201
5	3	1	6	94.25	9.734	9.137	0.5966
5	3	2	6	63.75	8.016	8.975	-0.9597
5	3	3	6	84.50	9.220	8.798	0.4212
5	3	4	6	78.00	8.860	8.860	-0.0001
5	3	5	6	85.00	9.247	9.305	-0.0581
5	3	1	7	43.50	6.633	6.907	-0.2736
5	3	2	7	47.75	6.946	6.745	0.2015
5	3	3	7	46.00	6.819	6.568	0.2513
5	3	4	7	43.25	6.614	6.630	-0.0152
5	3	5	7	47.25	6.910	7.074	-0.1640
5	3	1	8	41.67	6.494	6.783	-0.2893
5	3	2	8	31.00	5.612	6.621	-1.0086
5	3	3	8	41.25	6.461	6.444	0.0174
5	3	4	8	36.25	6.062	6.506	-0.4437
5	3	5	8	74.75	8.675	6.950	1.7242

5	3	1	10	96.00	9.823	9.848	-0.0247
5	3	2	10	97.25	9.887	9.686	0.2008
5	3	3	10	85.25	9.260	9.509	-0.2490
5	3	4	10	97.25	9.887	9.571	0.3160
5	3	5	10	95.00	9.772	10.015	-0.2431
5	3	1	11	34.50	5.916	6.314	-0.3984
5	3	2	11	38.00	6.205	6.152	0.0525
5	3	3	11	44.00	6.671	5.975	0.6955
5	3	4	11	40.50	6.403	6.037	0.3660
5	3	5	11	32.75	5.766	6.482	-0.7155
5	3	1	12	41.50	6.481	6.247	0.2334
5	3	2	12	38.00	6.205	6.085	0.1196
5	3	3	12	25.50	5.099	5.908	-0.8093
5	3	4	12	34.25	5.895	5.970	-0.0752
5	3	5	12	47.75	6.946	6.415	0.5315

===== clleftprun for AREA 3 and YEAR 6 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	1.6623	0.4156	1.24	0.309
+ CULT	10	164.5732	16.4573	49.16	<.001
Residual	40	13.3900	0.3347		

Total	54	179.6255	3.3264

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

CULT	Prediction	se
1	6.803	0.259
2	5.941	0.259
3	6.859	0.259
4	10.358	0.259
5	6.117	0.259
6	9.975	0.259
7	6.566	0.259
8	6.965	0.259
10	10.616	0.259
11	6.322	0.259
12	6.430	0.259

*** Coefficient of variation and standard error of a single unit ***

%cv	se
7.67	0.5786

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.024	*			
3	0.880	0.016	*		
4	0.000	0.000	0.000	*	
5	0.068	0.633	0.050	0.000	*
6	0.000	0.000	0.000	0.301	0.000
7	0.521	0.095	0.429	0.000	0.227
8	0.660	0.008	0.772	0.000	0.026
10	0.000	0.000	0.000	0.485	0.000
11	0.197	0.304	0.151	0.000	0.578
12	0.314	0.190	0.248	0.000	0.399

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.282	*		
10	0.087	0.000	0.000	*	
11	0.000	0.509	0.087	0.000	*
12	0.000	0.711	0.151	0.000	0.771

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5
7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR	AREA	REP	CULT	clleftprun	Tclleftprun	FITTED	RESIDUAL
6	3	1	1	51.25	7.194	6.875	0.3190
6	3	2	1	53.75	7.365	6.850	0.5151
6	3	3	1	44.50	6.708	6.631	0.0769
6	3	4	1	39.50	6.325	6.592	-0.2670
6	3	5	1	40.75	6.423	7.067	-0.6440
6	3	1	2	47.50	6.928	6.013	0.9151
6	3	2	2	37.75	6.185	5.989	0.1961
6	3	3	2	28.00	5.339	5.770	-0.4310
6	3	4	2	28.00	5.339	5.730	-0.3913
6	3	5	2	34.50	5.916	6.205	-0.2889
6	3	1	3	44.25	6.690	6.930	-0.2409
6	3	2	3	49.25	7.053	6.906	0.1474
6	3	3	3	37.75	6.185	6.687	-0.5023
6	3	4	3	48.50	7.000	6.647	0.3528
6	3	5	3	53.75	7.365	7.122	0.2431
6	3	1	4	104.75	10.259	10.430	-0.1710

6	3	2	4	112.50	10.630	10.406	0.2244
6	3	3	4	107.50	10.392	10.187	0.2056
6	3	4	4	98.75	9.962	10.147	-0.1845
6	3	5	4	110.75	10.548	10.622	-0.0745
6	3	1	5	41.25	6.461	6.189	0.2722
6	3	2	5	44.75	6.727	6.165	0.5620
6	3	3	5	36.00	6.042	5.946	0.0958
6	3	4	5	31.00	5.612	5.906	-0.2935
6	3	5	5	32.50	5.745	6.381	-0.6365
6	3	1	6	113.75	10.689	10.047	0.6422
6	3	2	6	86.00	9.301	10.022	-0.7216
6	3	3	6	97.25	9.887	9.803	0.0838
6	3	4	6	96.25	9.836	9.763	0.0728
6	3	5	6	102.75	10.161	10.238	-0.0773
6	3	1	7	39.00	6.285	6.638	-0.3531
6	3	2	7	46.00	6.819	6.614	0.2056
6	3	3	7	44.00	6.671	6.395	0.2763
6	3	4	7	43.50	6.633	6.355	0.2785
6	3	5	7	40.75	6.423	6.830	-0.4073
6	3	1	8	47.33	6.916	7.037	-0.1212
6	3	2	8	34.50	5.916	7.013	-1.0966
6	3	3	8	46.25	6.837	6.794	0.0438
6	3	4	8	37.75	6.185	6.754	-0.5692
6	3	5	8	80.00	8.972	7.229	1.7432
6	3	1	10	103.50	10.198	10.688	-0.4899
6	3	2	10	113.25	10.665	10.663	0.0019
6	3	3	10	112.50	10.630	10.444	0.1857
6	3	4	10	117.25	10.851	10.405	0.4466
6	3	5	10	114.75	10.735	10.880	-0.1443
6	3	1	11	32.00	5.701	6.394	-0.6934
6	3	2	11	40.33	6.390	6.370	0.0200
6	3	3	11	49.00	7.036	6.151	0.8848

6	3	4	11	40.50	6.403	6.111	0.2921
6	3	5	11	36.50	6.083	6.586	-0.5034
6	3	1	12	40.75	6.423	6.501	-0.0788
6	3	2	12	40.75	6.423	6.477	-0.0544
6	3	3	12	28.00	5.339	6.258	-0.9194
6	3	4	12	41.50	6.481	6.218	0.2626
6	3	5	12	55.50	7.483	6.693	0.7900

===== clleftprun for AREA 3 and YEAR 7 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	3.1878	0.7969	2.44	0.063
+ CULT	10	183.5585	18.3558	56.13	<.001
Residual	40	13.0819	0.3270		
Total	54	199.8281	3.7005		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as

summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
CULT		
1	6.778	0.256
2	5.781	0.256
3	7.570	0.256
4	9.478	0.256
5	5.997	0.256
6	10.438	0.256
7	6.567	0.256
8	6.293	0.256
10	11.079	0.256
11	6.266	0.256
12	6.169	0.256

*** Coefficient of variation and standard error of a single unit ***

%cv	se
7.63	0.5719

***** Pairwise differences *****

t probabilities of pairwise differences

1	*			
2	0.009	*		
3	0.034	0.000	*	
4	0.000	0.000	0.000	*

5	0.037	0.554	0.000	0.000	*
6	0.000	0.000	0.000	0.011	0.000
7	0.563	0.036	0.008	0.000	0.122
8	0.187	0.164	0.001	0.000	0.418
10	0.000	0.000	0.000	0.000	0.000
11	0.164	0.187	0.001	0.000	0.461
12	0.100	0.289	0.000	0.000	0.636

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.452	*		
10	0.084	0.000	0.000	*	
11	0.000	0.409	0.940	0.000	*
12	0.000	0.277	0.733	0.000	0.790

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	104	37.25	255.9
2	105	28.87	152.0
3	105	37.28	287.9
4	105	58.48	964.8
5	105	50.73	819.4
6	105	58.60	814.5

7	105	36.40	248.7
8	105	46.91	619.1
10	105	61.79	933.7
11	105	44.80	594.7
12	105	48.65	784.8

YEAR	AREA	REP	CULT	clleftprun	Tclleftprun	FITTED	RESIDUAL
7	3	1	1	48.25	6.982	6.922	0.0600
7	3	2	1	56.75	7.566	7.089	0.4771
7	3	3	1	42.75	6.576	6.618	-0.0411
7	3	4	1	39.75	6.344	6.404	-0.0598
7	3	5	1	40.75	6.423	6.859	-0.4363
7	3	1	2	42.75	6.576	5.924	0.6520
7	3	2	2	38.50	6.245	6.092	0.1534
7	3	3	2	26.75	5.220	5.620	-0.3997
7	3	4	2	28.25	5.362	5.406	-0.0445
7	3	5	2	29.75	5.500	5.861	-0.3612
7	3	1	3	53.00	7.314	7.714	-0.3997
7	3	2	3	67.25	8.231	7.881	0.3498
7	3	3	3	40.75	6.423	7.409	-0.9869
7	3	4	3	59.00	7.714	7.196	0.5176
7	3	5	3	66.25	8.170	7.651	0.5192
7	3	1	4	96.25	9.836	9.621	0.2148
7	3	2	4	91.50	9.592	9.789	-0.1969
7	3	3	4	91.25	9.579	9.317	0.2618
7	3	4	4	81.00	9.028	9.103	-0.0756
7	3	5	4	87.00	9.354	9.558	-0.2040
7	3	1	5	43.00	6.595	6.140	0.4550
7	3	2	5	44.75	6.727	6.308	0.4192
7	3	3	5	36.25	6.062	5.836	0.2263
7	3	4	5	29.75	5.500	5.622	-0.1224

7	3	5	5	25.50	5.099	6.077	-0.9782
7	3	1	6	125.00	11.203	10.582	0.6210
7	3	2	6	100.50	10.050	10.749	-0.6990
7	3	3	6	112.25	10.618	10.277	0.3412
7	3	4	6	94.75	9.760	10.064	-0.3041
7	3	5	6	111.00	10.559	10.518	0.0409
7	3	1	7	46.50	6.856	6.711	0.1445
7	3	2	7	48.25	6.982	6.878	0.1038
7	3	3	7	44.00	6.671	6.407	0.2642
7	3	4	7	37.00	6.124	6.193	-0.0694
7	3	5	7	38.00	6.205	6.648	-0.4431
7	3	1	8	34.67	5.930	6.437	-0.5063
7	3	2	8	31.75	5.679	6.604	-0.9250
7	3	3	8	38.50	6.245	6.132	0.1129
7	3	4	8	31.33	5.642	5.919	-0.2768
7	3	5	8	63.00	7.969	6.373	1.5952
7	3	1	10	108.25	10.428	11.222	-0.7940
7	3	2	10	140.25	11.864	11.390	0.4743
7	3	3	10	124.00	11.158	10.918	0.2402
7	3	4	10	119.00	10.932	10.704	0.2273
7	3	5	10	120.75	11.011	11.159	-0.1478
7	3	1	11	33.75	5.852	6.410	-0.5572
7	3	2	11	43.00	6.595	6.577	0.0187
7	3	3	11	47.75	6.946	6.105	0.8412
7	3	4	11	33.75	5.852	5.892	-0.0392
7	3	5	11	36.50	6.083	6.346	-0.2636
7	3	1	12	40.75	6.423	6.313	0.1099
7	3	2	12	39.25	6.305	6.480	-0.1752
7	3	3	12	26.00	5.148	6.008	-0.8603
7	3	4	12	36.00	6.042	5.795	0.2468
7	3	5	12	47.50	6.928	6.249	0.6787

Appendix 3.7.2 ANOVA for number of fertile cladodes of individual cultivars over production years and areas

JPfertcladAOV.out

file is JPfyieldAOV.gen

========== CACTUS PEAR ENVIRONMENTAL ADAPTIBILITY: FRUIT YIELD

counts transformed to stabilise treatment variances Y = sqrt(X+0.5)

===== fertclad for AREA 1 and YEAR 1 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.7152	0.1788	0.47	0.756
+ CULT	10	58.3606	5.8361	15.42	<.001
Residual	40	15.1377	0.3784		
Total	54	74.2135	1.3743		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as

summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

	Prediction	se
CULT		
1	0.943	0.275
2	1.339	0.275
3	0.978	0.275
4	1.210	0.275
5	3.517	0.275
6	2.100	0.275
7	0.829	0.275
8	3.184	0.275
10	2.975	0.275
11	3.076	0.275
12	3.192	0.275

*** Coefficient of variation and standard error of a single unit ***

%cv	se
28.99	0.6152

***** Pairwise differences *****

t probabilities of pairwise differences

1	*	
2	0.315	*

3	0.929	0.358	*		
4	0.498	0.740	0.555	*	
5	0.000	0.000	0.000	0.000	*
6	0.005	0.058	0.006	0.027	0.001
7	0.771	0.197	0.705	0.334	0.000
8	0.000	0.000	0.000	0.000	0.398
10	0.000	0.000	0.000	0.000	0.171
11	0.000	0.000	0.000	0.000	0.264
12	0.000	0.000	0.000	0.000	0.409

	1	2	3	4	5
6	*				
7	0.002	*			
8	0.008	0.000	*		
10	0.030	0.000	0.594	*	
11	0.016	0.000	0.783	0.795	*
12	0.008	0.000	0.982	0.580	0.768

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	105	4.34	33.01
2	105	3.84	8.81
3	105	3.81	23.06
4	105	15.47	171.04

5	105	16.24	140.76
6	105	14.30	97.29
7	105	2.29	9.62
8	105	12.29	97.68
10	105	21.43	110.94
11	105	14.31	113.80
12	105	16.83	170.54

YEAR	AREA	REP	CULT	fertclad	Tfertclad	FITTED	RESIDUAL
1	1	1	0.250	0.866	0.875	-0.0088	
1	1	2	0.750	1.118	0.933	0.1848	
1	1	3	0.250	0.866	0.831	0.0354	
1	1	4	0.500	1.000	0.918	0.0824	
1	1	5	0.250	0.866	1.160	-0.2938	
1	1	1	1.500	1.414	1.271	0.1432	
1	1	2	1.500	1.414	1.329	0.0849	
1	1	3	0.000	0.707	1.227	-0.5197	
1	1	4	1.000	1.225	1.314	-0.0889	
1	1	5	3.250	1.936	1.556	0.3805	
1	1	1	0.250	0.866	0.909	-0.0433	
1	1	2	1.000	1.225	0.968	0.2570	
1	1	3	0.000	0.707	0.865	-0.1580	
1	1	4	0.250	0.866	0.952	-0.0860	
1	1	5	1.000	1.225	1.194	0.0304	
1	1	1	0.500	1.000	1.141	-0.1412	
1	1	2	1.000	1.225	1.200	0.0252	
1	1	3	2.500	1.732	1.097	0.6351	
1	1	4	1.000	1.225	1.184	0.0409	
1	1	5	0.250	0.866	1.426	-0.5601	
1	1	1	21.250	4.664	3.448	1.2154	
1	1	2	10.250	3.279	3.507	-0.2280	

1	1	3	5	7.250	2.784	3.404	-0.6202
1	1	4	5	17.640	4.259	3.491	0.7681
1	1	5	5	6.250	2.598	3.733	-1.1352
1	1	1	6	2.000	1.581	2.031	-0.4502
1	1	2	6	2.750	1.803	2.090	-0.2869
1	1	3	6	3.000	1.871	1.987	-0.1163
1	1	4	6	6.500	2.646	2.074	0.5717
1	1	5	6	6.250	2.598	2.316	0.2818
1	1	1	7	0.500	1.000	0.761	0.2391
1	1	2	7	0.250	0.866	0.819	0.0468
1	1	3	7	0.000	0.707	0.717	-0.0096
1	1	4	7	0.250	0.866	0.804	0.0624
1	1	5	7	0.000	0.707	1.046	-0.3387
1	1	1	8	12.250	3.571	3.116	0.4549
1	1	2	8	9.250	3.122	3.174	-0.0516
1	1	3	8	6.250	2.598	3.072	-0.4735
1	1	4	8	9.750	3.202	3.158	0.0431
1	1	5	8	11.250	3.428	3.401	0.0271
1	1	1	10	8.500	3.000	2.907	0.0935
1	1	2	10	11.000	3.391	2.965	0.4263
1	1	3	10	7.250	2.784	2.862	-0.0784
1	1	4	10	5.000	2.345	2.949	-0.6040
1	1	5	10	10.750	3.354	3.191	0.1626
1	1	1	11	6.750	2.693	3.008	-0.3155
1	1	2	11	10.000	3.240	3.066	0.1740
1	1	3	11	13.000	3.674	2.964	0.7104
1	1	4	11	9.000	3.082	3.051	0.0315
1	1	5	11	6.750	2.693	3.293	-0.6004
1	1	1	12	3.250	1.936	3.124	-1.1871
1	1	2	12	6.000	2.550	3.182	-0.6324
1	1	3	12	13.000	3.674	3.079	0.5948
1	1	4	12	5.000	2.345	3.166	-0.8211

1 1 5 12 29.250 5.454 3.409 2.0458

===== fertclad for AREA 1 and YEAR 2 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.8141	0.2035	0.49	0.742
+ CULT	10	68.8944	6.8894	16.64	<.001
Residual	40	16.5625	0.4141		
Total	54	86.2710	1.5976		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

	Prediction	se
CULT		
1	0.943	0.288

2	1.511	0.288
3	0.707	0.288
4	1.088	0.288
5	3.668	0.288
6	2.137	0.288
7	0.921	0.288
8	3.343	0.288
10	3.117	0.288
11	3.202	0.288
12	3.347	0.288

*** Coefficient of variation and standard error of a single unit ***

%cv	se
29.51	0.6435

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.171	*			
3	0.565	0.055	*		
4	0.723	0.306	0.354	*	
5	0.000	0.000	0.000	0.000	*
6	0.006	0.132	0.001	0.014	0.001
7	0.955	0.155	0.603	0.682	0.000
8	0.000	0.000	0.000	0.000	0.429

10	0.000	0.000	0.000	0.000	0.183
11	0.000	0.000	0.000	0.000	0.258
12	0.000	0.000	0.000	0.000	0.434

	1	2	3	4	5
6	*				
7	0.005	*			
8	0.005	0.000	*		
10	0.021	0.000	0.581	*	
11	0.012	0.000	0.729	0.836	*
12	0.005	0.000	0.990	0.575	0.723

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	105	4.34	33.01
2	105	3.84	8.81
3	105	3.81	23.06
4	105	15.47	171.04
5	105	16.24	140.76
6	105	14.30	97.29
7	105	2.29	9.62
8	105	12.29	97.68
10	105	21.43	110.94
11	105	14.31	113.80

12 105 16.83 170.54

YEAR	AREA	REP	CULT	fertclad	Tfertclad	FITTED	RESIDUAL
2	1	1	1	0.250	0.866	0.867	-0.0012
2	1	2	1	0.750	1.118	0.877	0.2406
2	1	3	1	0.250	0.866	0.922	-0.0556
2	1	4	1	0.500	1.000	0.867	0.1334
2	1	5	1	0.250	0.866	1.183	-0.3171
2	1	1	2	1.500	1.414	1.435	-0.0204
2	1	2	2	1.500	1.414	1.445	-0.0307
2	1	3	2	1.750	1.500	1.489	0.0109
2	1	4	2	1.000	1.225	1.434	-0.2092
2	1	5	2	3.500	2.000	1.751	0.2494
2	1	1	3	0.000	0.707	0.631	0.0760
2	1	2	3	0.000	0.707	0.641	0.0657
2	1	3	3	0.000	0.707	0.686	0.0216
2	1	4	3	0.000	0.707	0.630	0.0767
2	1	5	3	0.000	0.707	0.947	-0.2399
2	1	1	4	0.500	1.000	1.012	-0.0124
2	1	2	4	1.000	1.225	1.023	0.2021
2	1	3	4	2.750	1.803	1.067	0.7360
2	1	4	4	0.000	0.707	1.012	-0.3046
2	1	5	4	0.000	0.707	1.328	-0.6212
2	1	1	5	23.500	4.899	3.592	1.3065
2	1	2	5	11.000	3.391	3.603	-0.2116
2	1	3	5	8.000	2.915	3.647	-0.7314
2	1	4	5	19.250	4.444	3.592	0.8523
2	1	5	5	6.750	2.693	3.908	-1.2158
2	1	1	6	2.000	1.581	2.061	-0.4801
2	1	2	6	2.750	1.803	2.071	-0.2687
2	1	3	6	3.000	1.871	2.116	-0.2448

2	1	4	6	7.000	2.739	2.061	0.6781
2	1	5	6	6.750	2.693	2.377	0.3155
2	1	1	7	0.500	1.000	0.845	0.1553
2	1	2	7	0.000	0.707	0.855	-0.1478
2	1	3	7	0.000	0.707	0.899	-0.1919
2	1	4	7	0.250	0.866	0.844	0.0221
2	1	5	7	1.250	1.323	1.161	0.1623
2	1	1	8	13.750	3.775	3.267	0.5075
2	1	2	8	10.250	3.279	3.278	0.0011
2	1	3	8	7.000	2.739	3.322	-0.5832
2	1	4	8	10.750	3.354	3.267	0.0873
2	1	5	8	12.250	3.571	3.583	-0.0126
2	1	1	10	9.250	3.122	3.041	0.0815
2	1	2	10	12.250	3.571	3.051	0.5195
2	1	3	10	8.250	2.958	3.095	-0.1373
2	1	4	10	5.250	2.398	3.040	-0.6424
2	1	5	10	12.000	3.536	3.357	0.1786
2	1	1	11	7.250	2.784	3.126	-0.3419
2	1	2	11	10.750	3.354	3.136	0.2181
2	1	3	11	14.250	3.841	3.180	0.6604
2	1	4	11	9.750	3.202	3.125	0.0765
2	1	5	11	7.500	2.828	3.442	-0.6132
2	1	1	12	3.500	2.000	3.271	-1.2708
2	1	2	12	6.750	2.693	3.281	-0.5885
2	1	3	12	14.250	3.841	3.325	0.5153
2	1	4	12	5.750	2.500	3.270	-0.7702
2	1	5	12	32.000	5.701	3.587	2.1141

===== fertclad for AREA 1 and YEAR 3 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.7155	0.1789	0.77	0.554
+ CULT	10	146.9867	14.6987	62.95	<.001
Residual	40	9.3397	0.2335		
Total	54	157.0419	2.9082		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

	Prediction	se
CULT		
1	1.801	0.216
2	3.009	0.216
3	1.076	0.216
4	2.369	0.216
5	5.591	0.216
6	3.943	0.216
7	1.194	0.216

8	4.622	0.216
10	5.041	0.216
11	4.928	0.216
12	5.391	0.216

*** Coefficient of variation and standard error of a single unit ***

%cv	se
13.64	0.4832

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.000	*			
3	0.023	0.000	*		
4	0.070	0.043	0.000	*	
5	0.000	0.000	0.000	0.000	*
6	0.000	0.004	0.000	0.000	0.000
7	0.054	0.000	0.700	0.000	0.000
8	0.000	0.000	0.000	0.000	0.003
10	0.000	0.000	0.000	0.000	0.079
11	0.000	0.000	0.000	0.000	0.036
12	0.000	0.000	0.000	0.000	0.515

1	2	3	4	5

6	*				
7	0.000	*			
8	0.032	0.000	*		
10	0.001	0.000	0.178	*	
11	0.003	0.000	0.322	0.715	*
12	0.000	0.000	0.016	0.259	0.138

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	105	4.34	33.01
2	105	3.84	8.81
3	105	3.81	23.06
4	105	15.47	171.04
5	105	16.24	140.76
6	105	14.30	97.29
7	105	2.29	9.62
8	105	12.29	97.68
10	105	21.43	110.94
11	105	14.31	113.80
12	105	16.83	170.54

YEAR	AREA	REP	CULT	fertclad	Tfertclad	FITTED	RESIDUAL
3	1	1	1	1.25	1.323	1.650	-0.3270
3	1	2	1	2.00	1.581	1.678	-0.0972

3	1	3	1	4.75	2.291	1.911	0.3804
3	1	4	1	3.25	1.936	1.850	0.0865
3	1	5	1	3.00	1.871	1.914	-0.0428
3	1	1	2	7.25	2.784	2.859	-0.0747
3	1	2	2	5.50	2.449	2.887	-0.4376
3	1	3	2	5.50	2.449	3.120	-0.6701
3	1	4	2	16.50	4.123	3.059	1.0644
3	1	5	2	10.00	3.240	3.122	0.1180
3	1	1	3	0.00	0.707	0.925	-0.2180
3	1	2	3	0.50	1.000	0.954	0.0464
3	1	3	3	1.00	1.225	1.186	0.0386
3	1	4	3	2.00	1.581	1.125	0.4559
3	1	5	3	0.25	0.866	1.189	-0.3229
3	1	1	4	5.50	2.449	2.219	0.2309
3	1	2	4	2.75	1.803	2.247	-0.4443
3	1	3	4	5.25	2.398	2.480	-0.0817
3	1	4	4	6.25	2.598	2.419	0.1794
3	1	5	4	6.25	2.598	2.482	0.1157
3	1	1	5	38.25	6.225	5.441	0.7842
3	1	2	5	28.75	5.408	5.469	-0.0608
3	1	3	5	36.25	6.062	5.702	0.3605
3	1	4	5	31.75	5.679	5.641	0.0381
3	1	5	5	20.50	4.583	5.705	-1.1219
3	1	1	6	18.00	4.301	3.793	0.5084
3	1	2	6	19.00	4.416	3.821	0.5947
3	1	3	6	11.75	3.500	4.054	-0.5537
3	1	4	6	10.50	3.317	3.993	-0.6762
3	1	5	6	17.00	4.183	4.057	0.1268
3	1	1	7	0.75	1.118	1.044	0.0744
3	1	2	7	1.75	1.500	1.072	0.4279
3	1	3	7	0.25	0.866	1.305	-0.4386
3	1	4	7	0.00	0.707	1.244	-0.5366

3	1	5	7	2.67	1.780	1.307	0.4730
3	1	1	8	15.50	4.000	4.471	-0.4712
3	1	2	8	19.75	4.500	4.500	0.0004
3	1	3	8	23.25	4.873	4.732	0.1412
3	1	4	8	25.50	5.099	4.671	0.4278
3	1	5	8	21.00	4.637	4.735	-0.0982
3	1	1	10	21.00	4.637	4.890	-0.2531
3	1	2	10	23.25	4.873	4.918	-0.0449
3	1	3	10	23.25	4.873	5.151	-0.2774
3	1	4	10	25.25	5.074	5.090	-0.0155
3	1	5	10	32.50	5.745	5.154	0.5909
3	1	1	11	19.50	4.472	4.777	-0.3052
3	1	2	11	22.75	4.822	4.806	0.0160
3	1	3	11	33.75	5.852	5.038	0.8140
3	1	4	11	19.25	4.444	4.977	-0.5334
3	1	5	11	25.00	5.050	5.041	0.0086
3	1	1	12	27.50	5.292	5.240	0.0514
3	1	2	12	27.25	5.268	5.269	-0.0007
3	1	3	12	33.00	5.788	5.501	0.2868
3	1	4	12	24.00	4.950	5.440	-0.4904
3	1	5	12	31.50	5.657	5.504	0.1530

===== fertclad for AREA 1 and YEAR 4 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	1.6812	0.4203	1.82	0.144
+ CULT	10	130.2217	13.0222	56.34	<.001
Residual	40	9.2452	0.2311		
Total	54	141.1480	2.6139		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

CULT	Prediction	se
1	1.350	0.215
2	2.699	0.215
3	2.292	0.215
4	3.288	0.215
5	5.433	0.215
6	3.958	0.215
7	0.811	0.215
8	4.185	0.215
10	5.342	0.215
11	4.946	0.215
12	4.984	0.215

*** Coefficient of variation and standard error of a single unit ***

%cv	se
13.46	0.4808

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.000	*			
3	0.004	0.189	*		
4	0.000	0.059	0.002	*	
5	0.000	0.000	0.000	0.000	*
6	0.000	0.000	0.000	0.034	0.000
7	0.084	0.000	0.000	0.000	0.000
8	0.000	0.000	0.000	0.005	0.000
10	0.000	0.000	0.000	0.000	0.765
11	0.000	0.000	0.000	0.000	0.117
12	0.000	0.000	0.000	0.000	0.147

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.459	0.000	*		
10	0.000	0.000	0.000	*	
11	0.002	0.000	0.017	0.200	*
12	0.002	0.000	0.012	0.246	0.901

6 7 8 10 11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	105	4.34	33.01
2	105	3.84	8.81
3	105	3.81	23.06
4	105	15.47	171.04
5	105	16.24	140.76
6	105	14.30	97.29
7	105	2.29	9.62
8	105	12.29	97.68
10	105	21.43	110.94
11	105	14.31	113.80
12	105	16.83	170.54

YEAR	AREA	REP	CULT	fertclad	Tfertclad	FITTED	RESIDUAL
4	1	1	1	1.00	1.225	1.188	0.0370
4	1	2	1	2.25	1.658	1.158	0.5002
4	1	3	1	3.25	1.936	1.443	0.4937
4	1	4	1	1.00	1.225	1.634	-0.4092
4	1	5	1	0.00	0.707	1.329	-0.6218
4	1	1	2	6.25	2.598	2.536	0.0621
4	1	2	2	8.25	2.958	2.506	0.4517
4	1	3	2	6.50	2.646	2.791	-0.1452

4	1	4	2	6.25	2.598	2.982	-0.3841
4	1	5	2	6.75	2.693	2.677	0.0155
4	1	1	3	4.75	2.291	2.130	0.1613
4	1	2	3	3.25	1.936	2.100	-0.1638
4	1	3	3	5.00	2.345	2.385	-0.0397
4	1	4	3	4.75	2.291	2.576	-0.2849
4	1	5	3	6.25	2.598	2.271	0.3270
4	1	1	4	8.75	3.041	3.126	-0.0844
4	1	2	4	8.25	2.958	3.096	-0.1380
4	1	3	4	11.00	3.391	3.381	0.0104
4	1	4	4	8.25	2.958	3.572	-0.6139
4	1	5	4	16.25	4.093	3.267	0.8258
4	1	1	5	29.00	5.431	5.271	0.1606
4	1	2	5	29.75	5.500	5.241	0.2589
4	1	3	5	22.25	4.770	5.526	-0.7561
4	1	4	5	46.50	6.856	5.717	1.1387
4	1	5	5	20.75	4.610	5.412	-0.8021
4	1	1	6	7.50	2.828	3.795	-0.9667
4	1	2	6	12.00	3.536	3.765	-0.2299
4	1	3	6	18.75	4.387	4.050	0.3374
4	1	4	6	26.50	5.196	4.241	0.9548
4	1	5	6	14.25	3.841	3.936	-0.0956
4	1	1	7	0.00	0.707	0.648	0.0590
4	1	2	7	0.00	0.707	0.618	0.0887
4	1	3	7	0.00	0.707	0.903	-0.1960
4	1	4	7	1.00	1.225	1.094	0.1304
4	1	5	7	0.00	0.707	0.789	-0.0821
4	1	1	8	18.25	4.330	4.022	0.3077
4	1	2	8	14.50	3.873	3.993	-0.1197
4	1	3	8	16.00	4.062	4.277	-0.2154
4	1	4	8	17.75	4.272	4.469	-0.1966
4	1	5	8	18.75	4.387	4.164	0.2240

4	1	1	10	29.00	5.431	5.179	0.2520
4	1	2	10	28.00	5.339	5.150	0.1888
4	1	3	10	28.75	5.408	5.434	-0.0261
4	1	4	10	33.00	5.788	5.626	0.1623
4	1	5	10	22.00	4.743	5.321	-0.5771
4	1	1	11	23.50	4.899	4.783	0.1156
4	1	2	11	16.75	4.153	4.754	-0.6004
4	1	3	11	29.00	5.431	5.038	0.3930
4	1	4	11	25.00	5.050	5.230	-0.1798
4	1	5	11	26.50	5.196	4.925	0.2716
4	1	1	12	21.75	4.717	4.821	-0.1043
4	1	2	12	20.25	4.555	4.792	-0.2365
4	1	3	12	26.75	5.220	5.076	0.1438
4	1	4	12	24.00	4.950	5.268	-0.3178
4	1	5	12	29.50	5.477	4.962	0.5148

===== fertclad for AREA 1 and YEAR 5 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.3155	0.0789	0.48	0.751
+ CULT	10	166.7762	16.6776	101.31	<.001
Residual	40	6.5849	0.1646		

Total	54	173.6767	3.2162

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

CULT	Prediction	se
1	1.199	0.181
2	1.979	0.181
3	0.848	0.181
4	4.337	0.181
5	4.888	0.181
6	3.253	0.181
7	0.771	0.181
8	4.240	0.181
10	4.266	0.181
11	5.520	0.181
12	5.411	0.181

*** Coefficient of variation and standard error of a single unit ***

%cv	se
12.16	0.4057

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.004	*			
3	0.179	0.000	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.038	*
6	0.000	0.000	0.000	0.000	0.000
7	0.103	0.000	0.765	0.000	0.000
8	0.000	0.000	0.000	0.707	0.016
10	0.000	0.000	0.000	0.784	0.020
11	0.000	0.000	0.000	0.000	0.018
12	0.000	0.000	0.000	0.000	0.048

	1	2	3	4	5

6	*				
7	0.000	*			
8	0.000	0.000	*		
10	0.000	0.000	0.919	*	
11	0.000	0.000	0.000	0.000	*
12	0.000	0.000	0.000	0.000	0.675

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	105	4.34	33.01
2	105	3.84	8.81
3	105	3.81	23.06
4	105	15.47	171.04
5	105	16.24	140.76
6	105	14.30	97.29
7	105	2.29	9.62
8	105	12.29	97.68
10	105	21.43	110.94
11	105	14.31	113.80
12	105	16.83	170.54

YEAR	AREA	REP	CULT	fertclad	Tfertclad	FITTED	RESIDUAL
5	1	1	1	1.00	1.225	1.206	0.0183
5	1	2	1	2.00	1.581	1.183	0.3985
5	1	3	1	1.25	1.323	1.263	0.0595
5	1	4	1	0.25	0.866	1.065	-0.1987
5	1	5	1	0.50	1.000	1.278	-0.2777
5	1	1	2	2.25	1.658	1.986	-0.3280
5	1	2	2	4.25	2.179	1.963	0.2169
5	1	3	2	3.50	2.000	2.043	-0.0432
5	1	4	2	2.25	1.658	1.845	-0.1862
5	1	5	2	5.25	2.398	2.057	0.3404
5	1	1	3	0.00	0.707	0.855	-0.1482
5	1	2	3	0.00	0.707	0.832	-0.1245
5	1	3	3	0.50	1.000	0.912	0.0878
5	1	4	3	0.00	0.707	0.714	-0.0065

5	1	5	3	0.75	1.118	0.927	0.1915
5	1	1	4	23.00	4.848	4.344	0.5034
5	1	2	4	15.75	4.031	4.320	-0.2894
5	1	3	4	20.25	4.555	4.401	0.1541
5	1	4	4	12.75	3.640	4.203	-0.5625
5	1	5	4	20.75	4.610	4.415	0.1943
5	1	1	5	24.75	5.025	4.896	0.1293
5	1	2	5	27.25	5.268	4.872	0.3959
5	1	3	5	24.75	5.025	4.953	0.0724
5	1	4	5	24.50	5.000	4.754	0.2461
5	1	5	5	16.50	4.123	4.967	-0.8438
5	1	1	6	12.25	3.571	3.260	0.3106
5	1	2	6	10.25	3.279	3.236	0.0424
5	1	3	6	8.75	3.041	3.317	-0.2756
5	1	4	6	11.75	3.500	3.118	0.3816
5	1	5	6	7.75	2.872	3.331	-0.4590
5	1	1	7	0.00	0.707	0.778	-0.0710
5	1	2	7	0.00	0.707	0.754	-0.0473
5	1	3	7	0.25	0.866	0.835	0.0310
5	1	4	7	0.00	0.707	0.636	0.0707
5	1	5	7	0.25	0.866	0.849	0.0166
5	1	1	8	15.00	3.937	4.247	-0.3102
5	1	2	8	17.25	4.213	4.223	-0.0103
5	1	3	8	13.75	3.775	4.304	-0.5291
5	1	4	8	20.75	4.610	4.105	0.5043
5	1	5	8	21.25	4.664	4.318	0.3453
5	1	1	10	15.00	3.937	4.273	-0.3364
5	1	2	10	22.75	4.822	4.250	0.5721
5	1	3	10	18.00	4.301	4.330	-0.0292
5	1	4	10	18.00	4.301	4.132	0.1695
5	1	5	10	15.25	3.969	4.345	-0.3760
5	1	1	11	29.50	5.477	5.527	-0.0500

5	1	2	11	28.50	5.385	5.503	-0.1183
5	1	3	11	37.00	6.124	5.584	0.5396
5	1	4	11	24.50	5.000	5.385	-0.3855
5	1	5	11	31.00	5.612	5.598	0.0141
5	1	1	12	32.00	5.701	5.419	0.2821
5	1	2	12	18.50	4.359	5.395	-1.0361
5	1	3	12	28.75	5.408	5.476	-0.0673
5	1	4	12	27.00	5.244	5.277	-0.0330
5	1	5	12	39.75	6.344	5.490	0.8543

===== fertclad for AREA 1 and YEAR 6 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.8375	0.2094	1.18	0.333
+ CULT	10	163.6256	16.3626	92.49	<.001
Residual	40	7.0765	0.1769		
Total	54	171.5396	3.1767		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

CULT	Prediction	se
1	1.595	0.188
2	2.463	0.188
3	1.365	0.188
4	4.098	0.188
5	5.200	0.188
6	3.386	0.188
7	1.051	0.188
8	4.789	0.188
10	4.732	0.188
11	5.884	0.188
12	5.884	0.188

*** Coefficient of variation and standard error of a single unit ***

%cv	se
11.44	0.4206

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.002	*			
3	0.392	0.000	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.000	*
6	0.000	0.001	0.000	0.011	0.000
7	0.047	0.000	0.245	0.000	0.000
8	0.000	0.000	0.000	0.013	0.130
10	0.000	0.000	0.000	0.022	0.086
11	0.000	0.000	0.000	0.000	0.014
12	0.000	0.000	0.000	0.000	0.014

	1	2	3	4	5

6	*				
7	0.000	*			
8	0.000	0.000	*		
10	0.000	0.000	0.831	*	
11	0.000	0.000	0.000	0.000	*
12	0.000	0.000	0.000	0.000	0.992

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	105	4.34	33.01
2	105	3.84	8.81

3	105	3.81	23.06
4	105	15.47	171.04
5	105	16.24	140.76
6	105	14.30	97.29
7	105	2.29	9.62
8	105	12.29	97.68
10	105	21.43	110.94
11	105	14.31	113.80
12	105	16.83	170.54

YEAR	AREA	REP	CULT	fertclad	Tfertclad	FITTED	RESIDUAL
6	1	1	1	1.50	1.414	1.661	-0.2469
6	1	2	1	5.25	2.398	1.646	0.7520
6	1	3	1	0.25	0.866	1.589	-0.7228
6	1	4	1	0.75	1.118	1.362	-0.2443
6	1	5	1	4.25	2.179	1.717	0.4620
6	1	1	2	4.25	2.179	2.529	-0.3498
6	1	2	2	7.25	2.784	2.514	0.2698
6	1	3	2	4.25	2.179	2.457	-0.2776
6	1	4	2	5.00	2.345	2.230	0.1147
6	1	5	2	7.50	2.828	2.586	0.2428
6	1	1	3	2.25	1.658	1.431	0.2275
6	1	2	3	1.25	1.323	1.416	-0.0927
6	1	3	3	1.75	1.500	1.359	0.1415
6	1	4	3	0.75	1.118	1.132	-0.0139
6	1	5	3	1.00	1.225	1.487	-0.2623
6	1	1	4	18.50	4.359	4.164	0.1945
6	1	2	4	11.75	3.500	4.149	-0.6491
6	1	3	4	21.75	4.717	4.092	0.6249
6	1	4	4	11.75	3.500	3.866	-0.3655
6	1	5	4	19.00	4.416	4.221	0.1952

6	1	1	5	31.50	5.657	5.266	0.3907
6	1	2	5	26.00	5.148	5.251	-0.1031
6	1	3	5	25.25	5.074	5.194	-0.1195
6	1	4	5	24.00	4.950	4.967	-0.0176
6	1	5	5	26.25	5.172	5.322	-0.1504
6	1	1	6	17.25	4.213	3.452	0.7615
6	1	2	6	8.75	3.041	3.436	-0.3949
6	1	3	6	9.25	3.122	3.379	-0.2568
6	1	4	6	14.75	3.905	3.153	0.7524
6	1	5	6	6.50	2.646	3.508	-0.8621
6	1	1	7	0.00	0.707	1.117	-0.4099
6	1	2	7	1.25	1.323	1.102	0.2212
6	1	3	7	0.50	1.000	1.045	-0.0447
6	1	4	7	0.50	1.000	0.818	0.1819
6	1	5	7	1.00	1.225	1.173	0.0515
6	1	1	8	24.67	5.017	4.855	0.1622
6	1	2	8	22.50	4.796	4.839	-0.0437
6	1	3	8	24.50	5.000	4.782	0.2175
6	1	4	8	18.75	4.387	4.556	-0.1684
6	1	5	8	22.00	4.743	4.911	-0.1676
6	1	1	10	22.25	4.770	4.798	-0.0281
6	1	2	10	21.75	4.717	4.783	-0.0655
6	1	3	10	26.25	5.172	4.725	0.4466
6	1	4	10	19.75	4.500	4.499	0.0011
6	1	5	10	19.75	4.500	4.854	-0.3540
6	1	1	11	32.50	5.745	5.950	-0.2056
6	1	2	11	37.00	6.124	5.935	0.1888
6	1	3	11	33.50	5.831	5.878	-0.0470
6	1	4	11	32.00	5.701	5.651	0.0495
6	1	5	11	35.75	6.021	6.006	0.0143
6	1	1	12	29.25	5.454	5.950	-0.4961
6	1	2	12	33.75	5.852	5.935	-0.0828

6	1	3	12	34.50	5.916	5.878	0.0379
6	1	4	12	28.25	5.362	5.652	-0.2897
6	1	5	12	46.25	6.837	6.007	0.8307

===== fertclad for AREA 1 and YEAR 7 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	2.1350	0.5338	1.88	0.133
+ CULT	10	85.8418	8.5842	30.22	<.001
Residual	40	11.3606	0.2840		
Total	54	99.3374	1.8396		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

Prediction se

CULT		
1	1.685	0.238
2	2.261	0.238
3	1.226	0.238
4	2.983	0.238
5	4.420	0.238
6	2.289	0.238
7	1.288	0.238
8	3.360	0.238
10	4.277	0.238
11	4.481	0.238
12	4.529	0.238

*** Coefficient of variation and standard error of a single unit ***

%cv	se
17.87	0.5329

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.095	*			
3	0.181	0.004	*		
4	0.000	0.038	0.000	*	
5	0.000	0.000	0.000	0.000	*
6	0.081	0.934	0.003	0.046	0.000

7	0.246	0.006	0.855	0.000	0.000
8	0.000	0.002	0.000	0.270	0.003
10	0.000	0.000	0.000	0.000	0.674
11	0.000	0.000	0.000	0.000	0.857
12	0.000	0.000	0.000	0.000	0.747

	1	2	3	4	5
6	*				
7	0.005	*			
8	0.003	0.000	*		
10	0.000	0.000	0.010	*	
11	0.000	0.000	0.002	0.548	*
12	0.000	0.000	0.001	0.459	0.887

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	105	4.34	33.01
2	105	3.84	8.81
3	105	3.81	23.06
4	105	15.47	171.04
5	105	16.24	140.76
6	105	14.30	97.29
7	105	2.29	9.62
8	105	12.29	97.68

10	105	21.43	110.94
11	105	14.31	113.80
12	105	16.83	170.54

YEAR	AREA	REP	CULT	fertclad	Tfertclad	FITTED	RESIDUAL
7	1	1	1	1.00	1.225	1.595	-0.3706
7	1	2	1	4.25	2.179	2.056	0.1234
7	1	3	1	3.75	2.062	1.645	0.4168
7	1	4	1	1.00	1.225	1.471	-0.2461
7	1	5	1	2.50	1.732	1.656	0.0765
7	1	1	2	2.25	1.658	2.171	-0.5130
7	1	2	2	7.50	2.828	2.632	0.1963
7	1	3	2	7.00	2.739	2.221	0.5179
7	1	4	2	5.00	2.345	2.047	0.2983
7	1	5	2	2.50	1.732	2.232	-0.4996
7	1	1	3	0.50	1.000	1.137	-0.1366
7	1	2	3	1.25	1.323	1.597	-0.2744
7	1	3	3	2.00	1.581	1.186	0.3952
7	1	4	3	0.50	1.000	1.012	-0.0121
7	1	5	3	1.00	1.225	1.197	0.0279
7	1	1	4	10.50	3.317	2.893	0.4233
7	1	2	4	18.75	4.387	3.354	1.0334
7	1	3	4	3.00	1.871	2.943	-1.0719
7	1	4	4	2.50	1.732	2.769	-1.0368
7	1	5	4	12.50	3.606	2.954	0.6520
7	1	1	5	21.75	4.717	4.331	0.3863
7	1	2	5	23.50	4.899	4.791	0.1075
7	1	3	5	20.25	4.555	4.380	0.1751
7	1	4	5	13.75	3.775	4.206	-0.4313
7	1	5	5	16.75	4.153	4.391	-0.2377
7	1	1	6	5.00	2.345	2.199	0.1458

7	1	2	6	3.75	2.062	2.660	-0.5986
7	1	3	6	4.50	2.236	2.249	-0.0127
7	1	4	6	3.75	2.062	2.075	-0.0134
7	1	5	6	7.00	2.739	2.260	0.4789
7	1	1	7	1.00	1.225	1.198	0.0263
7	1	2	7	1.00	1.225	1.659	-0.4345
7	1	3	7	1.00	1.225	1.248	-0.0231
7	1	4	7	0.67	1.082	1.074	0.0077
7	1	5	7	2.33	1.682	1.259	0.4235
7	1	1	8	5.33	2.415	3.271	-0.8561
7	1	2	8	17.25	4.213	3.731	0.4817
7	1	3	8	11.50	3.464	3.320	0.1441
7	1	4	8	15.25	3.969	3.146	0.8225
7	1	5	8	7.00	2.739	3.331	-0.5923
7	1	1	10	24.50	5.000	4.188	0.8122
7	1	2	10	19.75	4.500	4.649	-0.1486
7	1	3	10	13.25	3.708	4.237	-0.5292
7	1	4	10	14.75	3.905	4.063	-0.1583
7	1	5	10	17.75	4.272	4.248	0.0239
7	1	1	11	18.50	4.359	4.392	-0.0330
7	1	2	11	16.67	4.144	4.853	-0.7090
7	1	3	11	24.00	4.950	4.441	0.5085
7	1	4	11	22.25	4.770	4.267	0.5023
7	1	5	11	17.00	4.183	4.452	-0.2688
7	1	1	12	20.25	4.555	4.440	0.1153
7	1	2	12	25.75	5.123	4.901	0.2228
7	1	3	12	15.25	3.969	4.489	-0.5207
7	1	4	12	20.50	4.583	4.315	0.2671
7	1	5	12	19.00	4.416	4.500	-0.0844

===== fertclad for AREA 2 and YEAR 1 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.1090	0.0272	0.16	0.960
+ CULT	10	20.0486	2.0049	11.41	<.001
Residual	40	7.0268	0.1757		
Total	54	27.1844	0.5034		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

	Prediction	se
CULT		
1	2.065	0.187
2	1.210	0.187
3	1.065	0.187
4	1.364	0.187
5	2.556	0.187

6	1.608	0.187
7	1.554	0.187
8	2.344	0.187
10	2.805	0.187
11	2.348	0.187
12	2.750	0.187

*** Coefficient of variation and standard error of a single unit ***

%cv	se
21.28	0.4191

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.002	*			
3	0.001	0.589	*		
4	0.012	0.564	0.267	*	
5	0.071	0.000	0.000	0.000	*
6	0.093	0.140	0.047	0.361	0.001
7	0.061	0.201	0.072	0.476	0.001
8	0.298	0.000	0.000	0.001	0.429
10	0.008	0.000	0.000	0.000	0.354
11	0.292	0.000	0.000	0.001	0.437
12	0.014	0.000	0.000	0.000	0.469

	1	2	3	4	5
6	*				
7	0.839	*			
8	0.008	0.005	*		
10	0.000	0.000	0.090	*	
11	0.008	0.005	0.986	0.093	*
12	0.000	0.000	0.134	0.837	0.137

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	105	4.34	33.01
2	105	3.84	8.81
3	105	3.81	23.06
4	105	15.47	171.04
5	105	16.24	140.76
6	105	14.30	97.29
7	105	2.29	9.62
8	105	12.29	97.68
10	105	21.43	110.94
11	105	14.31	113.80
12	105	16.83	170.54

YEAR AREA REP CULT fertclad Tfertclad FITTED RESIDUAL

1	2	1	1	2.750	1.803	2.046	-0.2434
1	2	2	1	6.000	2.550	2.023	0.5268
1	2	3	1	3.750	2.062	2.058	0.0031
1	2	4	1	4.250	2.179	2.047	0.1325
1	2	5	1	2.500	1.732	2.151	-0.4190
1	2	1	2	0.500	1.000	1.191	-0.1907
1	2	2	2	2.500	1.732	1.167	0.5649
1	2	3	2	0.250	0.866	1.203	-0.3369
1	2	4	2	1.000	1.225	1.191	0.0334
1	2	5	2	1.000	1.225	1.295	-0.0707
1	2	1	3	1.750	1.500	1.046	0.4538
1	2	2	3	0.750	1.118	1.023	0.0954
1	2	3	3	0.000	0.707	1.058	-0.3513
1	2	4	3	0.500	1.000	1.047	-0.0469
1	2	5	3	0.500	1.000	1.151	-0.1510
1	2	1	4	2.000	1.581	1.345	0.2363
1	2	2	4	0.250	0.866	1.321	-0.4553
1	2	3	4	2.500	1.732	1.357	0.3750
1	2	4	4	1.500	1.414	1.345	0.0687
1	2	5	4	1.000	1.225	1.450	-0.2248
1	2	1	5	4.750	2.291	2.538	-0.2462
1	2	2	5	1.750	1.500	2.514	-1.0140
1	2	3	5	10.250	3.279	2.550	0.7289
1	2	4	5	6.000	2.550	2.538	0.0113
1	2	5	5	9.500	3.162	2.642	0.5200
1	2	1	6	2.250	1.658	1.590	0.0687
1	2	2	6	1.750	1.500	1.566	-0.0661
1	2	3	6	1.750	1.500	1.602	-0.1019
1	2	4	6	2.000	1.581	1.590	-0.0091
1	2	5	6	2.750	1.803	1.694	0.1084
1	2	1	7	1.750	1.500	1.536	-0.0355
1	2	2	7	1.250	1.323	1.512	-0.1892

1	2	3	7	1.500	1.414	1.548	-0.1336
1	2	4	7	2.750	1.803	1.536	0.2666
1	2	5	7	2.500	1.732	1.640	0.0917
1	2	1	8	4.500	2.236	2.326	-0.0895
1	2	2	8	3.750	2.062	2.302	-0.2405
1	2	3	8	5.000	2.345	2.338	0.0073
1	2	4	8	8.250	2.958	2.326	0.6318
1	2	5	8	4.000	2.121	2.430	-0.3091
1	2	1	10	4.500	2.236	2.786	-0.5498
1	2	2	10	11.000	3.391	2.762	0.6288
1	2	3	10	5.750	2.500	2.798	-0.2982
1	2	4	10	6.250	2.598	2.787	-0.1885
1	2	5	10	10.380	3.298	2.891	0.4078
1	2	1	11	7.500	2.828	2.329	0.4991
1	2	2	11	4.000	2.121	2.306	-0.1845
1	2	3	11	5.750	2.500	2.342	0.1584
1	2	4	11	4.750	2.291	2.330	-0.0388
1	2	5	11	3.500	2.000	2.434	-0.4341
1	2	1	12	7.500	2.828	2.731	0.0973
1	2	2	12	8.750	3.041	2.708	0.3338
1	2	3	12	6.750	2.693	2.743	-0.0508
1	2	4	12	3.000	1.871	2.732	-0.8610
1	2	5	12	10.500	3.317	2.836	0.4807

===== fertclad for AREA 2 and YEAR 2 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.0906	0.0227	0.09	0.986
+ CULT	10	31.9230	3.1923	12.03	<.001
Residual	40	10.6102	0.2653		
Total	54	42.6238	0.7893		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

	Prediction	se
CULT		
1	2.320	0.230
2	1.204	0.230
3	1.097	0.230
4	1.177	0.230
5	2.879	0.230
6	1.766	0.230
7	1.673	0.230
8	2.625	0.230
10	3.182	0.230
11	2.632	0.230
12	3.137	0.230

*** Coefficient of variation and standard error of a single unit ***

%cv	se
23.91	0.5150

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.001	*			
3	0.001	0.744	*		
4	0.001	0.934	0.807	*	
5	0.094	0.000	0.000	0.000	*
6	0.097	0.092	0.047	0.078	0.001
7	0.054	0.157	0.084	0.135	0.001
8	0.355	0.000	0.000	0.000	0.439
10	0.012	0.000	0.000	0.000	0.359
11	0.344	0.000	0.000	0.000	0.452
12	0.016	0.000	0.000	0.000	0.434

	1	2	3	4	5
6	*				
7	0.777	*			
8	0.012	0.006	*		
10	0.000	0.000	0.095	*	

11	0.011	0.005	0.980	0.099	*
12	0.000	0.000	0.124	0.891	0.129

6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	105	4.34	33.01
2	105	3.84	8.81
3	105	3.81	23.06
4	105	15.47	171.04
5	105	16.24	140.76
6	105	14.30	97.29
7	105	2.29	9.62
8	105	12.29	97.68
10	105	21.43	110.94
11	105	14.31	113.80
12	105	16.83	170.54

YEAR	AREA	REP	CULT	fertclad	Tfertclad	FITTED	RESIDUAL
2	2	1	1	3.500	2.000	2.336	-0.3357
2	2	2	1	7.750	2.872	2.288	0.5847
2	2	3	1	4.750	2.291	2.328	-0.0368
2	2	4	1	5.750	2.500	2.266	0.2342
2	2	5	1	3.250	1.936	2.383	-0.4463
2	2	1	2	0.500	1.000	1.219	-0.2195

2	2	2	2	3.000	1.871	1.171	0.6994
2	2	3	2	0.000	0.707	1.212	-0.5047
2	2	4	2	1.250	1.323	1.150	0.1733
2	2	5	2	0.750	1.118	1.267	-0.1485
2	2	1	3	2.250	1.658	1.112	0.5459
2	2	2	3	0.750	1.118	1.064	0.0537
2	2	3	3	0.000	0.707	1.105	-0.3977
2	2	4	3	0.500	1.000	1.043	-0.0425
2	2	5	3	0.500	1.000	1.159	-0.1595
2	2	1	4	2.500	1.732	1.192	0.5397
2	2	2	4	0.250	0.866	1.144	-0.2782
2	2	3	4	3.000	1.871	1.185	0.6861
2	2	4	4	0.000	0.707	1.122	-0.4153
2	2	5	4	0.000	0.707	1.239	-0.5323
2	2	1	5	6.250	2.598	2.895	-0.2970
2	2	2	5	2.250	1.658	2.847	-1.1887
2	2	3	5	13.500	3.742	2.888	0.8541
2	2	4	5	7.500	2.828	2.825	0.0032
2	2	5	5	12.250	3.571	2.942	0.6285
2	2	1	6	2.750	1.803	1.782	0.0212
2	2	2	6	2.000	1.581	1.733	-0.1524
2	2	3	6	2.000	1.581	1.774	-0.1928
2	2	4	6	2.750	1.803	1.712	0.0911
2	2	5	6	3.750	2.062	1.829	0.2329
2	2	1	7	2.000	1.581	1.689	-0.1078
2	2	2	7	1.500	1.414	1.641	-0.2266
2	2	3	7	1.750	1.500	1.681	-0.1813
2	2	4	7	3.500	2.000	1.619	0.3809
2	2	5	7	3.000	1.871	1.736	0.1348
2	2	1	8	5.750	2.500	2.640	-0.1403
2	2	2	8	4.500	2.236	2.592	-0.3562
2	2	3	8	6.250	2.598	2.633	-0.0346

2	2	4	8	11.000	3.391	2.570	0.8207
2	2	5	8	5.250	2.398	2.687	-0.2895
2	2	1	10	6.000	2.550	3.197	-0.6479
2	2	2	10	14.500	3.873	3.149	0.7236
2	2	3	10	7.750	2.872	3.190	-0.3175
2	2	4	10	7.750	2.872	3.128	-0.2553
2	2	5	10	13.500	3.742	3.245	0.4971
2	2	1	11	9.750	3.202	2.648	0.5537
2	2	2	11	5.000	2.345	2.600	-0.2546
2	2	3	11	7.500	2.828	2.640	0.1882
2	2	4	11	6.000	2.550	2.578	-0.0285
2	2	5	11	4.500	2.236	2.695	-0.4589
2	2	1	12	10.000	3.240	3.153	0.0876
2	2	2	12	11.750	3.500	3.105	0.3953
2	2	3	12	9.000	3.082	3.145	-0.0630
2	2	4	12	4.000	2.121	3.083	-0.9616
2	2	5	12	13.500	3.742	3.200	0.5418

===== fertclad for AREA 2 and YEAR 3 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.6325	0.1581	0.33	0.856

+ CULT	10	36.1750	3.6175	7.56 <.001
Residual	40	19.1381	0.4785	
Total	54	55.9456	1.0360	

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

	Prediction	se
CULT		
1	3.184	0.309
2	2.075	0.309
3	3.118	0.309
4	4.321	0.309
5	4.193	0.309
6	4.581	0.309
7	2.625	0.309
8	3.737	0.309
10	4.453	0.309
11	4.039	0.309
12	4.566	0.309

*** Coefficient of variation and standard error of a single unit ***

%cv	se
18.61	0.6917

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.015	*			
3	0.881	0.022	*		
4	0.013	0.000	0.009	*	
5	0.026	0.000	0.018	0.772	*
6	0.003	0.000	0.002	0.557	0.382
7	0.209	0.216	0.266	0.000	0.001
8	0.214	0.000	0.165	0.189	0.303
10	0.006	0.000	0.004	0.765	0.556
11	0.058	0.000	0.042	0.522	0.725
12	0.003	0.000	0.002	0.579	0.399

	1	2	3	4	5

6	*				
7	0.000	*			
8	0.061	0.015	*		
10	0.772	0.000	0.109	*	
11	0.223	0.002	0.494	0.349	*
12	0.973	0.000	0.065	0.797	0.235

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	105	4.34	33.01
2	105	3.84	8.81
3	105	3.81	23.06
4	105	15.47	171.04
5	105	16.24	140.76
6	105	14.30	97.29
7	105	2.29	9.62
8	105	12.29	97.68
10	105	21.43	110.94
11	105	14.31	113.80
12	105	16.83	170.54

YEAR	AREA	REP	CULT	fertclad	Tfertclad	FITTED	RESIDUAL
3	2	1	1	15.75	4.031	3.001	1.0303
3	2	2	1	14.25	3.841	3.136	0.7049
3	2	3	1	14.25	3.841	3.232	0.6083
3	2	4	1	0.00	0.707	3.239	-2.5322
3	2	5	1	11.75	3.500	3.311	0.1887
3	2	1	2	1.75	1.500	1.892	-0.3920
3	2	2	2	3.50	2.000	2.027	-0.0269
3	2	3	2	3.75	2.062	2.124	-0.0620
3	2	4	2	6.75	2.693	2.131	0.5620
3	2	5	2	4.00	2.121	2.203	-0.0812
3	2	1	3	6.00	2.550	2.935	-0.3857
3	2	2	3	6.75	2.693	3.070	-0.3775

3	2	3	3	11.75	3.500	3.167	0.3333
3	2	4	3	12.25	3.571	3.174	0.3970
3	2	5	3	10.25	3.279	3.246	0.0330
3	2	1	4	20.75	4.610	4.138	0.4717
3	2	2	4	17.75	4.272	4.273	-0.0009
3	2	3	4	21.25	4.664	4.370	0.2942
3	2	4	4	16.50	4.123	4.377	-0.2535
3	2	5	4	15.00	3.937	4.449	-0.5115
3	2	1	5	13.00	3.674	4.010	-0.3361
3	2	2	5	20.50	4.583	4.145	0.4373
3	2	3	5	13.75	3.775	4.242	-0.4669
3	2	4	5	23.25	4.873	4.249	0.6245
3	2	5	5	16.00	4.062	4.321	-0.2588
3	2	1	6	10.00	3.240	4.397	-1.1570
3	2	2	6	21.00	4.637	4.532	0.1045
3	2	3	6	21.50	4.690	4.629	0.0615
3	2	4	6	24.00	4.950	4.636	0.3138
3	2	5	6	28.50	5.385	4.708	0.6772
3	2	1	7	6.00	2.550	2.442	0.1076
3	2	2	7	5.25	2.398	2.577	-0.1789
3	2	3	7	6.50	2.646	2.673	-0.0276
3	2	4	7	10.00	3.240	2.680	0.5599
3	2	5	7	4.75	2.291	2.752	-0.4611
3	2	1	8	19.50	4.472	3.553	0.9186
3	2	2	8	8.00	2.915	3.688	-0.7729
3	2	3	8	9.00	3.082	3.785	-0.7028
3	2	4	8	17.25	4.213	3.792	0.4210
3	2	5	8	15.50	4.000	3.864	0.1360
3	2	1	10	16.50	4.123	4.270	-0.1468
3	2	2	10	23.25	4.873	4.405	0.4686
3	2	3	10	19.75	4.500	4.501	-0.0014
3	2	4	10	17.25	4.213	4.508	-0.2953

3	2	5	10	20.25	4.555	4.580	-0.0252
3	2	1	11	21.25	4.664	3.856	0.8081
3	2	2	11	17.25	4.213	3.991	0.2226
3	2	3	11	12.75	3.640	4.087	-0.4471
3	2	4	11	15.25	3.969	4.094	-0.1255
3	2	5	11	13.25	3.708	4.166	-0.4580
3	2	1	12	11.50	3.464	4.383	-0.9188
3	2	2	12	15.00	3.937	4.518	-0.5808
3	2	3	12	24.75	5.025	4.614	0.4105
3	2	4	12	24.00	4.950	4.621	0.3283
3	2	5	12	29.25	5.454	4.693	0.7609

===== fertclad for AREA 2 and YEAR 4 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.4506	0.1126	0.65	0.633
+ CULT	10	50.9960	5.0996	29.22	<.001
Residual	40	6.9818	0.1745		
Total	54	58.4283	1.0820		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

CULT	Prediction	se
1	3.543	0.187
2	2.453	0.187
3	3.217	0.187
4	4.805	0.187
5	4.955	0.187
6	4.400	0.187
7	2.399	0.187
8	4.714	0.187
10	4.803	0.187
11	4.596	0.187
12	5.134	0.187

*** Coefficient of variation and standard error of a single unit ***

%cv	se
10.21	0.4178

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.000	*			
3	0.224	0.006	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.573	*
6	0.002	0.000	0.000	0.133	0.042
7	0.000	0.839	0.004	0.000	0.000
8	0.000	0.000	0.000	0.732	0.367
10	0.000	0.000	0.000	0.989	0.567
11	0.000	0.000	0.000	0.433	0.181
12	0.000	0.000	0.000	0.220	0.502

	1	2	3	4	5

6	*				
7	0.000	*			
8	0.241	0.000	*		
10	0.135	0.000	0.738	*	
11	0.462	0.000	0.657	0.438	*
12	0.008	0.000	0.120	0.217	0.048

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			

1	105	4.34	33.01
2	105	3.84	8.81
3	105	3.81	23.06
4	105	15.47	171.04
5	105	16.24	140.76
6	105	14.30	97.29
7	105	2.29	9.62
8	105	12.29	97.68
10	105	21.43	110.94
11	105	14.31	113.80
12	105	16.83	170.54

YEAR	AREA	REP	CULT	fertclad	Tfertclad	FITTED	RESIDUAL
4	2	1	1	11.25	3.428	3.377	0.0508
4	2	2	1	16.25	4.093	3.618	0.4742
4	2	3	1	12.75	3.640	3.517	0.1230
4	2	4	1	9.75	3.202	3.595	-0.3931
4	2	5	1	10.75	3.354	3.609	-0.2550
4	2	1	2	3.25	1.936	2.287	-0.3506
4	2	2	2	6.75	2.693	2.529	0.1641
4	2	3	2	5.50	2.449	2.427	0.0224
4	2	4	2	7.00	2.739	2.505	0.2339
4	2	5	2	5.50	2.449	2.519	-0.0697
4	2	1	3	9.75	3.202	3.051	0.1507
4	2	2	3	7.75	2.872	3.292	-0.4200
4	2	3	3	10.25	3.279	3.191	0.0878
4	2	4	3	12.25	3.571	3.268	0.3022
4	2	5	3	9.50	3.162	3.283	-0.1207
4	2	1	4	24.50	5.000	4.639	0.3609
4	2	2	4	25.00	5.050	4.881	0.1692
4	2	3	4	27.00	5.244	4.779	0.4649

4	2	4	4	16.50	4.123	4.857	-0.7336
4	2	5	4	20.75	4.610	4.871	-0.2615
4	2	1	5	24.50	5.000	4.789	0.2109
4	2	2	5	24.50	5.000	5.031	-0.0305
4	2	3	5	16.50	4.123	4.929	-0.8060
4	2	4	5	27.75	5.315	5.007	0.3083
4	2	5	5	28.00	5.339	5.021	0.3173
4	2	1	6	13.25	3.708	4.234	-0.5255
4	2	2	6	20.75	4.610	4.475	0.1348
4	2	3	6	22.50	4.796	4.374	0.4223
4	2	4	6	18.25	4.330	4.451	-0.1211
4	2	5	6	20.25	4.555	4.466	0.0895
4	2	1	7	4.50	2.236	2.233	0.0029
4	2	2	7	4.50	2.236	2.475	-0.2385
4	2	3	7	4.25	2.179	2.373	-0.1937
4	2	4	7	8.50	3.000	2.451	0.5493
4	2	5	7	5.00	2.345	2.465	-0.1200
4	2	1	8	25.75	5.123	4.548	0.5755
4	2	2	8	17.00	4.183	4.789	-0.6061
4	2	3	8	15.25	3.969	4.688	-0.7193
4	2	4	8	25.75	5.123	4.766	0.3579
4	2	5	8	26.25	5.172	4.780	0.3920
4	2	1	10	18.00	4.301	4.637	-0.3356
4	2	2	10	29.50	5.477	4.878	0.5990
4	2	3	10	24.75	5.025	4.777	0.2482
4	2	4	10	19.00	4.416	4.854	-0.4385
4	2	5	10	22.50	4.796	4.869	-0.0731
4	2	1	11	23.50	4.899	4.430	0.4692
4	2	2	11	20.75	4.610	4.671	-0.0614
4	2	3	11	19.00	4.416	4.570	-0.1539
4	2	4	11	19.75	4.500	4.647	-0.1474
4	2	5	11	20.25	4.555	4.662	-0.1066

4	2	1	12	18.50	4.359	4.968	-0.6094
4	2	2	12	24.75	5.025	5.210	-0.1848
4	2	3	12	31.00	5.612	5.108	0.5042
4	2	4	12	27.25	5.268	5.186	0.0820
4	2	5	12	28.75	5.408	5.200	0.2079

===== fertclad for AREA 2 and YEAR 5 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.5506	0.1377	0.62	0.650
+ CULT	10	81.5937	8.1594	36.83	<.001
Residual	40	8.8628	0.2216		
Total	54	91.0072	1.6853		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

CULT	Prediction	se
1	3.402	0.211
2	2.589	0.211
3	3.129	0.211
4	5.195	0.211
5	5.491	0.211
6	4.429	0.211
7	2.085	0.211
8	5.258	0.211
10	5.172	0.211
11	4.892	0.211
12	5.730	0.211

*** Coefficient of variation and standard error of a single unit ***

%cv	se
10.93	0.4707

***** Pairwise differences *****

t probabilities of pairwise differences

1	*			
2	0.009	*		
3	0.365	0.077	*	
4	0.000	0.000	0.000	*

5	0.000	0.000	0.000	0.325	*
6	0.001	0.000	0.000	0.014	0.001
7	0.000	0.098	0.001	0.000	0.000
8	0.000	0.000	0.000	0.833	0.437
10	0.000	0.000	0.000	0.939	0.289
11	0.000	0.000	0.000	0.315	0.051
12	0.000	0.000	0.000	0.080	0.427

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.008	0.000	*		
10	0.017	0.000	0.774	*	
11	0.128	0.000	0.226	0.352	*
12	0.000	0.000	0.120	0.068	0.008

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	105	4.34	33.01
2	105	3.84	8.81
3	105	3.81	23.06
4	105	15.47	171.04
5	105	16.24	140.76
6	105	14.30	97.29

7	105	2.29	9.62
8	105	12.29	97.68
10	105	21.43	110.94
11	105	14.31	113.80
12	105	16.83	170.54

YEAR	AREA	REP	CULT	fertclad	Tfertclad	FITTED	RESIDUAL
5	2	1	1	11.25	3.428	3.367	0.0609
5	2	2	1	17.25	4.213	3.579	0.6343
5	2	3	1	9.50	3.162	3.320	-0.1578
5	2	4	1	9.00	3.082	3.304	-0.2219
5	2	5	1	9.25	3.122	3.438	-0.3155
5	2	1	2	4.75	2.291	2.555	-0.2635
5	2	2	2	7.25	2.784	2.767	0.0172
5	2	3	2	5.75	2.500	2.508	-0.0080
5	2	4	2	7.75	2.872	2.492	0.3802
5	2	5	2	5.75	2.500	2.626	-0.1259
5	2	1	3	12.75	3.640	3.094	0.5457
5	2	2	3	8.25	2.958	3.306	-0.3482
5	2	3	3	7.75	2.872	3.048	-0.1753
5	2	4	3	11.00	3.391	3.032	0.3595
5	2	5	3	7.25	2.784	3.165	-0.3816
5	2	1	4	29.00	5.431	5.160	0.2714
5	2	2	4	32.75	5.766	5.372	0.3944
5	2	3	4	31.25	5.635	5.113	0.5215
5	2	4	4	14.50	3.873	5.097	-1.2242
5	2	5	4	27.25	5.268	5.231	0.0368
5	2	1	5	30.75	5.590	5.457	0.1336
5	2	2	5	29.00	5.431	5.669	-0.2371
5	2	3	5	21.50	4.690	5.410	-0.7194
5	2	4	5	35.50	6.000	5.394	0.6061

5	2	5	5	32.50	5.745	5.528	0.2169
5	2	1	6	17.00	4.183	4.394	-0.2106
5	2	2	6	21.25	4.664	4.606	0.0579
5	2	3	6	23.25	4.873	4.347	0.5262
5	2	4	6	18.25	4.330	4.331	-0.0011
5	2	5	6	16.25	4.093	4.465	-0.3724
5	2	1	7	3.75	2.062	2.050	0.0114
5	2	2	7	3.00	1.871	2.262	-0.3912
5	2	3	7	2.75	1.803	2.003	-0.2006
5	2	4	7	4.75	2.291	1.987	0.3038
5	2	5	7	5.25	2.398	2.121	0.2767
5	2	1	8	32.00	5.701	5.223	0.4779
5	2	2	8	24.25	4.975	5.435	-0.4599
5	2	3	8	18.75	4.387	5.176	-0.7887
5	2	4	8	30.75	5.590	5.160	0.4300
5	2	5	8	31.25	5.635	5.294	0.3407
5	2	1	10	21.25	4.664	5.137	-0.4733
5	2	2	10	34.25	5.895	5.349	0.5460
5	2	3	10	27.50	5.292	5.090	0.2012
5	2	4	10	21.75	4.717	5.074	-0.3573
5	2	5	10	27.50	5.292	5.208	0.0834
5	2	1	11	25.25	5.074	4.857	0.2175
5	2	2	11	24.25	4.975	5.069	-0.0939
5	2	3	11	24.25	4.975	4.810	0.1648
5	2	4	11	22.00	4.743	4.794	-0.0508
5	2	5	11	21.50	4.690	4.928	-0.2376
5	2	1	12	23.75	4.924	5.695	-0.7710
5	2	2	12	33.00	5.788	5.907	-0.1194
5	2	3	12	39.00	6.285	5.649	0.6362
5	2	4	12	28.75	5.408	5.633	-0.2244
5	2	5	12	38.50	6.245	5.767	0.4785

===== fertclad for AREA 2 and YEAR 6 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	2.2038	0.5509	3.33	0.019
+ CULT	10	100.4386	10.0439	60.69	<.001
Residual	40	6.6201	0.1655		
Total	54	109.2624	2.0234		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

	Prediction	se
CULT		
1	4.363	0.182
2	2.555	0.182
3	4.270	0.182

4	6.480	0.182
5	6.566	0.182
6	5.371	0.182
7	3.126	0.182
8	5.980	0.182
10	5.784	0.182
11	5.780	0.182
12	6.752	0.182

*** Coefficient of variation and standard error of a single unit ***

%cv	se
7.85	0.4068

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.000	*			
3	0.720	0.000	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.739	*
6	0.000	0.000	0.000	0.000	0.000
7	0.000	0.032	0.000	0.000	0.000
8	0.000	0.000	0.000	0.059	0.028
10	0.000	0.000	0.000	0.010	0.004
11	0.000	0.000	0.000	0.010	0.004

12	0.000	0.000	0.000	0.296	0.474

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.023	0.000	*		
10	0.116	0.000	0.450	*	
11	0.120	0.000	0.441	0.985	*
12	0.000	0.000	0.005	0.001	0.001

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	105	4.34	33.01
2	105	3.84	8.81
3	105	3.81	23.06
4	105	15.47	171.04
5	105	16.24	140.76
6	105	14.30	97.29
7	105	2.29	9.62
8	105	12.29	97.68
10	105	21.43	110.94
11	105	14.31	113.80
12	105	16.83	170.54

YEAR	AREA	REP	CULT	fertclad	Tfertclad	FITTED	RESIDUAL
6	2	1	1	21.75	4.717	4.298	0.4187
6	2	2	1	18.25	4.330	4.064	0.2665
6	2	3	1	12.50	3.606	4.329	-0.7239
6	2	4	1	21.25	4.664	4.449	0.2148
6	2	5	1	19.75	4.500	4.676	-0.1761
6	2	1	2	2.50	1.732	2.490	-0.7577
6	2	2	2	4.25	2.179	2.255	-0.0756
6	2	3	2	9.00	3.082	2.521	0.5613
6	2	4	2	7.00	2.739	2.640	0.0982
6	2	5	2	8.75	3.041	2.868	0.1738
6	2	1	3	18.00	4.301	4.206	0.0956
6	2	2	3	14.25	3.841	3.971	-0.1303
6	2	3	3	17.00	4.183	4.237	-0.0533
6	2	4	3	20.25	4.555	4.356	0.1991
6	2	5	3	19.50	4.472	4.583	-0.1112
6	2	1	4	42.50	6.557	6.415	0.1425
6	2	2	4	40.75	6.423	6.180	0.2424
6	2	3	4	47.25	6.910	6.446	0.4641
6	2	4	4	37.75	6.185	6.566	-0.3808
6	2	5	4	39.50	6.325	6.793	-0.4681
6	2	1	5	40.75	6.423	6.501	-0.0784
6	2	2	5	37.50	6.164	6.266	-0.1019
6	2	3	5	42.75	6.576	6.532	0.0443
6	2	4	5	43.00	6.595	6.652	-0.0562
6	2	5	5	49.50	7.071	6.879	0.1922
6	2	1	6	34.00	5.874	5.306	0.5679
6	2	2	6	21.50	4.690	5.071	-0.3807
6	2	3	6	28.00	5.339	5.337	0.0016
6	2	4	6	28.00	5.339	5.456	-0.1178
6	2	5	6	31.00	5.612	5.684	-0.0711

6	2	1	7	10.25	3.279	3.061	0.2175
6	2	2	7	8.00	2.915	2.827	0.0889
6	2	3	7	7.25	2.784	3.092	-0.3085
6	2	4	7	9.00	3.082	3.212	-0.1296
6	2	5	7	12.25	3.571	3.439	0.1317
6	2	1	8	34.50	5.916	5.915	0.0009
6	2	2	8	26.25	5.172	5.680	-0.5085
6	2	3	8	39.00	6.285	5.946	0.3386
6	2	4	8	40.25	6.384	6.066	0.3178
6	2	5	8	37.25	6.144	6.293	-0.1489
6	2	1	10	23.75	4.924	5.719	-0.7945
6	2	2	10	35.00	5.958	5.484	0.4740
6	2	3	10	35.00	5.958	5.750	0.2082
6	2	4	10	34.00	5.874	5.869	0.0042
6	2	5	10	38.00	6.205	6.097	0.1082
6	2	1	11	39.25	6.305	5.715	0.5898
6	2	2	11	26.00	5.148	5.480	-0.3324
6	2	3	11	33.00	5.788	5.746	0.0418
6	2	4	11	35.00	5.958	5.866	0.0927
6	2	5	11	32.00	5.701	6.093	-0.3919
6	2	1	12	39.00	6.285	6.687	-0.4023
6	2	2	12	47.25	6.910	6.453	0.4576
6	2	3	12	37.25	6.144	6.718	-0.5742
6	2	4	12	43.00	6.595	6.838	-0.2423
6	2	5	12	60.75	7.826	7.065	0.7613

===== fertclad for AREA 2 and YEAR 7 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	2.2407	0.5602	1.43	0.241
+ CULT	10	20.2891	2.0289	5.19	<.001
Residual	40	15.6415	0.3910		
Total	54	38.1713	0.7069		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

	Prediction	se
CULT		
1	3.711	0.280
2	2.821	0.280
3	2.653	0.280
4	3.206	0.280
5	3.549	0.280
6	3.040	0.280
7	3.090	0.280
8	3.598	0.280
10	5.022	0.280

11	3.401	0.280
12	3.762	0.280

*** Coefficient of variation and standard error of a single unit ***

%cv	se
18.17	0.6253

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.030	*			
3	0.011	0.674	*		
4	0.209	0.336	0.170	*	
5	0.684	0.073	0.029	0.391	*
6	0.098	0.582	0.334	0.677	0.206
7	0.124	0.500	0.276	0.771	0.253
8	0.777	0.056	0.022	0.327	0.901
10	0.002	0.000	0.000	0.000	0.001
11	0.437	0.150	0.066	0.625	0.710
12	0.899	0.022	0.008	0.168	0.594

	1	2	3	4	5
6	*				
7	0.900	*			

8	0.166	0.206	*		
10	0.000	0.000	0.001	*	
11	0.367	0.436	0.621	0.000	*
12	0.076	0.097	0.682	0.003	0.367

6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	105	4.34	33.01
2	105	3.84	8.81
3	105	3.81	23.06
4	105	15.47	171.04
5	105	16.24	140.76
6	105	14.30	97.29
7	105	2.29	9.62
8	105	12.29	97.68
10	105	21.43	110.94
11	105	14.31	113.80
12	105	16.83	170.54

YEAR	AREA	REP	CULT	fertclad	Tfertclad	FITTED	RESIDUAL
7	2	1	1	17.25	4.213	3.974	0.2390
7	2	2	1	13.00	3.674	3.852	-0.1777
7	2	3	1	10.25	3.279	3.419	-0.1399
7	2	4	1	11.00	3.391	3.549	-0.1574

7	2	5	1	15.50	4.000	3.764	0.2360
7	2	1	2	4.50	2.236	3.084	-0.8476
7	2	2	2	7.50	2.828	2.962	-0.1332
7	2	3	2	6.25	2.598	2.528	0.0698
7	2	4	2	12.25	3.571	2.658	0.9124
7	2	5	2	7.75	2.872	2.874	-0.0014
7	2	1	3	6.00	2.550	2.916	-0.3665
7	2	2	3	3.75	2.062	2.794	-0.7324
7	2	3	3	8.50	3.000	2.361	0.6393
7	2	4	3	7.25	2.784	2.491	0.2933
7	2	5	3	7.75	2.872	2.706	0.1663
7	2	1	4	18.00	4.301	3.469	0.8322
7	2	2	4	8.25	2.958	3.347	-0.3888
7	2	3	4	13.25	3.708	2.914	0.7945
7	2	4	4	4.50	2.236	3.044	-0.8074
7	2	5	4	7.50	2.828	3.259	-0.4305
7	2	1	5	12.00	3.536	3.812	-0.2764
7	2	2	5	21.25	4.664	3.690	0.9739
7	2	3	5	3.75	2.062	3.257	-1.1950
7	2	4	5	8.25	2.958	3.386	-0.4284
7	2	5	5	20.00	4.528	3.602	0.9259
7	2	1	6	9.00	3.082	3.303	-0.2208
7	2	2	6	11.25	3.428	3.181	0.2469
7	2	3	6	8.75	3.041	2.748	0.2938
7	2	4	6	8.25	2.958	2.878	0.0805
7	2	5	6	6.75	2.693	3.093	-0.4004
7	2	1	7	7.33	2.798	3.353	-0.5547
7	2	2	7	13.50	3.742	3.231	0.5109
7	2	3	7	5.25	2.398	2.797	-0.3996
7	2	4	7	9.25	3.122	2.927	0.1951
7	2	5	7	11.00	3.391	3.143	0.2483
7	2	1	8	27.25	5.268	3.861	1.4068

7	2	2	8	10.25	3.279	3.739	-0.4603
7	2	3	8	7.00	2.739	3.306	-0.5671
7	2	4	8	15.25	3.969	3.436	0.5330
7	2	5	8	7.00	2.739	3.651	-0.9124
7	2	1	10	24.75	5.025	5.285	-0.2600
7	2	2	10	27.25	5.268	5.163	0.1050
7	2	3	10	25.75	5.123	4.730	0.3939
7	2	4	10	23.00	4.848	4.859	-0.0118
7	2	5	10	23.00	4.848	5.075	-0.2272
7	2	1	11	16.00	4.062	3.664	0.3982
7	2	2	11	15.50	4.000	3.542	0.4582
7	2	3	11	9.00	3.082	3.108	-0.0262
7	2	4	11	4.75	2.291	3.238	-0.9471
7	2	5	11	12.25	3.571	3.454	0.1169
7	2	1	12	13.00	3.674	4.024	-0.3502
7	2	2	12	11.75	3.500	3.902	-0.4024
7	2	3	12	12.50	3.606	3.469	0.1364
7	2	4	12	15.00	3.937	3.599	0.3380
7	2	5	12	16.25	4.093	3.814	0.2783

===== fertclad for AREA 3 and YEAR 1 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.3959	0.0990	0.90	0.470
+ CULT	10	25.8346	2.5835	23.61	<.001
Residual	40	4.3768	0.1094		
Total	54	30.6073	0.5668		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

	Prediction	se
CULT		
1	0.842	0.148
2	1.318	0.148
3	0.811	0.148
4	2.167	0.148
5	1.112	0.148
6	2.115	0.148
7	0.707	0.148
8	0.897	0.148
10	2.962	0.148
11	1.855	0.148
12	1.540	0.148

*** Coefficient of variation and standard error of a single unit ***

%cv	se
22.29	0.3308

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.028	*			
3	0.880	0.020	*		
4	0.000	0.000	0.000	*	
5	0.205	0.331	0.158	0.000	*
6	0.000	0.000	0.000	0.805	0.000
7	0.521	0.006	0.623	0.000	0.060
8	0.794	0.051	0.681	0.000	0.311
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.014	0.000	0.144	0.001
12	0.002	0.295	0.001	0.005	0.047

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.369	*		
10	0.000	0.000	0.000	*	
11	0.221	0.000	0.000	0.000	*
12	0.009	0.000	0.004	0.000	0.141

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	105	4.34	33.01
2	105	3.84	8.81
3	105	3.81	23.06
4	105	15.47	171.04
5	105	16.24	140.76
6	105	14.30	97.29
7	105	2.29	9.62
8	105	12.29	97.68
10	105	21.43	110.94
11	105	14.31	113.80
12	105	16.83	170.54

YEAR	AREA	REP	CULT	fertclad	Tfertclad	FITTED	RESIDUAL
1	3	1	1	1.000	1.225	0.945	0.2797
1	3	2	1	0.000	0.707	0.942	-0.2347
1	3	3	1	0.000	0.707	0.800	-0.0929
1	3	4	1	0.250	0.866	0.740	0.1265
1	3	5	1	0.000	0.707	0.786	-0.0786
1	3	1	2	3.250	1.936	1.421	0.5159
1	3	2	2	0.750	1.118	1.417	-0.2993
1	3	3	2	1.500	1.414	1.276	0.1386
1	3	4	2	1.500	1.414	1.215	0.1991
1	3	5	2	0.000	0.707	1.261	-0.5542

1	3	1	3	0.000	0.707	0.913	-0.2061
1	3	2	3	1.000	1.225	0.910	0.3148
1	3	3	3	0.000	0.707	0.768	-0.0612
1	3	4	3	0.000	0.707	0.708	-0.0006
1	3	5	3	0.000	0.707	0.754	-0.0469
1	3	1	4	6.250	2.598	2.269	0.3289
1	3	2	4	6.750	2.693	2.266	0.4267
1	3	3	4	2.750	1.803	2.124	-0.3214
1	3	4	4	3.250	1.936	2.064	-0.1271
1	3	5	4	2.750	1.803	2.110	-0.3071
1	3	1	5	0.000	0.707	1.215	-0.5075
1	3	2	5	1.750	1.500	1.211	0.2887
1	3	3	5	1.250	1.323	1.070	0.2532
1	3	4	5	1.250	1.323	1.009	0.3138
1	3	5	5	0.000	0.707	1.055	-0.3482
1	3	1	6	3.750	2.062	2.217	-0.1556
1	3	2	6	5.500	2.449	2.214	0.2356
1	3	3	6	3.500	2.000	2.072	-0.0722
1	3	4	6	3.500	2.000	2.012	-0.0116
1	3	5	6	3.750	2.062	2.058	0.0037
1	3	1	7	0.000	0.707	0.810	-0.1026
1	3	2	7	0.000	0.707	0.806	-0.0994
1	3	3	7	0.000	0.707	0.665	0.0424
1	3	4	7	0.000	0.707	0.604	0.1029
1	3	5	7	0.000	0.707	0.650	0.0567
1	3	1	8	0.000	0.707	1.000	-0.2928
1	3	2	8	0.000	0.707	0.997	-0.2896
1	3	3	8	0.000	0.707	0.855	-0.1479
1	3	4	8	0.000	0.707	0.794	-0.0873
1	3	5	8	2.250	1.658	0.841	0.8176
1	3	1	10	9.750	3.202	3.065	0.1370
1	3	2	10	10.500	3.317	3.061	0.2553

1	3	3	10	6.500	2.646	2.920	-0.2738
1	3	4	10	8.500	3.000	2.859	0.1410
1	3	5	10	6.500	2.646	2.905	-0.2595
1	3	1	11	3.000	1.871	1.957	-0.0863
1	3	2	11	2.000	1.581	1.954	-0.3728
1	3	3	11	5.000	2.345	1.812	0.5330
1	3	4	11	1.500	1.414	1.752	-0.3375
1	3	5	11	3.750	2.062	1.798	0.2636
1	3	1	12	2.500	1.732	1.643	0.0893
1	3	2	12	1.500	1.414	1.640	-0.2253
1	3	3	12	1.750	1.500	1.498	0.0022
1	3	4	12	0.750	1.118	1.437	-0.3192
1	3	5	12	3.250	1.936	1.483	0.4530

===== fertclad for AREA 3 and YEAR 2 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.8965	0.2241	1.74	0.159
+ CULT	10	36.7073	3.6707	28.56	<.001
Residual	40	5.1410	0.1285		
Total	54	42.7447	0.7916		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

CULT	Prediction	se
1	0.771	0.160
2	1.859	0.160
3	1.180	0.160
4	2.598	0.160
5	1.874	0.160
6	2.551	0.160
7	0.707	0.160
8	1.356	0.160
10	3.582	0.160
11	2.210	0.160
12	1.839	0.160

*** Coefficient of variation and standard error of a single unit ***

%cv	se
19.21	0.3585

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.000	*			
3	0.079	0.005	*		
4	0.000	0.002	0.000	*	
5	0.000	0.948	0.004	0.003	*
6	0.000	0.004	0.000	0.837	0.005
7	0.781	0.000	0.044	0.000	0.000
8	0.014	0.032	0.441	0.000	0.028
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.129	0.000	0.095	0.145
12	0.000	0.931	0.006	0.002	0.881

	1	2	3	4	5

6	*				
7	0.000	*			
8	0.000	0.007	*		
10	0.000	0.000	0.000	*	
11	0.141	0.000	0.001	0.000	*
12	0.003	0.000	0.039	0.000	0.110

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	105	4.34	33.01
2	105	3.84	8.81
3	105	3.81	23.06
4	105	15.47	171.04
5	105	16.24	140.76
6	105	14.30	97.29
7	105	2.29	9.62
8	105	12.29	97.68
10	105	21.43	110.94
11	105	14.31	113.80
12	105	16.83	170.54

YEAR	AREA	REP	CULT	fertclad	Tfertclad	FITTED	RESIDUAL
2	3	1	1	0.000	0.707	0.975	-0.2676
2	3	2	1	0.000	0.707	0.773	-0.0661
2	3	3	1	0.250	0.866	0.692	0.1744
2	3	4	1	0.250	0.866	0.594	0.2720
2	3	5	1	0.000	0.707	0.820	-0.1128
2	3	1	2	5.000	2.345	2.063	0.2823
2	3	2	2	1.250	1.323	1.861	-0.5385
2	3	3	2	2.250	1.658	1.780	-0.1215
2	3	4	2	2.500	1.732	1.682	0.0498
2	3	5	2	4.500	2.236	1.908	0.3280
2	3	1	3	0.750	1.118	1.384	-0.2656
2	3	2	3	1.500	1.414	1.182	0.2320
2	3	3	3	1.750	1.500	1.101	0.3994
2	3	4	3	0.250	0.866	1.003	-0.1370
2	3	5	3	0.500	1.000	1.229	-0.2289
2	3	1	4	9.500	3.162	2.802	0.3605

2	3	2	4	10.000	3.240	2.600	0.6401
2	3	3	4	3.750	2.062	2.519	-0.4572
2	3	4	4	5.000	2.345	2.421	-0.0759
2	3	5	4	4.250	2.179	2.647	-0.4675
2	3	1	5	5.250	2.398	2.077	0.3204
2	3	2	5	3.000	1.871	1.876	-0.0052
2	3	3	5	2.000	1.581	1.794	-0.2133
2	3	4	5	2.000	1.581	1.697	-0.1157
2	3	5	5	3.250	1.936	1.923	0.0138
2	3	1	6	5.750	2.500	2.755	-0.2550
2	3	2	6	8.250	2.958	2.554	0.4045
2	3	3	6	5.500	2.449	2.472	-0.0225
2	3	4	6	5.500	2.449	2.374	0.0752
2	3	5	6	5.250	2.398	2.600	-0.2023
2	3	1	7	0.000	0.707	0.911	-0.2040
2	3	2	7	0.000	0.707	0.710	-0.0025
2	3	3	7	0.000	0.707	0.628	0.0790
2	3	4	7	0.000	0.707	0.530	0.1767
2	3	5	7	0.000	0.707	0.756	-0.0492
2	3	1	8	2.250	1.658	1.560	0.0984
2	3	2	8	0.000	0.707	1.358	-0.6513
2	3	3	8	0.500	1.000	1.277	-0.2769
2	3	4	8	1.500	1.414	1.179	0.2350
2	3	5	8	3.500	2.000	1.405	0.5949
2	3	1	10	14.500	3.873	3.786	0.0874
2	3	2	10	15.750	4.031	3.584	0.4470
2	3	3	10	9.750	3.202	3.503	-0.3010
2	3	4	10	12.750	3.640	3.405	0.2351
2	3	5	10	9.500	3.162	3.631	-0.4685
2	3	1	11	4.250	2.179	2.414	-0.2350
2	3	2	11	3.250	1.936	2.213	-0.2765
2	3	3	11	7.500	2.828	2.131	0.6970

2	3	4	11	2.250	1.658	2.034	-0.3755
2	3	5	11	5.500	2.449	2.260	0.1898
2	3	1	12	4.000	2.121	2.043	0.0780
2	3	2	12	2.250	1.658	1.842	-0.1835
2	3	3	12	2.750	1.803	1.760	0.0425
2	3	4	12	1.250	1.323	1.663	-0.3398
2	3	5	12	4.750	2.291	1.889	0.4028

===== fertclad for AREA 3 and YEAR 3 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.7179	0.1795	0.72	0.585
+ CULT	10	110.6460	11.0646	44.22	<.001
Residual	40	10.0079	0.2502		
Total	54	121.3718	2.2476		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as

summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

	Prediction	se
CULT		
1	0.771	0.224
2	1.989	0.224
3	1.592	0.224
4	3.668	0.224
5	2.525	0.224
6	4.917	0.224
7	0.797	0.224
8	1.505	0.224
10	5.055	0.224
11	2.030	0.224
12	1.999	0.224

*** Coefficient of variation and standard error of a single unit ***

%cv	se
20.49	0.5002

***** Pairwise differences *****

t probabilities of pairwise differences

1	*	
2	0.000	*

3	0.013	0.217	*		
4	0.000	0.000	0.000	*	
5	0.000	0.098	0.005	0.001	*
6	0.000	0.000	0.000	0.000	0.000
7	0.932	0.001	0.016	0.000	0.000
8	0.025	0.134	0.785	0.000	0.003
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.898	0.174	0.000	0.125
12	0.000	0.975	0.206	0.000	0.104

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.031	*		
10	0.664	0.000	0.000	*	
11	0.000	0.000	0.105	0.000	*
12	0.000	0.000	0.127	0.000	0.922

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	105	4.34	33.01
2	105	3.84	8.81
3	105	3.81	23.06
4	105	15.47	171.04

5	105	16.24	140.76
6	105	14.30	97.29
7	105	2.29	9.62
8	105	12.29	97.68
10	105	21.43	110.94
11	105	14.31	113.80
12	105	16.83	170.54

YEAR	AREA	REP	CULT	fertclad	Tfertclad	FITTED	RESIDUAL
3	3	1	1	0.250	0.866	0.772	0.0941
3	3	2	1	0.000	0.707	0.744	-0.0373
3	3	3	1	0.250	0.866	0.854	0.0122
3	3	4	1	0.000	0.707	0.574	0.1328
3	3	5	1	0.000	0.707	0.909	-0.2018
3	3	1	2	3.750	2.062	1.990	0.0712
3	3	2	2	1.750	1.500	1.963	-0.4628
3	3	3	2	4.500	2.236	2.072	0.1638
3	3	4	2	5.000	2.345	1.793	0.5524
3	3	5	2	2.750	1.803	2.127	-0.3246
3	3	1	3	2.000	1.581	1.593	-0.0121
3	3	2	3	2.250	1.658	1.566	0.0925
3	3	3	3	2.500	1.732	1.675	0.0568
3	3	4	3	0.750	1.118	1.396	-0.2777
3	3	5	3	3.000	1.871	1.730	0.1405
3	3	1	4	11.250	3.428	3.669	-0.2415
3	3	2	4	14.250	3.841	3.642	0.1988
3	3	3	4	14.500	3.873	3.751	0.1217
3	3	4	4	14.000	3.808	3.472	0.3361
3	3	5	4	11.000	3.391	3.806	-0.4152
3	3	1	5	10.500	3.317	2.526	0.7903
3	3	2	5	3.250	1.936	2.499	-0.5623

3	3	3	5	7.750	2.872	2.608	0.2640
3	3	4	5	5.750	2.500	2.329	0.1712
3	3	5	5	3.500	2.000	2.663	-0.6633
3	3	1	6	23.500	4.899	4.918	-0.0188
3	3	2	6	21.000	4.637	4.890	-0.2534
3	3	3	6	25.250	5.074	5.000	0.0748
3	3	4	6	25.500	5.099	4.720	0.3788
3	3	5	6	23.250	4.873	5.055	-0.1814
3	3	1	7	0.000	0.707	0.799	-0.0916
3	3	2	7	0.500	1.000	0.771	0.2288
3	3	3	7	0.000	0.707	0.881	-0.1735
3	3	4	7	0.000	0.707	0.601	0.1060
3	3	5	7	0.250	0.866	0.936	-0.0697
3	3	1	8	0.000	0.707	1.506	-0.7993
3	3	2	8	2.250	1.658	1.479	0.1794
3	3	3	8	0.000	0.707	1.588	-0.8812
3	3	4	8	2.000	1.581	1.309	0.2723
3	3	5	8	7.750	2.872	1.643	1.2289
3	3	1	10	27.000	5.244	5.056	0.1881
3	3	2	10	32.250	5.723	5.028	0.6943
3	3	3	10	22.750	4.822	5.138	-0.3161
3	3	4	10	16.500	4.123	4.858	-0.7353
3	3	5	10	28.250	5.362	5.193	0.1689
3	3	1	11	4.250	2.179	2.031	0.1485
3	3	2	11	5.250	2.398	2.003	0.3944
3	3	3	11	7.750	2.872	2.113	0.7594
3	3	4	11	0.750	1.118	1.833	-0.7154
3	3	5	11	2.000	1.581	2.168	-0.5869
3	3	1	12	3.000	1.871	2.000	-0.1291
3	3	2	12	1.750	1.500	1.972	-0.4724
3	3	3	12	3.500	2.000	2.082	-0.0818
3	3	4	12	2.000	1.581	1.802	-0.2212

3 3 5 12 8.750 3.041 2.137 0.9045

===== fertclad for AREA 3 and YEAR 4 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.9034	0.2259	1.29	0.291
+ CULT	10	128.0443	12.8044	73.08	<.001
Residual	40	7.0081	0.1752		
Total	54	135.9558	2.5177		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

	Prediction	se
CULT		
1	1.287	0.187

2	2.334	0.187
3	2.839	0.187
4	4.866	0.187
5	3.539	0.187
6	4.780	0.187
7	1.871	0.187
8	2.319	0.187
10	6.818	0.187
11	2.939	0.187
12	2.847	0.187

*** Coefficient of variation and standard error of a single unit ***

%cv	se
12.64	0.4186

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.000	*			
3	0.000	0.063	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.012	0.000	*
6	0.000	0.000	0.000	0.746	0.000
7	0.033	0.088	0.001	0.000	0.000
8	0.000	0.955	0.056	0.000	0.000

10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.028	0.709	0.000	0.029
12	0.000	0.060	0.977	0.000	0.012

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.098	*		
10	0.000	0.000	0.000	*	
11	0.000	0.000	0.024	0.000	*
12	0.000	0.001	0.053	0.000	0.729

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	105	4.34	33.01
2	105	3.84	8.81
3	105	3.81	23.06
4	105	15.47	171.04
5	105	16.24	140.76
6	105	14.30	97.29
7	105	2.29	9.62
8	105	12.29	97.68
10	105	21.43	110.94
11	105	14.31	113.80

12 105 16.83 170.54

YEAR	AREA	REP	CULT	fertclad	Tfertclad	FITTED	RESIDUAL
4	3	1	1	2.00	1.581	1.382	0.1990
4	3	2	1	2.75	1.803	1.405	0.3978
4	3	3	1	0.75	1.118	1.224	-0.1062
4	3	4	1	0.00	0.707	1.063	-0.3562
4	3	5	1	1.00	1.225	1.359	-0.1343
4	3	1	2	3.75	2.062	2.429	-0.3679
4	3	2	2	4.00	2.121	2.452	-0.3309
4	3	3	2	6.25	2.598	2.272	0.3265
4	3	4	2	4.75	2.291	2.111	0.1807
4	3	5	2	6.25	2.598	2.406	0.1917
4	3	1	3	6.25	2.598	2.935	-0.3367
4	3	2	3	9.50	3.162	2.958	0.2047
4	3	3	3	10.50	3.317	2.777	0.5398
4	3	4	3	4.75	2.291	2.616	-0.3246
4	3	5	3	7.50	2.828	2.912	-0.0832
4	3	1	4	23.75	4.924	4.961	-0.0371
4	3	2	4	28.00	5.339	4.984	0.3543
4	3	3	4	22.75	4.822	4.804	0.0182
4	3	4	4	21.50	4.690	4.643	0.0478
4	3	5	4	20.25	4.555	4.938	-0.3832
4	3	1	5	15.75	4.031	3.635	0.3963
4	3	2	5	11.75	3.500	3.658	-0.1577
4	3	3	5	7.25	2.784	3.477	-0.6931
4	3	4	5	13.00	3.674	3.316	0.3582
4	3	5	5	13.25	3.708	3.612	0.0963
4	3	1	6	25.75	5.123	4.875	0.2483
4	3	2	6	24.25	4.975	4.898	0.0770
4	3	3	6	20.75	4.610	4.717	-0.1075

4	3	4	6	21.50	4.690	4.556	0.1341
4	3	5	6	19.75	4.500	4.852	-0.3520
4	3	1	7	2.50	1.732	1.967	-0.2345
4	3	2	7	4.00	2.121	1.989	0.1320
4	3	3	7	4.25	2.179	1.809	0.3708
4	3	4	7	3.50	2.000	1.648	0.3523
4	3	5	7	1.25	1.323	1.943	-0.6206
4	3	1	8	8.00	2.915	2.415	0.5008
4	3	2	8	2.75	1.803	2.438	-0.6347
4	3	3	8	1.50	1.414	2.257	-0.8426
4	3	4	8	3.50	2.000	2.096	-0.0959
4	3	5	8	11.50	3.464	2.392	1.0725
4	3	1	10	53.00	7.314	6.913	0.4014
4	3	2	10	46.25	6.837	6.936	-0.0984
4	3	3	10	44.50	6.708	6.755	-0.0469
4	3	4	10	42.25	6.538	6.594	-0.0558
4	3	5	10	44.25	6.690	6.890	-0.2003
4	3	1	11	8.00	2.915	3.034	-0.1189
4	3	2	11	9.50	3.162	3.057	0.1051
4	3	3	11	9.75	3.202	2.876	0.3251
4	3	4	11	5.75	2.500	2.716	-0.2155
4	3	5	11	8.00	2.915	3.011	-0.0958
4	3	1	12	4.75	2.291	2.942	-0.6507
4	3	2	12	8.00	2.915	2.965	-0.0493
4	3	3	12	8.50	3.000	2.784	0.2159
4	3	4	12	6.25	2.598	2.623	-0.0250
4	3	5	12	11.25	3.428	2.919	0.5090

===== fertclad for AREA 3 and YEAR 5 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	0.8839	0.2210	0.84	0.507
+ CULT	10	188.0068	18.8007	71.62	<.001
Residual	40	10.5000	0.2625		
Total	54	199.3908	3.6924		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

	Prediction	se
CULT		
1	0.766	0.229
2	1.280	0.229
3	1.414	0.229
4	6.351	0.229
5	2.476	0.229
6	5.201	0.229
7	0.766	0.229

8	2.304	0.229
10	5.162	0.229
11	2.225	0.229
12	2.084	0.229

*** Coefficient of variation and standard error of a single unit ***

%cv	se
18.77	0.5123

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.121	*			
3	0.052	0.681	*		
4	0.000	0.000	0.000	*	
5	0.000	0.001	0.002	0.000	*
6	0.000	0.000	0.000	0.001	0.000
7	0.992	0.121	0.052	0.000	0.000
8	0.000	0.003	0.009	0.000	0.598
10	0.000	0.000	0.000	0.001	0.000
11	0.000	0.006	0.016	0.000	0.442
12	0.000	0.017	0.045	0.000	0.233

	1	2	3	4	5

6	*				
7	0.000	*			
8	0.000	0.000	*		
10	0.905	0.000	0.000	*	
11	0.000	0.000	0.808	0.000	*
12	0.000	0.000	0.501	0.000	0.665

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	105	4.34	33.01
2	105	3.84	8.81
3	105	3.81	23.06
4	105	15.47	171.04
5	105	16.24	140.76
6	105	14.30	97.29
7	105	2.29	9.62
8	105	12.29	97.68
10	105	21.43	110.94
11	105	14.31	113.80
12	105	16.83	170.54

YEAR	AREA	REP	CULT	fertclad	Tfertclad	FITTED	RESIDUAL
5	3	1	1	0.50	1.000	0.797	0.2025
5	3	2	1	0.00	0.707	0.685	0.0224

5	3	3	1	0.00	0.707	0.885	-0.1777
5	3	4	1	0.00	0.707	0.563	0.1439
5	3	5	1	0.00	0.707	0.898	-0.1912
5	3	1	2	1.50	1.414	1.311	0.1028
5	3	2	2	0.75	1.118	1.199	-0.0806
5	3	3	2	1.75	1.500	1.399	0.1012
5	3	4	2	0.25	0.866	1.077	-0.2111
5	3	5	2	1.75	1.500	1.412	0.0878
5	3	1	3	0.25	0.866	1.446	-0.5797
5	3	2	3	0.25	0.866	1.333	-0.4669
5	3	3	3	2.75	1.803	1.533	0.2697
5	3	4	3	2.75	1.803	1.211	0.5913
5	3	5	3	2.50	1.732	1.547	0.1855
5	3	1	4	35.25	5.979	6.383	-0.4034
5	3	2	4	47.50	6.928	6.270	0.6585
5	3	3	4	41.00	6.442	6.470	-0.0278
5	3	4	4	35.75	6.021	6.148	-0.1275
5	3	5	4	40.25	6.384	6.483	-0.0998
5	3	1	5	4.50	2.236	2.508	-0.2721
5	3	2	5	7.50	2.828	2.395	0.4331
5	3	3	5	4.00	2.121	2.596	-0.4742
5	3	4	5	6.25	2.598	2.274	0.3242
5	3	5	5	6.25	2.598	2.609	-0.0109
5	3	1	6	30.00	5.523	5.233	0.2901
5	3	2	6	20.50	4.583	5.120	-0.5372
5	3	3	6	29.50	5.477	5.320	0.1573
5	3	4	6	23.50	4.899	4.998	-0.0993
5	3	5	6	30.00	5.523	5.333	0.1893
5	3	1	7	0.00	0.707	0.797	-0.0904
5	3	2	7	0.00	0.707	0.685	0.0224
5	3	3	7	0.50	1.000	0.885	0.1152
5	3	4	7	0.00	0.707	0.563	0.1439

5	3	5	7	0.00	0.707	0.898	-0.1912
5	3	1	8	5.67	2.484	2.336	0.1480
5	3	2	8	0.75	1.118	2.223	-1.1050
5	3	3	8	4.75	2.291	2.423	-0.1320
5	3	4	8	4.50	2.236	2.102	0.1345
5	3	5	8	11.00	3.391	2.437	0.9545
5	3	1	10	43.50	6.633	5.194	1.4392
5	3	2	10	28.25	5.362	5.081	0.2807
5	3	3	10	25.50	5.099	5.281	-0.1824
5	3	4	10	15.50	4.000	4.960	-0.9597
5	3	5	10	21.75	4.717	5.295	-0.5778
5	3	1	11	4.00	2.121	2.257	-0.1355
5	3	2	11	7.33	2.798	2.144	0.6542
5	3	3	11	5.75	2.500	2.344	0.1559
5	3	4	11	1.50	1.414	2.023	-0.6083
5	3	5	11	4.75	2.291	2.358	-0.0663
5	3	1	12	1.50	1.414	2.116	-0.7015
5	3	2	12	4.00	2.121	2.003	0.1184
5	3	3	12	5.25	2.398	2.203	0.1949
5	3	4	12	6.00	2.550	1.881	0.6681
5	3	5	12	3.25	1.936	2.216	-0.2800

===== fertclad for AREA 3 and YEAR 6 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	3.7734	0.9434	2.04	0.107
+ CULT	10	175.2193	17.5219	37.85	<.001
Residual	40	18.5178	0.4629		
Total	54	197.5105	3.6576		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

	Prediction	se
CULT		
1	0.951	0.304
2	0.988	0.304
3	0.842	0.304
4	6.255	0.304
5	3.279	0.304
6	4.251	0.304
7	0.766	0.304
8	2.480	0.304
10	5.186	0.304
11	2.387	0.304
12	3.175	0.304

*** Coefficient of variation and standard error of a single unit ***

%cv	se
24.49	0.6804

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.932	*			
3	0.801	0.737	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.000	*
6	0.000	0.000	0.000	0.000	0.029
7	0.668	0.608	0.859	0.000	0.000
8	0.001	0.001	0.000	0.000	0.071
10	0.000	0.000	0.000	0.017	0.000
11	0.002	0.002	0.001	0.000	0.045
12	0.000	0.000	0.000	0.000	0.811

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.000	*		
10	0.036	0.000	0.000	*	
11	0.000	0.001	0.829	0.000	*
12	0.017	0.000	0.114	0.000	0.074

6 7 8 10 11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	105	4.34	33.01
2	105	3.84	8.81
3	105	3.81	23.06
4	105	15.47	171.04
5	105	16.24	140.76
6	105	14.30	97.29
7	105	2.29	9.62
8	105	12.29	97.68
10	105	21.43	110.94
11	105	14.31	113.80
12	105	16.83	170.54

YEAR	AREA	REP	CULT	fertclad	Tfertclad	FITTED	RESIDUAL
6	3	1	1	0.75	1.118	0.445	0.6734
6	3	2	1	1.00	1.225	1.086	0.1383
6	3	3	1	0.00	0.707	1.168	-0.4609
6	3	4	1	0.50	1.000	0.961	0.0385
6	3	5	1	0.00	0.707	1.096	-0.3892
6	3	1	2	0.00	0.707	0.481	0.2260
6	3	2	2	0.50	1.000	1.123	-0.1229
6	3	3	2	0.25	0.866	1.204	-0.3384

6	3	4	2	1.75	1.500	0.998	0.5021
6	3	5	2	0.25	0.866	1.133	-0.2668
6	3	1	3	1.00	1.225	0.336	0.8890
6	3	2	3	0.25	0.866	0.977	-0.1114
6	3	3	3	0.00	0.707	1.059	-0.3519
6	3	4	3	0.00	0.707	0.853	-0.1454
6	3	5	3	0.00	0.707	0.987	-0.2803
6	3	1	4	38.75	6.265	5.748	0.5165
6	3	2	4	44.50	6.708	6.390	0.3179
6	3	3	4	42.00	6.519	6.472	0.0474
6	3	4	4	36.50	6.083	6.265	-0.1825
6	3	5	4	32.00	5.701	6.400	-0.6993
6	3	1	5	6.50	2.646	2.772	-0.1261
6	3	2	5	10.50	3.317	3.414	-0.0970
6	3	3	5	12.75	3.640	3.495	0.1449
6	3	4	5	9.00	3.082	3.289	-0.2064
6	3	5	5	13.25	3.708	3.424	0.2846
6	3	1	6	0.00	0.707	3.744	-3.0368
6	3	2	6	29.75	5.500	4.386	1.1143
6	3	3	6	23.50	4.899	4.467	0.4317
6	3	4	6	26.25	5.172	4.261	0.9113
6	3	5	6	24.25	4.975	4.396	0.5794
6	3	1	7	0.00	0.707	0.259	0.4481
6	3	2	7	0.00	0.707	0.901	-0.1936
6	3	3	7	0.50	1.000	0.982	0.0177
6	3	4	7	0.00	0.707	0.776	-0.0687
6	3	5	7	0.00	0.707	0.911	-0.2035
6	3	1	8	3.00	1.871	1.973	-0.1026
6	3	2	8	2.75	1.803	2.615	-0.8124
6	3	3	8	9.75	3.202	2.697	0.5048
6	3	4	8	3.75	2.062	2.490	-0.4287
6	3	5	8	11.50	3.464	2.625	0.8390

6	3	1	10	25.00	5.050	4.679	0.3707
6	3	2	10	26.75	5.220	5.321	-0.1006
6	3	3	10	25.75	5.123	5.402	-0.2789
6	3	4	10	26.75	5.220	5.196	0.0243
6	3	5	10	27.75	5.315	5.331	-0.0156
6	3	1	11	2.50	1.732	1.880	-0.1479
6	3	2	11	5.00	2.345	2.522	-0.1765
6	3	3	11	10.25	3.279	2.603	0.6754
6	3	4	11	4.25	2.179	2.397	-0.2173
6	3	5	11	5.25	2.398	2.532	-0.1337
6	3	1	12	8.25	2.958	2.668	0.2896
6	3	2	12	10.75	3.354	3.310	0.0439
6	3	3	12	8.50	3.000	3.392	-0.3918
6	3	4	12	8.25	2.958	3.185	-0.2272
6	3	5	12	12.50	3.606	3.320	0.2855

===== fertclad for AREA 3 and YEAR 7 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	1.9246	0.4811	1.67	0.176
+ CULT	10	124.8468	12.4847	43.28	<.001
Residual	40	11.5374	0.2884		

Total	54	138.3088	2.5613

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

CULT	Prediction	se
1	1.588	0.240
2	1.121	0.240
3	1.950	0.240
4	3.854	0.240
5	2.159	0.240
6	5.481	0.240
7	1.567	0.240
8	1.786	0.240
10	5.626	0.240
11	1.905	0.240
12	2.737	0.240

*** Coefficient of variation and standard error of a single unit ***

%cv	se
19.84	0.5371

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.176	*			
3	0.292	0.019	*		
4	0.000	0.000	0.000	*	
5	0.101	0.004	0.543	0.000	*
6	0.000	0.000	0.000	0.000	0.000
7	0.950	0.196	0.266	0.000	0.089
8	0.563	0.057	0.631	0.000	0.279
10	0.000	0.000	0.000	0.000	0.000
11	0.357	0.026	0.893	0.000	0.458
12	0.002	0.000	0.026	0.002	0.097

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.522	*		
10	0.671	0.000	0.000	*	
11	0.000	0.326	0.729	0.000	*
12	0.000	0.001	0.008	0.000	0.019

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	105	4.34	33.01
2	105	3.84	8.81
3	105	3.81	23.06
4	105	15.47	171.04
5	105	16.24	140.76
6	105	14.30	97.29
7	105	2.29	9.62
8	105	12.29	97.68
10	105	21.43	110.94
11	105	14.31	113.80
12	105	16.83	170.54

YEAR	AREA	REP	CULT	fertclad	Tfertclad	FITTED	RESIDUAL
7	3	1	1	4.250	2.179	1.708	0.4713
7	3	2	1	4.000	2.121	1.848	0.2729
7	3	3	1	1.500	1.414	1.617	-0.2032
7	3	4	1	0.500	1.000	1.321	-0.3206
7	3	5	1	1.000	1.225	1.445	-0.2206
7	3	1	2	1.000	1.225	1.241	-0.0159
7	3	2	2	1.250	1.323	1.381	-0.0581
7	3	3	2	0.250	0.866	1.150	-0.2839
7	3	4	2	1.250	1.323	0.853	0.4697
7	3	5	2	0.250	0.866	0.978	-0.1119
7	3	1	3	2.500	1.732	2.071	-0.3385
7	3	2	3	9.250	3.122	2.211	0.9116
7	3	3	3	0.750	1.118	1.980	-0.8618
7	3	4	3	2.250	1.658	1.683	-0.0248

7	3	5	3	4.000	2.121	1.808	0.3135
7	3	1	4	16.250	4.093	3.974	0.1185
7	3	2	4	11.000	3.391	4.114	-0.7233
7	3	3	4	19.500	4.472	3.883	0.5887
7	3	4	4	13.000	3.674	3.587	0.0876
7	3	5	4	12.750	3.640	3.711	-0.0714
7	3	1	5	5.250	2.398	2.279	0.1188
7	3	2	5	3.500	2.000	2.419	-0.4194
7	3	3	5	7.000	2.739	2.188	0.5502
7	3	4	5	3.500	2.000	1.892	0.1084
7	3	5	5	2.250	1.658	2.016	-0.3580
7	3	1	6	41.250	6.461	5.601	0.8601
7	3	2	6	28.750	5.408	5.742	-0.3333
7	3	3	6	26.000	5.148	5.511	-0.3628
7	3	4	6	25.000	5.050	5.214	-0.1640
7	3	5	6	28.000	5.339	5.339	0.0000
7	3	1	7	3.000	1.871	1.687	0.1838
7	3	2	7	3.250	1.936	1.827	0.1091
7	3	3	7	3.250	1.936	1.596	0.3402
7	3	4	7	1.000	1.225	1.300	-0.0748
7	3	5	7	0.250	0.866	1.424	-0.5583
7	3	1	8	3.670	2.042	1.906	0.1358
7	3	2	8	3.250	1.936	2.047	-0.1101
7	3	3	8	1.000	1.225	1.816	-0.5908
7	3	4	8	0.670	1.082	1.519	-0.4371
7	3	5	8	6.500	2.646	1.644	1.0022
7	3	1	10	17.500	4.243	5.747	-1.5040
7	3	2	10	41.000	6.442	5.887	0.5552
7	3	3	10	39.000	6.285	5.656	0.6290
7	3	4	10	34.250	5.895	5.359	0.5358
7	3	5	10	27.250	5.268	5.484	-0.2160
7	3	1	11	3.250	1.936	2.025	-0.0883

7	3	2	11	3.670	2.042	2.165	-0.1231
7	3	3	11	6.000	2.550	1.934	0.6154
7	3	4	11	2.000	1.581	1.637	-0.0562
7	3	5	11	1.500	1.414	1.762	-0.3478
7	3	1	12	8.000	2.915	2.857	0.0586
7	3	2	12	8.000	2.915	2.997	-0.0817
7	3	3	12	5.000	2.345	2.766	-0.4209
7	3	4	12	5.000	2.345	2.469	-0.1241
7	3	5	12	9.500	3.162	2.594	0.5682

Appendix 3.7.3 ANOVA for number of fruit set of individual cultivars over production years and areas

JPftotalAOV.out

file is JPfyieldAOV.gen

========== CACTUS PEAR ENVIRONMENTAL ADAPTIBILITY: FRUIT YIELD

counts transformed to stabilise treatment variances Y = sqrt(X+0.5)

===== ftotal for AREA 1 and YEAR 1 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	25.138	6.284	2.65	0.049
+ CULT	10	581.520	58.152	24.55	<.001
Residual	36	85.282	2.369		
Total	50	691.940	13.839		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as

summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

Prediction se

CULT		
1	1.430	0.689
2	1.417	0.776
3	1.228	0.776
4	2.476	0.689
5	9.863	0.689
6	6.074	0.689
7	1.278	0.903
8	6.785	0.689
10	4.587	0.689
11	8.780	0.689
12	10.254	0.689

*** Coefficient of variation and standard error of a single unit ***

%cv	se
29.55	1.539

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.988	*			
3	0.847	0.863	*		
4	0.290	0.315	0.238	*	
5	0.000	0.000	0.000	0.000	*
6	0.000	0.000	0.000	0.001	0.000
7	0.894	0.907	0.966	0.300	0.000
8	0.000	0.000	0.000	0.000	0.003
10	0.003	0.004	0.003	0.037	0.000
11	0.000	0.000	0.000	0.000	0.273
12	0.000	0.000	0.000	0.000	0.690

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.470	0.000	*		
10	0.135	0.006	0.030	*	
11	0.009	0.000	0.048	0.000	*
12	0.000	0.000	0.001	0.000	0.139

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	36.40	2080
2	101	51.09	2084
3	86	44.75	2087
4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091
8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR	AREA	REP	CULT	ftotal	Tftotal	FITTED	RESIDUAL
1	1	1	1	1.25	1.323	1.490	-0.1667
1	1	2	1	1.00	1.225	1.441	-0.2161

1	1	3	1	3.50	2.000	1.899	0.1011
1	1	4	1	1.75	1.500	1.057	0.4429
1	1	5	1	1.00	1.225	1.386	-0.1613
1	1	1	2	1.25	1.323	1.477	-0.1540
1	1	2	2	0.50	1.000	1.428	-0.4282
1	1	3	2	*	*	1.886	*
1	1	4	2	1.75	1.500	1.044	0.4556
1	1	5	2	1.75	1.500	1.373	0.1266
1	1	1	3	0.00	0.707	1.288	-0.5812
1	1	2	3	2.00	1.581	1.240	0.3416
1	1	3	3	*	*	1.698	*
1	1	4	3	1.50	1.414	0.856	0.5584
1	1	5	3	0.25	0.866	1.185	-0.3187
1	1	1	4	4.50	2.236	2.536	-0.2997
1	1	2	4	9.75	3.202	2.487	0.7145
1	1	3	4	5.50	2.449	2.945	-0.4956
1	1	4	4	2.25	1.658	2.103	-0.4450
1	1	5	4	8.25	2.958	2.432	0.5258
1	1	1	5	206.75	14.396	9.923	4.4734
1	1	2	5	77.25	8.818	9.874	-1.0564
1	1	3	5	69.25	8.352	10.332	-1.9804
1	1	4	5	95.75	9.811	9.490	0.3204
1	1	5	5	64.50	8.062	9.819	-1.7570
1	1	1	6	53.00	7.314	6.134	1.1804
1	1	2	6	36.75	6.103	6.085	0.0180
1	1	3	6	36.50	6.083	6.543	-0.4605
1	1	4	6	27.75	5.315	5.701	-0.3864
1	1	5	6	31.75	5.679	6.030	-0.3515
1	1	1	7	0.75	1.118	1.338	-0.2198
1	1	2	7	0.50	1.000	1.289	-0.2891
1	1	3	7	*	*	1.747	*
1	1	4	7	1.50	1.414	0.905	0.5089

1	1	5	7	*	*	1.234	*
1	1	1	8	37.00	6.124	6.845	-0.7208
1	1	2	8	42.25	6.538	6.796	-0.2575
1	1	3	8	47.75	6.946	7.254	-0.3076
1	1	4	8	72.50	8.544	6.412	2.1320
1	1	5	8	34.25	5.895	6.741	-0.8461
1	1	1	10	6.50	2.646	4.647	-2.0011
1	1	2	10	51.50	7.211	4.598	2.6130
1	1	3	10	38.75	6.265	5.056	1.2088
1	1	4	10	15.00	3.937	4.214	-0.2774
1	1	5	10	8.50	3.000	4.543	-1.5433
1	1	1	11	81.25	9.042	8.840	0.2017
1	1	2	11	80.50	9.000	8.791	0.2089
1	1	3	11	116.25	10.805	9.249	1.5560
1	1	4	11	38.00	6.205	8.407	-2.2025
1	1	5	11	80.00	8.972	8.736	0.2359
1	1	1	12	73.50	8.602	10.314	-1.7120
1	1	2	12	73.75	8.617	10.266	-1.6488
1	1	3	12	122.75	11.102	10.724	0.3782
1	1	4	12	76.50	8.775	9.882	-1.1069
1	1	5	12	204.00	14.300	10.211	4.0895

===== ftotal for AREA 1 and YEAR 2 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	97.657	24.414	5.42	0.002
+ CULT	9	70.143	7.794	1.73	0.122
Residual	32	144.119	4.504		
Total	45	311.919	6.932		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

	Prediction	se
CULT		
1	3.820	0.949
2	3.793	0.949
3	*	*
4	4.704	1.253
5	5.820	0.949
6	4.308	0.949
7	3.421	1.253
8	4.820	0.949
10	4.641	0.949
11	4.943	0.949
12	7.913	0.949

*** Coefficient of variation and standard error of a single unit ***

%cv	se
43.45	2.122

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.982	*			
3	*	*	*		
4	0.578	0.566	*	*	
5	0.146	0.141	*	0.483	*
6	0.719	0.704	*	0.802	0.268
7	0.802	0.814	*	0.481	0.137
8	0.461	0.450	*	0.941	0.462
10	0.545	0.532	*	0.968	0.386
11	0.409	0.398	*	0.880	0.518
12	0.005	0.004	*	0.050	0.129

	1	2	3	4	5
6	*				
7	0.577	*			
8	0.705	0.380	*		
10	0.805	0.443	0.895	*	
11	0.639	0.340	0.927	0.823	*
12	0.011	0.007	0.028	0.021	0.034

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	36.40	2080
2	101	51.09	2084
3	86	44.75	2087
4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091
8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR	AREA	REP	CULT	ftotal	Tftotal	FITTED	RESIDUAL
2	1	1	1	1.75	1.500	2.146	-0.646
2	1	2	1	35.75	6.021	2.665	3.355
2	1	3	1	0.00	0.707	3.369	-2.662
2	1	4	1	48.00	6.964	5.011	1.953
2	1	5	1	16.25	4.093	6.093	-2.000
2	1	1	2	0.75	1.118	2.120	-1.002
2	1	2	2	0.75	1.118	2.639	-1.521
2	1	3	2	17.25	4.213	3.342	0.871
2	1	4	2	37.50	6.164	4.985	1.180
2	1	5	2	42.25	6.538	6.066	0.472
2	1	1	3	*	*	2.146	*
2	1	2	3	*	*	2.665	*
2	1	3	3	*	*	3.369	*
2	1	4	3	*	*	5.011	*
2	1	5	3	*	*	6.093	*

2	1	1	4	0.25	0.866	3.031	-2.164
2	1	2	4	0.00	0.707	3.550	-2.842
2	1	3	4	85.25	9.260	4.253	5.007
2	1	4	4	*	*	5.896	*
2	1	5	4	*	*	6.977	*
2	1	1	5	58.50	7.681	4.147	3.535
2	1	2	5	16.00	4.062	4.666	-0.604
2	1	3	5	5.25	2.398	5.369	-2.971
2	1	4	5	71.00	8.456	7.012	1.444
2	1	5	5	44.25	6.690	8.093	-1.404
2	1	1	6	9.50	3.162	2.634	0.528
2	1	2	6	3.00	1.871	3.153	-1.282
2	1	3	6	23.75	4.924	3.857	1.068
2	1	4	6	17.00	4.183	5.499	-1.316
2	1	5	6	57.00	7.583	6.581	1.002
2	1	1	7	1.50	1.414	1.748	-0.334
2	1	2	7	*	*	2.267	*
2	1	3	7	*	*	2.971	*
2	1	4	7	11.75	3.500	4.613	-1.113
2	1	5	7	50.50	7.141	5.695	1.447
2	1	1	8	30.75	5.590	3.147	2.443
2	1	2	8	10.75	3.354	3.666	-0.312
2	1	3	8	12.50	3.606	4.369	-0.764
2	1	4	8	27.75	5.315	6.012	-0.697
2	1	5	8	40.75	6.423	7.093	-0.671
2	1	1	10	12.00	3.536	2.968	0.568
2	1	2	10	17.50	4.243	3.487	0.756
2	1	3	10	11.50	3.464	4.191	-0.727
2	1	4	10	31.00	5.612	5.833	-0.220
2	1	5	10	42.25	6.538	6.915	-0.376
2	1	1	11	11.75	3.500	3.270	0.230
2	1	2	11	10.75	3.354	3.789	-0.435

2	1	3	11	29.75	5.500	4.493	1.007
2	1	4	11	39.75	6.344	6.135	0.209
2	1	5	11	38.00	6.205	7.217	-1.012
2	1	1	12	9.00	3.082	6.240	-3.157
2	1	2	12	92.50	9.644	6.759	2.885
2	1	3	12	43.50	6.633	7.462	-0.829
2	1	4	12	58.25	7.665	9.105	-1.440
2	1	5	12	161.50	12.728	10.186	2.542

===== ftotal for AREA 1 and YEAR 3 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	182.662	45.665	10.93	<.001
+ CULT	10	94.233	9.423	2.25	0.035
Residual	38	158.809	4.179		
Total	52	435.704	8.379		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as

summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

	Prediction	se
CULT		
1	6.181	0.914
2	6.419	0.914
3	6.083	1.031
4	7.235	0.914
5	7.715	0.914
6	7.602	0.914
7	5.483	1.031
8	8.224	0.914
10	8.800	0.914
11	8.356	0.914
12	10.350	0.914

*** Coefficient of variation and standard error of a single unit ***

%cv	se
27.04	2.044

***** Pairwise differences *****

t probabilities of pairwise differences

1	*			
2	0.855	*		
3	0.943	0.808	*	
4	0.420	0.532	0.409	*

5	0.243	0.323	0.244	0.712	*
6	0.279	0.366	0.278	0.778	0.930
7	0.616	0.501	0.684	0.212	0.114
8	0.122	0.171	0.129	0.449	0.696
10	0.050	0.073	0.056	0.233	0.406
11	0.101	0.143	0.108	0.391	0.623
12	0.003	0.004	0.004	0.021	0.049

	1	2	3	4	5
6	*				
7	0.133	*			
8	0.633	0.054	*		
10	0.360	0.021	0.659	*	
11	0.563	0.044	0.919	0.733	*
12	0.040	0.001	0.108	0.238	0.131

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	88	36.40	2080
2	101	51.09	2084
3	86	44.75	2087
4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091

8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR	AREA	REP	CULT	ftotal	Tftotal	FITTED	RESIDUAL
3	1	1	1	16.25	4.093	4.146	-0.053
3	1	2	1	72.00	8.515	4.242	4.272
3	1	3	1	3.25	1.936	6.153	-4.216
3	1	4	1	62.50	7.937	7.238	0.699
3	1	5	1	69.00	8.337	9.039	-0.702
3	1	1	2	10.25	3.279	4.384	-1.105
3	1	2	2	15.25	3.969	4.480	-0.512
3	1	3	2	46.75	6.874	6.391	0.483
3	1	4	2	61.50	7.874	7.476	0.398
3	1	5	2	99.75	10.012	9.277	0.736
3	1	1	3	*	*	4.047	*
3	1	2	3	8.75	3.041	4.144	-1.102
3	1	3	3	42.00	6.519	6.055	0.465
3	1	4	3	56.75	7.566	7.140	0.427
3	1	5	3	83.25	9.152	8.940	0.211
3	1	1	4	6.50	2.646	5.199	-2.553
3	1	2	4	4.50	2.236	5.296	-3.060
3	1	3	4	105.75	10.308	7.206	3.101
3	1	4	4	99.00	9.975	8.292	1.683
3	1	5	4	118.75	10.920	10.092	0.828
3	1	1	5	72.50	8.544	5.679	2.865
3	1	2	5	26.75	5.220	5.776	-0.556
3	1	3	5	33.25	5.809	7.686	-1.877
3	1	4	5	104.00	10.223	8.772	1.451
3	1	5	5	75.00	8.689	10.572	-1.883

3	1	1	6	45.00	6.745	5.566	1.179
3	1	2	6	31.75	5.679	5.663	0.016
3	1	3	6	97.25	9.887	7.573	2.314
3	1	4	6	17.75	4.272	8.658	-4.386
3	1	5	6	128.00	11.336	10.459	0.877
3	1	1	7	11.75	3.500	3.448	0.052
3	1	2	7	5.25	2.398	3.544	-1.146
3	1	3	7	26.75	5.220	5.455	-0.235
3	1	4	7	*	*	6.540	*
3	1	5	7	93.00	9.670	8.341	1.329
3	1	1	8	20.50	4.583	6.189	-1.606
3	1	2	8	36.00	6.042	6.285	-0.244
3	1	3	8	81.00	9.028	8.196	0.832
3	1	4	8	132.50	11.533	9.281	2.251
3	1	5	8	96.50	9.849	11.082	-1.233
3	1	1	10	46.75	6.874	6.765	0.109
3	1	2	10	42.25	6.538	6.861	-0.323
3	1	3	10	71.50	8.485	8.772	-0.287
3	1	4	10	102.75	10.161	9.857	0.304
3	1	5	10	140.00	11.853	11.657	0.196
3	1	1	11	49.50	7.071	6.320	0.751
3	1	2	11	27.75	5.315	6.416	-1.101
3	1	3	11	58.25	7.665	8.327	-0.662
3	1	4	11	104.50	10.247	9.412	0.834
3	1	5	11	129.25	11.391	11.213	0.178
3	1	1	12	74.75	8.675	8.314	0.361
3	1	2	12	147.50	12.166	8.411	3.755
3	1	3	12	107.75	10.404	10.321	0.083
3	1	4	12	59.50	7.746	11.407	-3.661
3	1	5	12	160.00	12.669	13.207	-0.538

===== ftotal for AREA 1 and YEAR 4 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	233.094	58.273	13.42	<.001
+ CULT	10	135.694	13.569	3.12	0.006
Residual	36	156.326	4.342		
Total	50	525.113	10.502		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

	Prediction	se
CULT		
1	6.917	0.932
2	7.778	0.932
3	6.739	0.932
4	9.503	0.932
5	9.814	0.932
6	10.853	0.932

7	7.830	2.162
8	10.089	0.932
10	9.004	0.932
11	10.196	0.932
12	12.121	0.932

*** Coefficient of variation and standard error of a single unit ***

%cv	se
22.47	2.084

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.518	*			
3	0.893	0.436	*		
4	0.058	0.199	0.043	*	
5	0.034	0.131	0.025	0.814	*
6	0.005	0.025	0.004	0.312	0.436
7	0.701	0.981	0.646	0.483	0.405
8	0.021	0.088	0.015	0.659	0.836
10	0.122	0.358	0.094	0.707	0.543
11	0.018	0.075	0.013	0.602	0.773
12	0.000	0.002	0.000	0.055	0.089

	1	2	3	4	5

6	*				
7	0.208	*			
8	0.565	0.344	*		
10	0.169	0.621	0.416	*	
11	0.621	0.322	0.935	0.372	*
12	0.343	0.077	0.132	0.024	0.153

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	36.40	2080
2	101	51.09	2084
3	86	44.75	2087
4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091
8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR	AREA	REP	CULT	ftotal	Tftotal	FITTED	RESIDUAL
4	1	1	1	13.50	3.742	3.908	-0.166
4	1	2	1	90.00	9.513	5.430	4.083
4	1	3	1	4.75	2.291	6.615	-4.324

4	1	4	1	76.50	8.775	8.414	0.361
4	1	5	1	101.75	10.112	10.065	0.046
4	1	1	2	7.75	2.872	4.769	-1.897
4	1	2	2	60.25	7.794	6.291	1.503
4	1	3	2	61.50	7.874	7.476	0.398
4	1	4	2	100.25	10.037	9.275	0.762
4	1	5	2	102.75	10.161	10.927	-0.765
4	1	1	3	15.00	3.937	3.730	0.207
4	1	2	3	41.25	6.461	5.253	1.209
4	1	3	3	31.50	5.657	6.438	-0.781
4	1	4	3	51.25	7.194	8.237	-1.043
4	1	5	3	105.50	10.296	9.888	0.408
4	1	1	4	14.00	3.808	6.494	-2.686
4	1	2	4	31.00	5.612	8.016	-2.404
4	1	3	4	224.50	15.000	9.201	5.799
4	1	4	4	91.50	9.592	11.000	-1.409
4	1	5	4	177.75	13.351	12.651	0.700
4	1	1	5	72.75	8.559	6.805	1.753
4	1	2	5	45.50	6.782	8.328	-1.545
4	1	3	5	48.00	6.964	9.513	-2.549
4	1	4	5	220.25	14.858	11.312	3.546
4	1	5	5	137.75	11.758	12.963	-1.205
4	1	1	6	42.75	6.576	7.845	-1.268
4	1	2	6	62.75	7.953	9.367	-1.414
4	1	3	6	175.25	13.257	10.552	2.705
4	1	4	6	139.25	11.822	12.351	-0.529
4	1	5	6	210.00	14.509	14.002	0.506
4	1	1	7	*	*	4.821	*
4	1	2	7	*	*	6.343	*
4	1	3	7	*	*	7.528	*
4	1	4	7	86.50	9.327	9.327	0.000
4	1	5	7	*	*	10.979	*

4	1	1	8	73.25	8.588	7.080	1.508
4	1	2	8	55.00	7.450	8.602	-1.153
4	1	3	8	111.25	10.571	9.788	0.784
4	1	4	8	115.75	10.782	11.586	-0.804
4	1	5	8	166.00	12.903	13.238	-0.334
4	1	1	10	38.00	6.205	5.995	0.210
4	1	2	10	52.25	7.263	7.518	-0.255
4	1	3	10	48.25	6.982	8.703	-1.721
4	1	4	10	131.25	11.478	10.502	0.977
4	1	5	10	167.00	12.942	12.153	0.789
4	1	1	11	93.50	9.695	7.188	2.508
4	1	2	11	57.50	7.616	8.710	-1.094
4	1	3	11	80.75	9.014	9.895	-0.881
4	1	4	11	138.00	11.769	11.694	0.075
4	1	5	11	161.75	12.738	13.345	-0.607
4	1	1	12	79.50	8.944	9.112	-0.168
4	1	2	12	136.50	11.705	10.634	1.070
4	1	3	12	153.00	12.390	11.819	0.570
4	1	4	12	136.00	11.683	13.618	-1.935
4	1	5	12	247.00	15.732	15.270	0.463

===== ftotal for AREA 1 and YEAR 5 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	262.291	65.573	13.72	<.001
+ CULT	10	88.839	8.884	1.86	0.087
Residual	34	162.443	4.778		
Total	48	513.574	10.699		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

CULT	Prediction	se
1	6.563	0.978
2	5.422	0.978
3	7.292	1.588
4	8.524	0.978
5	5.848	0.978
6	8.328	0.978
7	8.000	1.588
8	8.010	0.978
10	6.073	0.978
11	7.659	0.978
12	9.906	0.978

*** Coefficient of variation and standard error of a single unit ***

%cv	se
29.57	2.186

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.415	*			
3	0.699	0.325	*		
4	0.165	0.031	0.515	*	
5	0.608	0.760	0.446	0.061	*
6	0.210	0.043	0.583	0.888	0.082
7	0.448	0.177	0.748	0.781	0.258
8	0.303	0.070	0.704	0.712	0.127
10	0.725	0.640	0.519	0.085	0.871
11	0.433	0.115	0.845	0.536	0.199
12	0.021	0.003	0.172	0.325	0.006

	1	2	3	4	5

6	*				
7	0.862	*			
8	0.819	0.991	*		
10	0.112	0.310	0.170	*	
11	0.632	0.856	0.801	0.259	*
12	0.262	0.316	0.179	0.009	0.113

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	36.40	2080
2	101	51.09	2084
3	86	44.75	2087
4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091
8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR	AREA	REP	CULT	ftotal	Tftotal	FITTED	RESIDUAL
5	1	1	1	3.50	2.000	3.277	-1.277
5	1	2	1	91.50	9.592	6.013	3.579
5	1	3	1	0.25	0.866	5.875	-5.009
5	1	4	1	91.75	9.605	6.671	2.934
5	1	5	1	101.00	10.075	10.301	-0.226
5	1	1	2	1.25	1.323	2.136	-0.813
5	1	2	2	57.00	7.583	4.871	2.712
5	1	3	2	23.50	4.899	4.734	0.165
5	1	4	2	49.00	7.036	5.530	1.506
5	1	5	2	30.75	5.590	9.160	-3.570
5	1	1	3	*	*	4.006	*
5	1	2	3	*	*	6.741	*
5	1	3	3	41.00	6.442	6.604	-0.162
5	1	4	3	*	*	7.400	*
5	1	5	3	124.75	11.192	11.030	0.162
5	1	1	4	20.00	4.528	5.238	-0.710

5	1	2	4	9.75	3.202	7.973	-4.772
5	1	3	4	114.50	10.724	7.836	2.888
5	1	4	4	87.50	9.381	8.632	0.749
5	1	5	4	198.50	14.107	12.262	1.845
5	1	1	5	25.00	5.050	2.562	2.488
5	1	2	5	18.50	4.359	5.297	-0.938
5	1	3	5	20.00	4.528	5.160	-0.632
5	1	4	5	19.75	4.500	5.956	-1.456
5	1	5	5	102.00	10.124	9.586	0.539
5	1	1	6	28.50	5.385	5.043	0.343
5	1	2	6	83.50	9.165	7.778	1.388
5	1	3	6	87.50	9.381	7.640	1.741
5	1	4	6	26.75	5.220	8.436	-3.216
5	1	5	6	139.00	11.811	12.066	-0.255
5	1	1	7	*	*	4.715	*
5	1	2	7	*	*	7.450	*
5	1	3	7	57.50	7.616	7.312	0.304
5	1	4	7	*	*	8.108	*
5	1	5	7	130.25	11.435	11.738	-0.304
5	1	1	8	10.00	3.240	4.724	-1.484
5	1	2	8	52.50	7.280	7.459	-0.179
5	1	3	8	48.00	6.964	7.321	-0.357
5	1	4	8	80.00	8.972	8.118	0.854
5	1	5	8	166.25	12.913	11.748	1.166
5	1	1	10	4.25	2.179	2.788	-0.608
5	1	2	10	12.75	3.640	5.523	-1.883
5	1	3	10	43.25	6.614	5.385	1.230
5	1	4	10	34.00	5.874	6.181	-0.308
5	1	5	10	129.00	11.380	9.811	1.569
5	1	1	11	43.25	6.614	4.374	2.241
5	1	2	11	27.00	5.244	7.109	-1.865
5	1	3	11	36.50	6.083	6.971	-0.888

5	1	4	11	70.00	8.396	7.767	0.629
5	1	5	11	126.75	11.281	11.397	-0.117
5	1	1	12	41.00	6.442	6.620	-0.178
5	1	2	12	127.50	11.314	9.355	1.958
5	1	3	12	98.25	9.937	9.217	0.720
5	1	4	12	68.75	8.322	10.014	-1.692
5	1	5	12	164.25	12.835	13.644	-0.808

===== ftotal for AREA 1 and YEAR 6 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	168.775	42.194	14.78	<.001
+ CULT	10	65.579	6.558	2.30	0.031
Residual	39	111.305	2.854		
Total	53	345.660	6.522		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

Prediction se

CULT		
1	5.248	0.756
2	5.467	0.756
3	6.801	0.756
4	6.941	0.756
5	5.599	0.756
6	6.946	0.756
7	5.969	0.852
8	7.642	0.756
10	5.995	0.756
11	7.448	0.756
12	9.108	0.756

*** Coefficient of variation and standard error of a single unit ***

%cv	se
25.35	1.689

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.838	*			
3	0.154	0.219	*		
4	0.121	0.176	0.896	*	
5	0.744	0.903	0.267	0.216	*
6	0.120	0.174	0.893	0.991	0.215
7	0.530	0.662	0.469	0.399	0.747
8	0.031	0.049	0.436	0.516	0.063

10	0.488	0.624	0.455	0.381	0.713
11	0.046	0.071	0.549	0.638	0.091
12	0.001	0.002	0.037	0.049	0.002

	1	2	3	4	5
6	*				
7	0.397	*			
8	0.518	0.150	*		
10	0.379	0.980	0.131	*	
11	0.641	0.202	0.856	0.182	*
12	0.050	0.009	0.178	0.006	0.128

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	36.40	2080
2	101	51.09	2084
3	86	44.75	2087
4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091
8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR	AREA	REP	CULT	ftotal	Tftotal	FITTED	RESIDUAL
6	1	1	8.75	3.041	2.916	0.126	
6	1	2	56.00	7.517	4.658	2.859	
6	1	3	0.25	0.866	4.423	-3.557	
6	1	4	46.50	6.856	5.708	1.148	
6	1	5	59.50	7.746	8.321	-0.575	
6	1	1	3.00	1.871	3.135	-1.265	
6	1	2	48.75	7.018	4.877	2.140	
6	1	3	18.50	4.359	4.643	-0.284	
6	1	4	52.25	7.263	5.928	1.335	
6	1	5	43.25	6.614	8.541	-1.926	
6	1	1	4.25	2.179	4.469	-2.290	
6	1	2	57.00	7.583	6.212	1.371	
6	1	3	39.50	6.325	5.977	0.347	
6	1	4	63.50	8.000	7.262	0.738	
6	1	5	93.75	9.708	9.875	-0.167	
6	1	1	20.00	4.528	4.609	-0.081	
6	1	2	6.25	2.598	6.351	-3.753	
6	1	3	65.25	8.109	6.117	1.992	
6	1	4	50.25	7.124	7.402	-0.278	
6	1	5	146.75	12.135	10.014	2.120	
6	1	1	32.75	5.766	3.267	2.500	
6	1	2	20.75	4.610	5.009	-0.399	
6	1	3	16.25	4.093	4.775	-0.682	
6	1	4	14.75	3.905	6.059	-2.154	
6	1	5	88.00	9.407	8.672	0.735	
6	1	1	36.25	6.062	4.614	1.449	
6	1	2	47.25	6.910	6.356	0.554	
6	1	3	59.25	7.730	6.122	1.608	
6	1	4	17.00	4.183	7.406	-3.223	

6	1	5	6	92.25	9.631	10.019	-0.388
6	1	1	7	*	*	3.637	*
6	1	2	7	25.75	5.123	5.379	-0.256
6	1	3	7	31.25	5.635	5.145	0.490
6	1	4	7	40.00	6.364	6.430	-0.066
6	1	5	7	78.25	8.874	9.042	-0.168
6	1	1	8	29.33	5.462	5.310	0.152
6	1	2	8	37.75	6.185	7.052	-0.867
6	1	3	8	55.25	7.467	6.818	0.649
6	1	4	8	80.00	8.972	8.102	0.870
6	1	5	8	97.75	9.912	10.715	-0.803
6	1	1	10	10.75	3.354	3.663	-0.309
6	1	2	10	12.00	3.536	5.405	-1.870
6	1	3	10	28.50	5.385	5.171	0.214
6	1	4	10	53.00	7.314	6.456	0.859
6	1	5	10	103.00	10.173	9.068	1.105
6	1	1	11	28.50	5.385	5.116	0.270
6	1	2	11	34.00	5.874	6.858	-0.984
6	1	3	11	26.25	5.172	6.623	-1.451
6	1	4	11	96.25	9.836	7.908	1.928
6	1	5	11	115.25	10.759	10.521	0.238
6	1	1	12	38.25	6.225	6.776	-0.551
6	1	2	12	94.00	9.721	8.518	1.203
6	1	3	12	79.75	8.958	8.283	0.675
6	1	4	12	70.25	8.411	9.568	-1.157
6	1	5	12	143.75	12.010	12.181	-0.171

===== ftotal for AREA 1 and YEAR 7 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	83.731	20.933	9.91	<.001
+ CULT	10	27.126	2.713	1.28	0.272
Residual	40	84.476	2.112		
Total	54	195.333	3.617		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

	Prediction	se
CULT		
1	4.352	0.650
2	4.644	0.650
3	3.820	0.650
4	5.261	0.650
5	4.381	0.650
6	4.726	0.650
7	4.696	0.650
8	4.667	0.650
10	4.960	0.650
11	5.203	0.650

12 6.715 0.650

*** Coefficient of variation and standard error of a single unit ***

%cv se

29.92 1.453

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.752	*			
3	0.566	0.375	*		
4	0.329	0.506	0.125	*	
5	0.974	0.776	0.545	0.344	*
6	0.686	0.929	0.330	0.564	0.709
7	0.710	0.954	0.346	0.542	0.734
8	0.734	0.978	0.362	0.522	0.757
10	0.512	0.732	0.222	0.745	0.532
11	0.360	0.547	0.140	0.949	0.377
12	0.014	0.030	0.003	0.122	0.015

	1	2	3	4	5
6	*				
7	0.973	*			
8	0.949	0.974	*		
10	0.800	0.775	0.751	*	
11	0.607	0.585	0.563	0.793	*
12	0.037	0.034	0.032	0.063	0.108

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	36.40	2080
2	101	51.09	2084
3	86	44.75	2087
4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091
8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR	AREA	REP	CULT	ftotal	Tftotal	FITTED	RESIDUAL
7	1	1	1	8.25	2.958	2.840	0.1176
7	1	2	1	47.75	6.946	3.915	3.0309
7	1	3	1	1.50	1.414	3.713	-2.2987
7	1	4	1	20.00	4.528	4.818	-0.2901
7	1	5	1	34.50	5.916	6.476	-0.5598
7	1	1	2	2.25	1.658	3.132	-1.4738
7	1	2	2	23.25	4.873	4.207	0.6664
7	1	3	2	19.25	4.444	4.005	0.4395
7	1	4	2	38.50	6.245	5.110	1.1355
7	1	5	2	35.50	6.000	6.768	-0.7676
7	1	1	3	1.25	1.323	2.308	-0.9854
7	1	2	3	6.50	2.646	3.383	-0.7374
7	1	3	3	10.75	3.354	3.181	0.1734

7	1	4	3	31.25	5.635	4.286	1.3490
7	1	5	3	37.25	6.144	5.944	0.2004
7	1	1	4	11.25	3.428	3.749	-0.3211
7	1	2	4	8.00	2.915	4.824	-1.9083
7	1	3	4	30.50	5.568	4.621	0.9463
7	1	4	4	45.00	6.745	5.726	1.0190
7	1	5	4	58.00	7.649	7.384	0.2641
7	1	1	5	21.00	4.637	2.869	1.7674
7	1	2	5	13.50	3.742	3.944	-0.2026
7	1	3	5	14.00	3.808	3.742	0.0660
7	1	4	5	10.25	3.279	4.847	-1.5681
7	1	5	5	41.00	6.442	6.505	-0.0628
7	1	1	6	8.25	2.958	3.214	-0.2561
7	1	2	6	25.50	5.099	4.289	0.8100
7	1	3	6	42.50	6.557	4.087	2.4708
7	1	4	6	1.75	1.500	5.192	-3.6916
7	1	5	6	56.00	7.517	6.850	0.6670
7	1	1	7	13.75	3.775	3.184	0.5907
7	1	2	7	38.25	6.225	4.259	1.9659
7	1	3	7	9.50	3.162	4.057	-0.8944
7	1	4	7	24.00	4.950	5.162	-0.2119
7	1	5	7	28.33	5.369	6.820	-1.4503
7	1	1	8	10.00	3.240	3.155	0.0850
7	1	2	8	7.50	2.828	4.230	-1.4018
7	1	3	8	13.50	3.742	4.028	-0.2862
7	1	4	8	37.25	6.144	5.133	1.0113
7	1	5	8	54.00	7.382	6.791	0.5916
7	1	1	10	10.00	3.240	3.448	-0.2081
7	1	2	10	7.50	2.828	4.523	-1.6949
7	1	3	10	12.25	3.571	4.321	-0.7502
7	1	4	10	59.25	7.730	5.426	2.3040
7	1	5	10	54.75	7.433	7.084	0.3492

7	1	1	11	20.00	4.528	3.691	0.8369
7	1	2	11	9.00	3.082	4.766	-1.6834
7	1	3	11	17.75	4.272	4.563	-0.2912
7	1	4	11	41.75	6.500	5.668	0.8318
7	1	5	11	57.75	7.632	7.326	0.3059
7	1	1	12	25.00	5.050	5.203	-0.1532
7	1	2	12	54.75	7.433	6.278	1.1552
7	1	3	12	41.75	6.500	6.075	0.4246
7	1	4	12	27.50	5.292	7.180	-1.8888
7	1	5	12	86.00	9.301	8.838	0.4622

===== ftotal for AREA 2 and YEAR 1 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	17.062	4.265	3.66	0.013
+ CULT	10	646.240	64.624	55.44	<.001
Residual	39	45.461	1.166		
Total	53	708.764	13.373		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

CULT	Prediction	se
1	3.459	0.483
2	1.473	0.483
3	1.691	0.544
4	4.760	0.483
5	9.723	0.483
6	8.525	0.483
7	1.894	0.483
8	8.491	0.483
10	7.908	0.483
11	10.240	0.483
12	10.760	0.483

*** Coefficient of variation and standard error of a single unit ***

%cv	se
17.00	1.080

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.006	*			
3	0.020	0.767	*		
4	0.064	0.000	0.000	*	
5	0.000	0.000	0.000	0.000	*
6	0.000	0.000	0.000	0.000	0.087
7	0.027	0.542	0.782	0.000	0.000
8	0.000	0.000	0.000	0.000	0.079
10	0.000	0.000	0.000	0.000	0.011
11	0.000	0.000	0.000	0.000	0.453
12	0.000	0.000	0.000	0.000	0.137

	1	2	3	4	5

6	*				
7	0.000	*			
8	0.960	0.000	*		
10	0.371	0.000	0.398	*	
11	0.016	0.000	0.014	0.002	*
12	0.002	0.000	0.002	0.000	0.451

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	88	36.40	2080
2	101	51.09	2084

3	86	44.75	2087
4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091
8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR	AREA	REP	CULT	ftotal	Tftotal	FITTED	RESIDUAL
1	2	1	1	20.00	4.528	3.277	1.2512
1	2	2	1	10.75	3.354	3.007	0.3474
1	2	3	1	15.00	3.937	4.093	-0.1558
1	2	4	1	10.75	3.354	3.851	-0.4974
1	2	5	1	4.25	2.179	3.125	-0.9454
1	2	1	2	0.00	0.707	1.291	-0.5838
1	2	2	2	1.25	1.323	1.021	0.3018
1	2	3	2	2.25	1.658	2.107	-0.4489
1	2	4	2	4.50	2.236	1.866	0.3702
1	2	5	2	1.75	1.500	1.139	0.3608
1	2	1	3	0.50	1.000	1.508	-0.5083
1	2	2	3	2.75	1.803	1.239	0.5643
1	2	3	3	*	*	2.325	*
1	2	4	3	2.75	1.803	2.083	-0.2805
1	2	5	3	2.00	1.581	1.357	0.2245
1	2	1	4	20.25	4.555	4.577	-0.0220
1	2	2	4	29.50	5.477	4.307	1.1698
1	2	3	4	17.00	4.183	5.394	-1.2102
1	2	4	4	19.25	4.444	5.152	-0.7081
1	2	5	4	26.50	5.196	4.426	0.7706

1	2	1	5	109.25	10.476	9.540	0.9360
1	2	2	5	35.00	5.958	9.270	-3.3121
1	2	3	5	127.75	11.325	10.356	0.9683
1	2	4	5	135.25	11.651	10.115	1.5361
1	2	5	5	85.25	9.260	9.388	-0.1283
1	2	1	6	80.50	9.000	8.343	0.6571
1	2	2	6	74.00	8.631	8.073	0.5582
1	2	3	6	67.00	8.216	9.159	-0.9434
1	2	4	6	69.75	8.382	8.918	-0.5364
1	2	5	6	71.00	8.456	8.191	0.2645
1	2	1	7	4.00	2.121	1.711	0.4099
1	2	2	7	2.75	1.803	1.442	0.3611
1	2	3	7	2.50	1.732	2.528	-0.7957
1	2	4	7	3.00	1.871	2.286	-0.4156
1	2	5	7	3.50	2.000	1.560	0.4403
1	2	1	8	54.25	7.399	8.309	-0.9095
1	2	2	8	49.00	7.036	8.039	-1.0034
1	2	3	8	84.00	9.192	9.125	0.0673
1	2	4	8	111.75	10.595	8.884	1.7110
1	2	5	8	68.25	8.292	8.157	0.1345
1	2	1	10	36.25	6.062	7.725	-1.6631
1	2	2	10	79.75	8.958	7.456	1.5027
1	2	3	10	93.00	9.670	8.542	1.1279
1	2	4	10	65.50	8.124	8.300	-0.1763
1	2	5	10	45.50	6.782	7.574	-0.7913
1	2	1	11	95.50	9.798	10.057	-0.2595
1	2	2	11	85.50	9.274	9.788	-0.5140
1	2	3	11	161.75	12.738	10.874	1.8640
1	2	4	11	111.00	10.559	10.632	-0.0730
1	2	5	11	78.50	8.888	9.906	-1.0175
1	2	1	12	126.50	11.269	10.577	0.6920
1	2	2	12	106.25	10.332	10.308	0.0243

1	2	3	12	118.75	10.920	11.394	-0.4736
1	2	4	12	104.00	10.223	11.152	-0.9299
1	2	5	12	123.00	11.113	10.426	0.6873

===== ftotal for AREA 2 and YEAR 2 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	98.196	24.549	13.96	<.001
+ CULT	10	46.444	4.644	2.64	0.016
Residual	36	63.309	1.759		
Total	50	207.949	4.159		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

	Prediction	se
CULT		
1	2.854	0.593

2	4.284	0.669
3	3.153	0.669
4	3.914	0.781
5	3.703	0.593
6	4.277	0.593
7	3.459	0.593
8	4.421	0.593
10	5.086	0.593
11	4.202	0.593
12	6.419	0.593

*** Coefficient of variation and standard error of a single unit ***

%cv	se
31.66	1.326

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.119	*			
3	0.740	0.236	*		
4	0.287	0.723	0.468	*	
5	0.318	0.521	0.543	0.831	*
6	0.099	0.990	0.218	0.714	0.499
7	0.475	0.363	0.734	0.645	0.772
8	0.070	0.879	0.165	0.609	0.398
10	0.012	0.376	0.038	0.240	0.108
11	0.117	0.927	0.249	0.771	0.556

12	0.000	0.022	0.001	0.015	0.003

	1	2	3	4	5
6	*				
7	0.336	*			
8	0.864	0.259	*		
10	0.341	0.060	0.432	*	
11	0.929	0.381	0.796	0.299	*
12	0.015	0.001	0.023	0.121	0.012

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	36.40	2080
2	101	51.09	2084
3	86	44.75	2087
4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091
8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR	AREA	REP	CULT	ftotal	Tftotal	FITTED	RESIDUAL
2	2	1	1	1.25	1.323	1.688	-0.3654
2	2	2	1	7.50	2.828	1.395	1.4337
2	2	3	1	3.25	1.936	2.921	-0.9846
2	2	4	1	16.25	4.093	3.313	0.7801
2	2	5	1	18.50	4.359	5.223	-0.8637
2	2	1	2	6.00	2.550	3.118	-0.5688
2	2	2	2	0.25	0.866	2.825	-1.9587
2	2	3	2	*	*	4.351	*
2	2	4	2	45.25	6.764	4.743	2.0213
2	2	5	2	50.75	7.159	6.653	0.5063
2	2	1	3	5.50	2.449	1.987	0.4622
2	2	2	3	7.75	2.872	1.694	1.1786
2	2	3	3	*	*	3.220	*
2	2	4	3	9.50	3.162	3.612	-0.4493
2	2	5	3	18.25	4.330	5.522	-1.1915
2	2	1	4	6.25	2.598	2.748	-0.1503
2	2	2	4	1.50	1.414	2.455	-1.0406
2	2	3	4	26.25	5.172	3.981	1.1909
2	2	4	4	*	*	4.373	*
2	2	5	4	*	*	6.283	*
2	2	1	5	3.75	2.062	2.538	-0.4760
2	2	2	5	1.25	1.323	2.244	-0.9211
2	2	3	5	12.75	3.640	3.770	-0.1302
2	2	4	5	15.75	4.031	4.162	-0.1307
2	2	5	5	59.25	7.730	6.072	1.6580
2	2	1	6	9.00	3.082	3.111	-0.0286
2	2	2	6	11.50	3.464	2.817	0.6468
2	2	3	6	39.25	6.305	4.344	1.9612
2	2	4	6	7.00	2.739	4.735	-1.9965
2	2	5	6	36.25	6.062	6.645	-0.5830
2	2	1	7	5.00	2.345	2.293	0.0521

2	2	2	7	1.75	1.500	2.000	-0.4996
2	2	3	7	6.50	2.646	3.526	-0.8801
2	2	4	7	23.00	4.848	3.917	0.9302
2	2	5	7	38.25	6.225	5.827	0.3975
2	2	1	8	18.50	4.359	3.255	1.1041
2	2	2	8	2.75	1.803	2.961	-1.1585
2	2	3	8	7.50	2.828	4.488	-1.6591
2	2	4	8	40.00	6.364	4.879	1.4848
2	2	5	8	48.75	7.018	6.789	0.2287
2	2	1	10	14.50	3.873	3.921	-0.0477
2	2	2	10	26.00	5.148	3.627	1.5207
2	2	3	10	15.00	3.937	5.153	-1.2164
2	2	4	10	22.00	4.743	5.545	-0.8016
2	2	5	10	63.50	8.000	7.455	0.5450
2	2	1	11	19.75	4.500	3.036	1.4636
2	2	2	11	5.25	2.398	2.743	-0.3449
2	2	3	11	16.00	4.062	4.269	-0.2071
2	2	4	11	26.25	5.172	4.661	0.5113
2	2	5	11	26.00	5.148	6.571	-1.4229
2	2	1	12	14.00	3.808	5.253	-1.4452
2	2	2	12	36.75	6.103	4.960	1.1437
2	2	3	12	70.25	8.411	6.486	1.9255
2	2	4	12	20.00	4.528	6.877	-2.3497
2	2	5	12	90.00	9.513	8.787	0.7257

===== ftotal for AREA 2 and YEAR 3 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	93.099	23.275	8.42	<.001
+ CULT	10	181.631	18.163	6.57	<.001
Residual	39	107.834	2.765		
Total	53	382.564	7.218		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

	Prediction	se
CULT		
1	8.053	0.839
2	8.408	0.744
3	6.618	0.744
4	10.120	0.744
5	9.542	0.744
6	11.933	0.744
7	8.267	0.744
8	10.208	0.744
10	11.510	0.744
11	11.270	0.744
12	12.921	0.744

*** Coefficient of variation and standard error of a single unit ***

%cv	se
16.75	1.663

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.753	*			
3	0.208	0.097	*		
4	0.073	0.112	0.002	*	
5	0.192	0.287	0.008	0.586	*
6	0.001	0.002	0.000	0.093	0.029
7	0.850	0.894	0.125	0.086	0.232
8	0.062	0.095	0.002	0.934	0.531
10	0.004	0.005	0.000	0.194	0.069
11	0.007	0.010	0.000	0.281	0.108
12	0.000	0.000	0.000	0.011	0.003

	1	2	3	4	5
6	*				
7	0.001	*			
8	0.109	0.073	*		
10	0.690	0.004	0.223	*	
11	0.532	0.007	0.319	0.820	*
12	0.353	0.000	0.014	0.188	0.125

6 7 8 10 11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	36.40	2080
2	101	51.09	2084
3	86	44.75	2087
4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091
8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR	AREA	REP	CULT	ftotal	Tftotal	FITTED	RESIDUAL
3	2	1	1	23.0	4.848	6.008	-1.161
3	2	2	1	94.0	9.721	7.798	1.923
3	2	3	1	38.8	6.265	8.372	-2.107
3	2	4	1	*	*	8.003	*
3	2	5	1	130.0	11.424	10.079	1.344
3	2	1	2	40.5	6.403	6.363	0.040
3	2	2	2	49.0	7.036	8.153	-1.117
3	2	3	2	107.2	10.380	8.727	1.654
3	2	4	2	78.5	8.888	8.358	0.531

3	2	5	2	86.5	9.327	10.434	-1.107
3	2	1	3	14.0	3.808	4.573	-0.766
3	2	2	3	70.2	8.411	6.363	2.048
3	2	3	3	39.5	6.325	6.937	-0.612
3	2	4	3	38.0	6.205	6.568	-0.363
3	2	5	3	69.0	8.337	8.644	-0.308
3	2	1	4	86.8	9.341	8.076	1.265
3	2	2	4	67.8	8.261	9.865	-1.604
3	2	3	4	131.2	11.478	10.439	1.039
3	2	4	4	77.2	8.818	10.070	-1.252
3	2	5	4	160.8	12.698	12.147	0.552
3	2	1	5	81.5	9.055	7.498	1.558
3	2	2	5	91.0	9.566	9.287	0.278
3	2	3	5	78.0	8.860	9.861	-1.001
3	2	4	5	67.0	8.216	9.492	-1.276
3	2	5	5	143.8	12.010	11.569	0.442
3	2	1	6	54.0	7.382	9.888	-2.506
3	2	2	6	201.2	14.204	11.678	2.526
3	2	3	6	129.0	11.380	12.251	-0.872
3	2	4	6	132.8	11.543	11.882	-0.339
3	2	5	6	229.0	15.149	13.959	1.190
3	2	1	7	22.7	4.814	6.222	-1.409
3	2	2	7	59.2	7.730	8.012	-0.282
3	2	3	7	94.5	9.747	8.585	1.161
3	2	4	7	78.8	8.902	8.216	0.686
3	2	5	7	102.2	10.137	10.293	-0.157
3	2	1	8	139.0	11.811	8.163	3.648
3	2	2	8	67.8	8.261	9.953	-1.691
3	2	3	8	127.0	11.292	10.526	0.765
3	2	4	8	78.5	8.888	10.157	-1.269
3	2	5	8	115.8	10.782	12.234	-1.452
3	2	1	10	87.5	9.381	9.466	-0.085

3	2	2	10	111.0	10.559	11.255	-0.696
3	2	3	10	153.8	12.420	11.829	0.591
3	2	4	10	132.0	11.511	11.460	0.051
3	2	5	10	186.5	13.675	13.536	0.138
3	2	1	11	143.5	12.000	9.225	2.775
3	2	2	11	101.5	10.100	11.015	-0.916
3	2	3	11	97.5	9.899	11.589	-1.689
3	2	4	11	132.0	11.511	11.220	0.291
3	2	5	11	164.2	12.835	13.296	-0.461
3	2	1	12	56.0	7.517	10.876	-3.359
3	2	2	12	148.2	12.196	12.666	-0.469
3	2	3	12	204.2	14.309	13.239	1.070
3	2	4	12	249.5	15.811	12.870	2.941
3	2	5	12	217.5	14.765	14.947	-0.182

===== ftotal for AREA 2 and YEAR 4 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	236.701	59.175	16.92	<.001
+ CULT	10	355.483	35.548	10.16	<.001
Residual	40	139.921	3.498		

Total	54	732.105	13.557

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

CULT	Prediction	se
1	8.114	0.836
2	9.688	0.836
3	9.247	0.836
4	11.130	0.836
5	14.768	0.836
6	14.097	0.836
7	8.403	0.836
8	13.472	0.836
10	14.074	0.836
11	12.912	0.836
12	15.177	0.836

*** Coefficient of variation and standard error of a single unit ***

%cv	se
15.69	1.870

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.191	*			
3	0.344	0.711	*		
4	0.015	0.230	0.119	*	
5	0.000	0.000	0.000	0.004	*
6	0.000	0.001	0.000	0.016	0.574
7	0.808	0.284	0.480	0.026	0.000
8	0.000	0.003	0.001	0.055	0.280
10	0.000	0.001	0.000	0.017	0.561
11	0.000	0.009	0.004	0.140	0.124
12	0.000	0.000	0.000	0.001	0.731

	1	2	3	4	5

6	*				
7	0.000	*			
8	0.600	0.000	*		
10	0.983	0.000	0.614	*	
11	0.322	0.000	0.638	0.332	*
12	0.367	0.000	0.157	0.357	0.063

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	88	36.40	2080

2	101	51.09	2084
3	86	44.75	2087
4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091
8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR	AREA	REP	CULT	ftotal	Tftotal	FITTED	RESIDUAL
4	2	1	1	8.5	3.00	4.70	-1.700
4	2	2	1	131.2	11.48	7.45	4.030
4	2	3	1	14.0	3.81	8.07	-4.263
4	2	4	1	130.2	11.43	9.50	1.931
4	2	5	1	117.2	10.85	10.85	0.001
4	2	1	2	15.2	3.97	6.27	-2.305
4	2	2	2	73.8	8.62	9.02	-0.405
4	2	3	2	124.2	11.17	9.64	1.525
4	2	4	2	157.0	12.55	11.08	1.473
4	2	5	2	146.8	12.13	12.42	-0.289
4	2	1	3	53.8	7.37	5.83	1.533
4	2	2	3	73.5	8.60	8.58	0.022
4	2	3	3	80.5	9.00	9.20	-0.203
4	2	4	3	84.2	9.21	10.64	-1.431
4	2	5	3	145.0	12.06	11.98	0.080
4	2	1	4	60.8	7.83	7.72	0.111
4	2	2	4	93.0	9.67	10.46	-0.794
4	2	3	4	198.8	14.12	11.09	3.029
4	2	4	4	115.8	10.78	12.52	-1.738

4	2	5	4	175.2	13.26	13.87	-0.608
4	2	1	5	170.2	13.07	11.35	1.714
4	2	2	5	184.2	13.59	14.10	-0.509
4	2	3	5	223.2	14.96	14.72	0.234
4	2	4	5	180.0	13.44	16.16	-2.723
4	2	5	5	352.5	18.79	17.50	1.285
4	2	1	6	117.2	10.85	10.68	0.169
4	2	2	6	180.8	13.46	13.43	0.032
4	2	3	6	232.5	15.26	14.05	1.211
4	2	4	6	183.5	13.56	15.49	-1.922
4	2	5	6	300.2	17.34	16.83	0.510
4	2	1	7	8.2	2.96	4.99	-2.030
4	2	2	7	60.8	7.83	7.74	0.090
4	2	3	7	92.5	9.64	8.36	1.284
4	2	4	7	131.8	11.50	9.79	1.708
4	2	5	7	101.2	10.09	11.14	-1.051
4	2	1	8	110.2	10.52	10.06	0.466
4	2	2	8	144.2	12.03	12.81	-0.775
4	2	3	8	214.0	14.65	13.43	1.217
4	2	4	8	166.2	12.91	14.86	-1.949
4	2	5	8	297.0	17.25	16.21	1.040
4	2	1	10	134.8	11.63	10.66	0.970
4	2	2	10	134.0	11.60	13.41	-1.811
4	2	3	10	229.0	15.15	14.03	1.119
4	2	4	10	273.8	16.56	15.46	1.097
4	2	5	10	237.8	15.44	16.81	-1.374
4	2	1	11	91.0	9.57	9.50	0.068
4	2	2	11	116.2	10.81	12.25	-1.440
4	2	3	11	122.5	11.09	12.87	-1.778
4	2	4	11	273.8	16.56	14.30	2.259
4	2	5	11	273.0	16.54	15.65	0.891
4	2	1	12	162.5	12.77	11.76	1.005

4	2	2	12	257.8	16.07	14.51	1.560
4	2	3	12	137.8	11.76	15.13	-3.375
4	2	4	12	318.5	17.86	16.57	1.294
4	2	5	12	303.2	17.43	17.91	-0.484

===== ftotal for AREA 2 and YEAR 5 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	136.626	34.157	10.11	<.001
+ CULT	10	154.658	15.466	4.58	<.001
Residual	40	135.106	3.378		
Total	54	426.390	7.896		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

Prediction se

CULT		
1	7.745	0.822
2	8.335	0.822
3	8.457	0.822
4	11.352	0.822
5	8.343	0.822
6	9.834	0.822
7	8.151	0.822
8	10.663	0.822
10	8.665	0.822
11	9.460	0.822
12	13.581	0.822

*** Coefficient of variation and standard error of a single unit ***

%cv	se
19.33	1.838

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.615	*			
3	0.544	0.917	*		
4	0.004	0.013	0.017	*	
5	0.610	0.990	0.922	0.013	*
6	0.080	0.204	0.243	0.199	0.207
7	0.729	0.875	0.794	0.009	0.869
8	0.016	0.052	0.065	0.556	0.053

10	0.434	0.778	0.859	0.026	0.784
11	0.148	0.339	0.393	0.111	0.342
12	0.000	0.000	0.000	0.062	0.000

	1	2	3	4	5
6	*				
7	0.155	*			
8	0.480	0.037	*		
10	0.320	0.661	0.093	*	
11	0.749	0.267	0.307	0.498	*
12	0.003	0.000	0.016	0.000	0.001

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	36.40	2080
2	101	51.09	2084
3	86	44.75	2087
4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091
8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR	AREA	REP	CULT	ftotal	Tftotal	FITTED	RESIDUAL
5	2	1	1	10.50	3.317	5.221	-1.905
5	2	2	1	102.50	10.149	7.865	2.284
5	2	3	1	13.00	3.674	7.318	-3.643
5	2	4	1	118.50	10.909	8.200	2.709
5	2	5	1	113.50	10.677	10.122	0.555
5	2	1	2	32.50	5.745	5.811	-0.066
5	2	2	2	92.75	9.657	8.455	1.202
5	2	3	2	55.50	7.483	7.907	-0.424
5	2	4	2	99.50	10.000	8.789	1.211
5	2	5	2	76.75	8.789	10.711	-1.922
5	2	1	3	37.25	6.144	5.933	0.211
5	2	2	3	95.00	9.772	8.577	1.196
5	2	3	3	63.00	7.969	8.029	-0.061
5	2	4	3	85.00	9.247	8.911	0.335
5	2	5	3	83.25	9.152	10.833	-1.682
5	2	1	4	68.75	8.322	8.829	-0.507
5	2	2	4	72.25	8.529	11.472	-2.943
5	2	3	4	200.50	14.177	10.925	3.252
5	2	4	4	120.75	11.011	11.807	-0.796
5	2	5	4	216.25	14.722	13.729	0.993
5	2	1	5	93.25	9.682	5.820	3.863
5	2	2	5	48.50	7.000	8.463	-1.463
5	2	3	5	32.75	5.766	7.916	-2.150
5	2	4	5	77.00	8.803	8.798	0.005
5	2	5	5	109.00	10.464	10.720	-0.256
5	2	1	6	59.75	7.762	7.311	0.451
5	2	2	6	135.25	11.651	9.954	1.697
5	2	3	6	122.25	11.079	9.407	1.672
5	2	4	6	53.75	7.365	10.289	-2.924

5	2	5	6	127.50	11.314	12.211	-0.897
5	2	1	7	13.25	3.708	5.627	-1.919
5	2	2	7	94.00	9.721	8.271	1.451
5	2	3	7	52.75	7.297	7.723	-0.426
5	2	4	7	55.25	7.467	8.605	-1.139
5	2	5	7	157.25	12.560	10.527	2.033
5	2	1	8	83.25	9.152	8.139	1.012
5	2	2	8	77.50	8.832	10.783	-1.951
5	2	3	8	111.00	10.559	10.236	0.324
5	2	4	8	127.00	11.292	11.118	0.174
5	2	5	8	181.25	13.481	13.040	0.442
5	2	1	10	33.25	5.809	6.141	-0.331
5	2	2	10	57.50	7.616	8.785	-1.169
5	2	3	10	104.00	10.223	8.237	1.985
5	2	4	10	75.75	8.732	9.119	-0.387
5	2	5	10	119.25	10.943	11.041	-0.098
5	2	1	11	62.50	7.937	6.936	1.001
5	2	2	11	59.00	7.714	9.580	-1.866
5	2	3	11	69.25	8.352	9.032	-0.681
5	2	4	11	129.25	11.391	9.914	1.476
5	2	5	11	141.25	11.906	11.836	0.070
5	2	1	12	85.00	9.247	11.057	-1.810
5	2	2	12	232.50	15.264	13.701	1.564
5	2	3	12	176.50	13.304	13.153	0.151
5	2	4	12	178.25	13.370	14.035	-0.666
5	2	5	12	279.00	16.718	15.957	0.761

===== ftotal for AREA 2 and YEAR 6 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	288.028	72.007	13.21	<.001
+ CULT	10	474.441	47.444	8.70	<.001
Residual	40	218.027	5.451		
Total	54	980.496	18.157		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

	Prediction	se
CULT		
1	9.44	1.04
2	10.70	1.04
3	10.94	1.04
4	16.37	1.04
5	14.19	1.04
6	14.16	1.04
7	9.95	1.04
8	15.60	1.04
10	11.21	1.04

11	13.57	1.04
12	19.29	1.04

*** Coefficient of variation and standard error of a single unit ***

%cv	se
17.66	2.335

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.402	*			
3	0.318	0.870	*		
4	0.000	0.000	0.001	*	
5	0.003	0.023	0.033	0.149	*
6	0.003	0.024	0.035	0.143	0.980
7	0.735	0.615	0.506	0.000	0.006
8	0.000	0.002	0.003	0.603	0.348
10	0.238	0.728	0.853	0.001	0.050
11	0.008	0.059	0.082	0.065	0.674
12	0.000	0.000	0.000	0.055	0.001

	1	2	3	4	5
6	*				
7	0.007	*			
8	0.337	0.000	*		
10	0.053	0.397	0.005	*	

11	0.690	0.019	0.177	0.118	*
12	0.001	0.000	0.017	0.000	0.000

6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	36.40	2080
2	101	51.09	2084
3	86	44.75	2087
4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091
8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR	AREA	REP	CULT	ftotal	Tftotal	FITTED	RESIDUAL
6	2	1	1	7.2	2.78	5.88	-3.099
6	2	2	1	143.5	12.00	9.51	2.494
6	2	3	1	26.2	5.17	9.00	-3.832
6	2	4	1	175.2	13.26	9.75	3.506
6	2	5	1	195.8	14.01	13.08	0.931
6	2	1	2	50.8	7.16	7.13	0.026
6	2	2	2	166.8	12.93	10.76	2.176

6	2	3	2	135.5	11.66	10.26	1.407
6	2	4	2	113.5	10.68	11.00	-0.325
6	2	5	2	121.5	11.05	14.33	-3.284
6	2	1	3	62.2	7.92	7.38	0.545
6	2	2	3	183.8	13.57	11.00	2.575
6	2	3	3	98.5	9.95	10.50	-0.548
6	2	4	3	120.0	10.98	11.25	-0.268
6	2	5	3	150.0	12.27	14.57	-2.304
6	2	1	4	145.8	12.09	12.81	-0.713
6	2	2	4	183.5	13.56	16.43	-2.865
6	2	3	4	325.8	18.06	15.93	2.134
6	2	4	4	266.5	16.34	16.68	-0.336
6	2	5	4	474.0	21.78	20.00	1.780
6	2	1	5	191.8	13.87	10.63	3.233
6	2	2	5	154.0	12.43	14.26	-1.826
6	2	3	5	187.5	13.71	13.75	-0.043
6	2	4	5	137.8	11.76	14.50	-2.744
6	2	5	5	368.5	19.21	17.83	1.381
6	2	1	6	156.3	12.52	10.60	1.924
6	2	2	6	184.2	13.59	14.22	-0.630
6	2	3	6	274.8	16.59	13.72	2.869
6	2	4	6	108.0	10.42	14.47	-4.052
6	2	5	6	312.2	17.68	17.80	-0.111
6	2	1	7	10.5	3.32	6.39	-3.069
6	2	2	7	141.8	11.93	10.01	1.918
6	2	3	7	105.5	10.30	9.51	0.788
6	2	4	7	119.2	10.94	10.25	0.688
6	2	5	7	175.2	13.26	13.58	-0.325
6	2	1	8	111.0	10.56	12.03	-1.474
6	2	2	8	212.2	14.59	15.66	-1.071
6	2	3	8	301.2	17.37	15.16	2.215
6	2	4	8	301.8	17.39	15.90	1.483

6	2	5	8	326.2	18.08	19.23	-1.153
6	2	1	10	75.8	8.73	7.65	1.082
6	2	2	10	96.5	9.85	11.27	-1.425
6	2	3	10	113.5	10.68	10.77	-0.095
6	2	4	10	134.8	11.63	11.52	0.110
6	2	5	10	229.8	15.17	14.85	0.328
6	2	1	11	134.2	11.61	10.01	1.602
6	2	2	11	104.8	10.26	13.63	-3.371
6	2	3	11	134.8	11.63	13.13	-1.499
6	2	4	11	278.8	16.71	13.88	2.835
6	2	5	11	310.5	17.64	17.20	0.433
6	2	1	12	245.0	15.67	15.72	-0.056
6	2	2	12	456.2	21.37	19.35	2.024
6	2	3	12	238.2	15.45	18.85	-3.395
6	2	4	12	349.0	18.69	19.59	-0.898
6	2	5	12	636.8	25.24	22.92	2.324

===== ftotal for AREA 2 and YEAR 7 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	26.035	6.509	3.01	0.029
+ CULT	10	27.308	2.731	1.26	0.283

Residual	40	86.480	2.162
Total	54	139.823	2.589

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

CULT	Prediction	se
1	5.616	0.658
2	6.323	0.658
3	5.296	0.658
4	6.145	0.658
5	5.699	0.658
6	6.225	0.658
7	5.975	0.658
8	5.729	0.658
10	7.872	0.658
11	5.837	0.658
12	7.120	0.658

*** Coefficient of variation and standard error of a single unit ***

%cv	se
23.84	1.470

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.451	*			
3	0.733	0.276	*		
4	0.572	0.849	0.367	*	
5	0.928	0.506	0.667	0.634	*
6	0.516	0.917	0.324	0.931	0.575
7	0.701	0.710	0.470	0.855	0.768
8	0.903	0.527	0.644	0.657	0.973
10	0.020	0.104	0.008	0.071	0.025
11	0.813	0.604	0.564	0.742	0.883
12	0.114	0.396	0.057	0.301	0.134

	1	2	3	4	5
6	*				
7	0.789	*			
8	0.597	0.793	*		
10	0.084	0.048	0.027	*	
11	0.678	0.882	0.909	0.035	*
12	0.342	0.225	0.143	0.423	0.175

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			

1	88	36.40	2080
2	101	51.09	2084
3	86	44.75	2087
4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091
8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR	AREA	REP	CULT	ftotal	Tftotal	FITTED	RESIDUAL
7	2	1	1	18.50	4.359	5.158	-0.800
7	2	2	1	67.50	8.246	5.181	3.065
7	2	3	1	15.50	4.000	4.890	-0.890
7	2	4	1	21.50	4.690	6.683	-1.992
7	2	5	1	45.50	6.782	6.166	0.616
7	2	1	2	22.75	4.822	5.866	-1.044
7	2	2	2	18.25	4.330	5.888	-1.558
7	2	3	2	21.50	4.690	5.597	-0.906
7	2	4	2	86.00	9.301	7.390	1.911
7	2	5	2	71.25	8.471	6.873	1.597
7	2	1	3	16.00	4.062	4.839	-0.777
7	2	2	3	36.00	6.042	4.861	1.180
7	2	3	3	29.50	5.477	4.570	0.907
7	2	4	3	22.50	4.796	6.363	-1.567
7	2	5	3	36.75	6.103	5.847	0.257
7	2	1	4	49.75	7.089	5.688	1.401
7	2	2	4	20.50	4.583	5.710	-1.128
7	2	3	4	28.75	5.408	5.419	-0.010

7	2	4	4	42.25	6.538	7.212	-0.674
7	2	5	4	50.00	7.106	6.695	0.411
7	2	1	5	35.75	6.021	5.242	0.779
7	2	2	5	26.50	5.196	5.265	-0.068
7	2	3	5	27.50	5.292	4.973	0.318
7	2	4	5	30.25	5.545	6.766	-1.221
7	2	5	5	41.00	6.442	6.250	0.192
7	2	1	6	39.00	6.285	5.768	0.517
7	2	2	6	69.50	8.367	5.791	2.576
7	2	3	6	19.00	4.416	5.499	-1.083
7	2	4	6	37.50	6.164	7.292	-1.128
7	2	5	6	34.25	5.895	6.776	-0.881
7	2	1	7	22.50	4.796	5.518	-0.722
7	2	2	7	20.75	4.610	5.540	-0.930
7	2	3	7	29.25	5.454	5.249	0.206
7	2	4	7	71.00	8.456	7.042	1.414
7	2	5	7	42.50	6.557	6.525	0.032
7	2	1	8	63.50	8.000	5.272	2.728
7	2	2	8	17.00	4.183	5.295	-1.112
7	2	3	8	25.50	5.099	5.003	0.096
7	2	4	8	20.50	4.583	6.797	-2.214
7	2	5	8	45.50	6.782	6.280	0.502
7	2	1	10	51.50	7.211	7.415	-0.204
7	2	2	10	39.25	6.305	7.437	-1.133
7	2	3	10	54.50	7.416	7.146	0.270
7	2	4	10	107.25	10.380	8.939	1.441
7	2	5	10	64.25	8.047	8.422	-0.376
7	2	1	11	29.75	5.500	5.379	0.121
7	2	2	11	24.00	4.950	5.402	-0.452
7	2	3	11	21.50	4.690	5.110	-0.420
7	2	4	11	85.00	9.247	6.904	2.343
7	2	5	11	22.50	4.796	6.387	-1.591

7	2	1	12	21.25	4.664	6.663	-1.999
7	2	2	12	38.50	6.245	6.685	-0.440
7	2	3	12	62.00	7.906	6.394	1.512
7	2	4	12	97.00	9.874	8.187	1.687
7	2	5	12	47.25	6.910	7.670	-0.760

===== ftotal for AREA 3 and YEAR 1 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	9.333	2.333	2.11	0.114
+ CULT	9	168.085	18.676	16.85	<.001
Residual	22	24.378	1.108		
Total	35	201.796	5.766		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

	Prediction	se

CULT		
1	0.584	0.777
2	2.222	0.534
3	1.051	1.110
4	2.029	0.471
5	1.003	0.624
6	6.832	0.471
7	*	*
8	1.741	1.140
10	5.420	0.471
11	1.286	0.471
12	1.115	0.471

*** Coefficient of variation and standard error of a single unit ***

%cv	se
38.18	1.053

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.093	*			
3	0.738	0.350	*		
4	0.127	0.789	0.427	*	
5	0.681	0.148	0.969	0.205	*
6	0.000	0.000	0.000	0.000	0.000
7	*	*	*	*	*
8	0.420	0.713	0.674	0.817	0.584

10	0.000	0.000	0.002	0.000	0.000
11	0.449	0.203	0.847	0.276	0.722
12	0.565	0.135	0.957	0.184	0.887

	1	2	3	4	5
6	*				
7	*	*			
8	0.000	*	*		
10	0.045	*	0.007	*	
11	0.000	*	0.714	0.000	*
12	0.000	*	0.615	0.000	0.800

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	36.40	2080
2	101	51.09	2084
3	86	44.75	2087
4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091
8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR	AREA	REP	CULT	ftotal	Tftotal	FITTED	RESIDUAL
1	3	1	1	0.50	1.000	1.403	-0.4031
1	3	2	1	*	*	0.758	*
1	3	3	1	*	*	-0.263	*
1	3	4	1	1.00	1.225	0.822	0.4031
1	3	5	1	*	*	0.068	*
1	3	1	2	3.25	1.936	3.041	-1.1045
1	3	2	2	5.75	2.500	2.396	0.1042
1	3	3	2	6.25	2.598	1.374	1.2237
1	3	4	2	4.50	2.236	2.459	-0.2234
1	3	5	2	*	*	1.706	*
1	3	1	3	*	*	1.870	*
1	3	2	3	1.00	1.225	1.225	0.0000
1	3	3	3	*	*	0.203	*
1	3	4	3	*	*	1.288	*
1	3	5	3	*	*	0.535	*
1	3	1	4	4.75	2.291	2.848	-0.5568
1	3	2	4	4.25	2.179	2.203	-0.0234
1	3	3	4	0.25	0.866	1.182	-0.3155
1	3	4	4	3.25	1.936	2.267	-0.3301
1	3	5	4	7.00	2.739	1.513	1.2259
1	3	1	5	*	*	1.822	*
1	3	2	5	0.25	0.866	1.177	-0.3109
1	3	3	5	0.00	0.707	0.156	0.5516
1	3	4	5	0.50	1.000	1.241	-0.2407
1	3	5	5	*	*	0.487	*
1	3	1	6	74.25	8.646	7.651	0.9947
1	3	2	6	63.75	8.016	7.006	1.0097
1	3	3	6	20.75	4.610	5.985	-1.3748
1	3	4	6	66.75	8.201	7.070	1.1310

1	3	5	6	20.25	4.555	6.316	-1.7606
1	3	1	7	*	*	1.403	*
1	3	2	7	*	*	0.758	*
1	3	3	7	*	*	-0.263	*
1	3	4	7	*	*	0.822	*
1	3	5	7	*	*	0.068	*
1	3	1	8	*	*	2.560	*
1	3	2	8	*	*	1.915	*
1	3	3	8	*	*	0.893	*
1	3	4	8	*	*	1.979	*
1	3	5	8	1.00	1.225	1.225	0.0000
1	3	1	10	66.00	8.155	6.239	1.9157
1	3	2	10	28.00	5.339	5.594	-0.2553
1	3	3	10	7.50	2.828	4.572	-1.7440
1	3	4	10	36.25	6.062	5.658	0.4046
1	3	5	10	20.50	4.583	4.904	-0.3211
1	3	1	11	1.25	1.323	2.105	-0.7822
1	3	2	11	1.00	1.225	1.460	-0.2351
1	3	3	11	2.25	1.658	0.438	1.2198
1	3	4	11	0.25	0.866	1.524	-0.6575
1	3	5	11	1.00	1.225	0.770	0.4550
1	3	1	12	3.00	1.871	1.935	-0.0637
1	3	2	12	0.50	1.000	1.289	-0.2893
1	3	3	12	0.00	0.707	0.268	0.4392
1	3	4	12	0.25	0.866	1.353	-0.4870
1	3	5	12	0.50	1.000	0.599	0.4008

===== ftotal for AREA 3 and YEAR 2 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	11.722	2.930	2.09	0.105
+ CULT	9	47.751	5.306	3.79	0.002
Residual	32	44.772	1.399		
Total	45	104.245	2.317		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

	Prediction	se
CULT		
1	2.010	0.861
2	3.823	0.529
3	2.499	0.529
4	2.818	0.529
5	1.432	0.529
6	4.354	0.529
7	*	*
8	2.381	0.597
10	4.864	0.529
11	2.581	0.529

12	2.886	0.529

*** Coefficient of variation and standard error of a single unit ***

%cv	se
38.91	1.183

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.083	*			
3	0.632	0.086	*		
4	0.431	0.189	0.673	*	
5	0.573	0.003	0.163	0.073	*
6	0.027	0.483	0.019	0.048	0.000
7	*	*	*	*	*
8	0.724	0.081	0.883	0.588	0.244
10	0.008	0.174	0.003	0.010	0.000
11	0.577	0.107	0.914	0.753	0.135
12	0.394	0.219	0.609	0.928	0.061

	1	2	3	4	5
6	*				
7	*	*			
8	0.019	*	*		
10	0.500	*	0.004	*	
11	0.024	*	0.804	0.005	*

12	0.058	*	0.532	0.013	0.686

6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	36.40	2080
2	101	51.09	2084
3	86	44.75	2087
4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091
8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR	AREA	REP	CULT	ftotal	Tftotal	FITTED	RESIDUAL
2	3	1	1	*	*	1.132	*
2	3	2	1	*	*	1.921	*
2	3	3	1	0.00	0.707	1.994	-1.2866
2	3	4	1	12.00	3.536	2.249	1.2866
2	3	5	1	*	*	2.718	*
2	3	1	2	3.00	1.871	2.945	-1.0746
2	3	2	2	7.75	2.872	3.734	-0.8615
2	3	3	2	9.75	3.202	3.807	-0.6054

2	3	4	2	37.75	6.185	4.062	2.1226
2	3	5	2	24.00	4.950	4.531	0.4189
2	3	1	3	1.50	1.414	1.622	-0.2078
2	3	2	3	8.25	2.958	2.410	0.5478
2	3	3	3	13.00	3.674	2.483	1.1908
2	3	4	3	0.00	0.707	2.739	-2.0315
2	3	5	3	13.25	3.708	3.207	0.5007
2	3	1	4	3.50	2.000	1.941	0.0594
2	3	2	4	7.25	2.784	2.729	0.0550
2	3	3	4	8.50	3.000	2.802	0.1979
2	3	4	4	5.25	2.398	3.057	-0.6593
2	3	5	4	14.50	3.873	3.526	0.3470
2	3	1	5	3.75	2.062	0.555	1.5068
2	3	2	5	0.25	0.866	1.343	-0.4770
2	3	3	5	0.00	0.707	1.416	-0.7092
2	3	4	5	0.00	0.707	1.671	-0.9643
2	3	5	5	7.25	2.784	2.140	0.6437
2	3	1	6	14.75	3.905	3.476	0.4288
2	3	2	6	35.00	5.958	4.265	1.6936
2	3	3	6	12.50	3.606	4.338	-0.7323
2	3	4	6	11.00	3.391	4.593	-1.2018
2	3	5	6	23.25	4.873	5.062	-0.1884
2	3	1	7	*	*	1.132	*
2	3	2	7	*	*	1.921	*
2	3	3	7	*	*	1.994	*
2	3	4	7	*	*	2.249	*
2	3	5	7	*	*	2.718	*
2	3	1	8	0.00	0.707	1.504	-0.7967
2	3	2	8	*	*	2.292	*
2	3	3	8	13.50	3.742	2.365	1.3764
2	3	4	8	1.00	1.225	2.620	-1.3956
2	3	5	8	14.75	3.905	3.089	0.8159

2	3	1	10	15.00	3.937	3.986	-0.0494
2	3	2	10	16.25	4.093	4.775	-0.6820
2	3	3	10	31.50	5.657	4.848	0.8090
2	3	4	10	46.50	6.856	5.103	1.7526
2	3	5	10	13.50	3.742	5.572	-1.8302
2	3	1	11	1.75	1.500	1.703	-0.2034
2	3	2	11	2.25	1.658	2.492	-0.8333
2	3	3	11	4.50	2.236	2.565	-0.3288
2	3	4	11	21.50	4.690	2.820	1.8704
2	3	5	11	7.25	2.784	3.289	-0.5049
2	3	1	12	5.00	2.345	2.008	0.3368
2	3	2	12	10.75	3.354	2.797	0.5574
2	3	3	12	8.25	2.958	2.870	0.0882
2	3	4	12	5.00	2.345	3.125	-0.7798
2	3	5	12	11.00	3.391	3.594	-0.2026

===== ftotal for AREA 3 and YEAR 3 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	37.926	9.482	2.04	0.113
+ CULT	10	570.771	57.077	12.26	<.001
Residual	32	148.953	4.655		

Total	46	757.650	16.471

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

CULT	Prediction	se
1	1.635	1.585
2	6.767	0.965
3	4.734	0.965
4	7.323	0.965
5	2.537	0.965
6	13.736	0.965
7	4.864	1.574
8	4.062	1.274
10	9.605	0.965
11	3.278	0.965
12	3.230	0.965

*** Coefficient of variation and standard error of a single unit ***

%cv	se
36.06	2.157

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.009	*			
3	0.104	0.146	*		
4	0.004	0.686	0.067	*	
5	0.630	0.004	0.117	0.001	*
6	0.000	0.000	0.000	0.000	0.000
7	0.168	0.311	0.944	0.193	0.218
8	0.254	0.101	0.677	0.050	0.348
10	0.000	0.046	0.001	0.104	0.000
11	0.382	0.015	0.294	0.006	0.591
12	0.396	0.014	0.279	0.005	0.615

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.690	*		
10	0.005	0.015	0.002	*	
11	0.000	0.398	0.627	0.000	*
12	0.000	0.384	0.607	0.000	0.971

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	88	36.40	2080

2	101	51.09	2084
3	86	44.75	2087
4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091
8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR	AREA	REP	CULT	ftotal	Tftotal	FITTED	RESIDUAL
3	3	1	1	4.25	2.179	0.294	1.885
3	3	2	1	*	*	2.524	*
3	3	3	1	0.00	0.707	2.592	-1.885
3	3	4	1	*	*	1.723	*
3	3	5	1	*	*	1.012	*
3	3	1	2	1.75	1.500	5.427	-3.927
3	3	2	2	30.75	5.590	7.657	-2.066
3	3	3	2	81.00	9.028	7.724	1.303
3	3	4	2	84.75	9.233	6.855	2.378
3	3	5	2	71.00	8.456	6.145	2.311
3	3	1	3	4.00	2.121	3.393	-1.272
3	3	2	3	57.25	7.599	5.623	1.976
3	3	3	3	87.75	9.394	5.691	3.703
3	3	4	3	5.00	2.345	4.821	-2.476
3	3	5	3	4.25	2.179	4.111	-1.932
3	3	1	4	40.50	6.403	5.983	0.420
3	3	2	4	67.50	8.246	8.213	0.033
3	3	3	4	64.25	8.047	8.281	-0.234
3	3	4	4	46.75	6.874	7.411	-0.537

3	3	5	4	48.75	7.018	6.701	0.317
3	3	1	5	14.25	3.841	1.196	2.644
3	3	2	5	5.00	2.345	3.426	-1.081
3	3	3	5	4.75	2.291	3.494	-1.203
3	3	4	5	2.00	1.581	2.625	-1.044
3	3	5	5	6.25	2.598	1.914	0.684
3	3	1	6	156.50	12.530	12.395	0.135
3	3	2	6	212.75	14.603	14.625	-0.022
3	3	3	6	247.50	15.748	14.693	1.055
3	3	4	6	178.00	13.360	13.824	-0.463
3	3	5	6	153.50	12.410	13.113	-0.704
3	3	1	7	*	*	3.523	*
3	3	2	7	58.00	7.649	5.753	1.896
3	3	3	7	*	*	5.821	*
3	3	4	7	*	*	4.951	*
3	3	5	7	5.00	2.345	4.241	-1.896
3	3	1	8	*	*	2.721	*
3	3	2	8	45.75	6.801	4.951	1.849
3	3	3	8	*	*	5.019	*
3	3	4	8	0.25	0.866	4.150	-3.283
3	3	5	8	23.25	4.873	3.439	1.434
3	3	1	10	59.75	7.762	8.264	-0.502
3	3	2	10	81.00	9.028	10.494	-1.466
3	3	3	10	131.00	11.467	10.562	0.905
3	3	4	10	117.50	10.863	9.692	1.171
3	3	5	10	78.25	8.874	8.982	-0.108
3	3	1	11	2.25	1.658	1.937	-0.279
3	3	2	11	5.25	2.398	4.167	-1.769
3	3	3	11	6.25	2.598	4.235	-1.637
3	3	4	11	68.25	8.292	3.365	4.926
3	3	5	11	1.50	1.414	2.655	-1.241
3	3	1	12	7.25	2.784	1.889	0.895

3	3	2	12	22.25	4.770	4.119	0.650
3	3	3	12	4.25	2.179	4.187	-2.008
3	3	4	12	6.50	2.646	3.317	-0.672
3	3	5	12	13.50	3.742	2.607	1.134

===== ftotal for AREA 3 and YEAR 4 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	89.903	22.476	2.92	0.033
+ CULT	10	387.646	38.765	5.03	<.001
Residual	39	300.686	7.710		
Total	53	778.236	14.684		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

	Prediction	se
CULT		
1	3.30	1.40

2	8.96	1.24
3	5.98	1.24
4	7.13	1.24
5	3.59	1.24
6	10.36	1.24
7	7.13	1.24
8	5.30	1.24
10	12.02	1.24
11	4.87	1.24
12	4.28	1.24

*** Coefficient of variation and standard error of a single unit ***

%cv	se
41.50	2.777

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.004	*			
3	0.160	0.098	*		
4	0.048	0.305	0.517	*	
5	0.880	0.004	0.180	0.050	*
6	0.001	0.431	0.017	0.074	0.000
7	0.048	0.303	0.519	0.991	0.051
8	0.294	0.044	0.697	0.302	0.337
10	0.000	0.089	0.001	0.008	0.000
11	0.407	0.025	0.530	0.206	0.469

12	0.604	0.011	0.339	0.113	0.695

	1	2	3	4	5
6	*				
7	0.073	*			
8	0.006	0.304	*		
10	0.350	0.008	0.000	*	
11	0.003	0.207	0.811	0.000	*
12	0.001	0.113	0.567	0.000	0.739

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	36.40	2080
2	101	51.09	2084
3	86	44.75	2087
4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091
8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR	AREA	REP	CULT	ftotal	Tftotal	FITTED	RESIDUAL
4	3	1	1	5.00	2.345	1.187	1.158
4	3	2	1	22.50	4.796	4.433	0.363
4	3	3	1	5.25	2.398	4.069	-1.671
4	3	4	1	*	*	4.238	*
4	3	5	1	7.50	2.828	2.679	0.150
4	3	1	2	4.75	2.291	6.842	-4.550
4	3	2	2	78.75	8.902	10.088	-1.185
4	3	3	2	77.25	8.818	9.724	-0.906
4	3	4	2	151.50	12.329	9.893	2.436
4	3	5	2	156.75	12.540	8.334	4.206
4	3	1	3	14.00	3.808	3.867	-0.059
4	3	2	3	79.00	8.916	7.113	1.804
4	3	3	3	108.50	10.440	6.749	3.691
4	3	4	3	6.25	2.598	6.918	-4.320
4	3	5	3	17.50	4.243	5.359	-1.116
4	3	1	4	48.00	6.964	5.016	1.948
4	3	2	4	53.00	7.314	8.262	-0.947
4	3	3	4	51.25	7.194	7.898	-0.705
4	3	4	4	45.00	6.745	8.067	-1.322
4	3	5	4	56.25	7.533	6.508	1.025
4	3	1	5	11.75	3.500	1.471	2.029
4	3	2	5	17.25	4.213	4.717	-0.504
4	3	3	5	11.00	3.391	4.354	-0.963
4	3	4	5	3.50	2.000	4.523	-2.523
4	3	5	5	23.75	4.924	2.963	1.961
4	3	1	6	126.50	11.269	8.240	3.029
4	3	2	6	192.25	13.883	11.486	2.397
4	3	3	6	81.75	9.069	11.123	-2.053
4	3	4	6	83.50	9.165	11.291	-2.126
4	3	5	6	71.50	8.485	9.732	-1.247

4	3	1	7	6.00	2.550	5.009	-2.459
4	3	2	7	51.50	7.211	8.255	-1.044
4	3	3	7	94.75	9.760	7.891	1.868
4	3	4	7	148.25	12.196	8.060	4.136
4	3	5	7	15.50	4.000	6.501	-2.501
4	3	1	8	3.67	2.042	3.178	-1.136
4	3	2	8	88.25	9.421	6.424	2.997
4	3	3	8	77.00	8.803	6.060	2.743
4	3	4	8	2.25	1.658	6.229	-4.571
4	3	5	8	21.00	4.637	4.670	-0.033
4	3	1	10	97.25	9.887	9.901	-0.014
4	3	2	10	116.50	10.817	13.147	-2.330
4	3	3	10	174.00	13.210	12.784	0.426
4	3	4	10	287.25	16.963	12.952	4.011
4	3	5	10	86.00	9.301	11.393	-2.092
4	3	1	11	4.50	2.236	2.755	-0.519
4	3	2	11	14.75	3.905	6.001	-2.096
4	3	3	11	6.25	2.598	5.638	-3.040
4	3	4	11	154.00	12.430	5.807	6.623
4	3	5	11	10.25	3.279	4.247	-0.968
4	3	1	12	7.00	2.739	2.165	0.573
4	3	2	12	35.00	5.958	5.411	0.547
4	3	3	12	31.50	5.657	5.048	0.609
4	3	4	12	7.75	2.872	5.217	-2.344
4	3	5	12	17.75	4.272	3.657	0.615

===== ftotal for AREA 3 and YEAR 5 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	95.626	23.907	3.74	0.013
+ CULT	10	376.850	37.685	5.89	<.001
Residual	32	204.648	6.395		
Total	46	677.124	14.720		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

	Prediction	se
CULT		
1	3.89	2.64
2	7.61	1.13
3	5.48	1.13
4	9.17	1.13
5	1.64	1.13
6	10.59	1.13
7	7.25	2.64
8	5.39	1.13
10	7.47	1.13
11	2.97	1.13
12	2.88	1.13

*** Coefficient of variation and standard error of a single unit ***

%cv	se
42.89	2.529

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.205	*			
3	0.583	0.193	*		
4	0.075	0.336	0.028	*	
5	0.439	0.001	0.022	0.000	*
6	0.026	0.072	0.003	0.383	0.000
7	0.379	0.902	0.542	0.509	0.059
8	0.606	0.175	0.952	0.024	0.026
10	0.222	0.930	0.223	0.296	0.001
11	0.750	0.007	0.126	0.000	0.412
12	0.726	0.006	0.113	0.000	0.445

	1	2	3	4	5
6	*				
7	0.254	*			
8	0.003	0.521	*		
10	0.060	0.940	0.202	*	
11	0.000	0.146	0.141	0.008	*
12	0.000	0.137	0.126	0.007	0.954

6 7 8 10 11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	36.40	2080
2	101	51.09	2084
3	86	44.75	2087
4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091
8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR	AREA	REP	CULT	ftotal	Tftotal	FITTED	RESIDUAL
5	3	1	1	2.50	1.732	1.732	0.000
5	3	2	1	*	*	5.386	*
5	3	3	1	*	*	5.125	*
5	3	4	1	*	*	3.742	*
5	3	5	1	*	*	3.580	*
5	3	1	2	1.75	1.500	5.449	-3.949
5	3	2	2	149.00	12.227	9.103	3.124
5	3	3	2	103.50	10.198	8.841	1.357
5	3	4	2	61.25	7.858	7.458	0.400
5	3	5	2	40.00	6.364	7.296	-0.932

5	3	1	3	1.00	1.225	3.323	-2.098
5	3	2	3	108.50	10.440	6.977	3.463
5	3	3	3	101.75	10.112	6.716	3.396
5	3	4	3	3.00	1.871	5.333	-3.462
5	3	5	3	14.50	3.873	5.171	-1.298
5	3	1	4	73.25	8.588	7.009	1.579
5	3	2	4	89.00	9.460	10.663	-1.203
5	3	3	4	82.25	9.097	10.402	-1.305
5	3	4	4	72.75	8.559	9.019	-0.460
5	3	5	4	104.50	10.247	8.857	1.390
5	3	1	5	0.50	1.000	-0.519	1.519
5	3	2	5	1.50	1.414	3.135	-1.720
5	3	3	5	0.50	1.000	2.873	-1.873
5	3	4	5	0.75	1.118	1.490	-0.372
5	3	5	5	13.75	3.775	1.328	2.447
5	3	1	6	124.00	11.158	8.425	2.733
5	3	2	6	161.75	12.738	12.079	0.659
5	3	3	6	88.75	9.447	11.818	-2.371
5	3	4	6	67.25	8.231	10.435	-2.204
5	3	5	6	130.75	11.456	10.273	1.183
5	3	1	7	*	*	5.093	*
5	3	2	7	*	*	8.747	*
5	3	3	7	71.50	8.485	8.485	0.000
5	3	4	7	*	*	7.102	*
5	3	5	7	*	*	6.940	*
5	3	1	8	0.33	0.911	3.228	-2.316
5	3	2	8	91.75	9.605	6.882	2.723
5	3	3	8	87.50	9.381	6.620	2.761
5	3	4	8	10.00	3.240	5.237	-1.997
5	3	5	8	14.75	3.905	5.075	-1.170
5	3	1	10	46.25	6.837	5.309	1.529
5	3	2	10	27.50	5.292	8.963	-3.671

5	3	3	10	87.25	9.367	8.701	0.666
5	3	4	10	116.75	10.828	7.319	3.510
5	3	5	10	25.75	5.123	7.157	-2.033
5	3	1	11	0.75	1.118	0.810	0.308
5	3	2	11	6.67	2.678	4.464	-1.787
5	3	3	11	1.75	1.500	4.203	-2.703
5	3	4	11	52.25	7.263	2.820	4.443
5	3	5	11	5.25	2.398	2.658	-0.260
5	3	1	12	1.50	1.414	0.718	0.696
5	3	2	12	7.25	2.784	4.372	-1.588
5	3	3	12	17.00	4.183	4.111	0.073
5	3	4	12	7.75	2.872	2.728	0.144
5	3	5	12	10.00	3.240	2.566	0.675

===== ftotal for AREA 3 and YEAR 6 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	119.179	29.795	5.11	0.003
+ CULT	10	338.772	33.877	5.81	<.001
Residual	29	169.181	5.834		
Total	43	627.132	14.584		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

	Prediction	se
CULT		
1	3.40	1.43
2	8.13	1.22
3	6.51	1.77
4	9.38	1.08
5	1.62	1.08
6	9.25	1.22
7	8.88	2.53
8	5.70	1.08
10	7.67	1.08
11	2.63	1.08
12	3.37	1.08

*** Coefficient of variation and standard error of a single unit ***

%cv	se
41.92	2.415

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.019	*			
3	0.174	0.464	*		
4	0.002	0.452	0.178	*	
5	0.328	0.000	0.025	0.000	*
6	0.004	0.517	0.220	0.939	0.000
7	0.075	0.791	0.458	0.858	0.013
8	0.210	0.147	0.699	0.023	0.012
10	0.024	0.780	0.581	0.273	0.000
11	0.667	0.002	0.071	0.000	0.515
12	0.984	0.007	0.142	0.000	0.260

	1	2	3	4	5
6	*				
7	0.895	*			
8	0.038	0.258	*		
10	0.341	0.664	0.207	*	
11	0.000	0.031	0.053	0.003	*
12	0.001	0.055	0.138	0.009	0.628

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	88	36.40	2080
2	101	51.09	2084
3	86	44.75	2087

4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091
8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR	AREA	REP	CULT	ftotal	Tftotal	FITTED	RESIDUAL
6	3	1	1	0.00	0.707	0.892	-0.185
6	3	2	1	17.75	4.272	4.824	-0.552
6	3	3	1	*	*	4.089	*
6	3	4	1	20.25	4.555	3.818	0.737
6	3	5	1	*	*	2.905	*
6	3	1	2	*	*	5.621	*
6	3	2	2	92.75	9.657	9.552	0.105
6	3	3	2	78.75	8.902	8.817	0.085
6	3	4	2	68.00	8.276	8.547	-0.270
6	3	5	2	59.00	7.714	7.633	0.081
6	3	1	3	0.00	0.707	4.000	-3.293
6	3	2	3	125.50	11.225	7.932	3.293
6	3	3	3	*	*	7.197	*
6	3	4	3	*	*	6.926	*
6	3	5	3	*	*	6.013	*
6	3	1	4	76.50	8.775	6.866	1.909
6	3	2	4	105.00	10.271	10.797	-0.526
6	3	3	4	91.25	9.579	10.063	-0.484
6	3	4	4	75.00	8.689	9.792	-1.103
6	3	5	4	82.00	9.083	8.878	0.205
6	3	1	5	2.75	1.803	-0.892	2.695

6	3	2	5	1.00	1.225	3.039	-1.814
6	3	3	5	0.00	0.707	2.304	-1.597
6	3	4	5	0.00	0.707	2.033	-1.326
6	3	5	5	9.50	3.162	1.120	2.042
6	3	1	6	*	*	6.742	*
6	3	2	6	209.50	14.491	10.673	3.818
6	3	3	6	63.00	7.969	9.939	-1.970
6	3	4	6	75.75	8.732	9.668	-0.936
6	3	5	6	61.00	7.842	8.754	-0.912
6	3	1	7	*	*	6.369	*
6	3	2	7	*	*	10.300	*
6	3	3	7	91.00	9.566	9.566	0.000
6	3	4	7	*	*	9.295	*
6	3	5	7	*	*	8.381	*
6	3	1	8	0.00	0.707	3.191	-2.484
6	3	2	8	111.75	10.595	7.122	3.473
6	3	3	8	72.00	8.515	6.387	2.127
6	3	4	8	18.25	4.330	6.117	-1.786
6	3	5	8	14.50	3.873	5.203	-1.330
6	3	1	10	33.00	5.788	5.161	0.627
6	3	2	10	35.75	6.021	9.092	-3.071
6	3	3	10	128.00	11.336	8.357	2.979
6	3	4	10	90.75	9.552	8.086	1.466
6	3	5	10	26.25	5.172	7.173	-2.001
6	3	1	11	0.00	0.707	0.114	0.593
6	3	2	11	0.33	0.911	4.045	-3.134
6	3	3	11	0.00	0.707	3.311	-2.603
6	3	4	11	60.50	7.810	3.040	4.771
6	3	5	11	5.75	2.500	2.126	0.374
6	3	1	12	0.50	1.000	0.862	0.138
6	3	2	12	9.75	3.202	4.793	-1.592
6	3	3	12	30.00	5.523	4.059	1.464

6	3	4	12	4.50	2.236	3.788	-1.552
6	3	5	12	19.00	4.416	2.874	1.542

===== ftotal for AREA 3 and YEAR 7 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	56.607	14.152	1.60	0.192
+ CULT	10	714.630	71.463	8.10	<.001
Residual	40	352.955	8.824		
Total	54	1124.192	20.818		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

	Prediction	se
CULT		
1	3.06	1.33
2	8.36	1.33

3	6.22	1.33
4	5.13	1.33
5	2.52	1.33
6	13.01	1.33
7	6.30	1.33
8	4.95	1.33
10	13.30	1.33
11	4.47	1.33
12	2.64	1.33

*** Coefficient of variation and standard error of a single unit ***

%cv	se
46.72	2.971

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.007	*			
3	0.101	0.261	*		
4	0.276	0.094	0.568	*	
5	0.774	0.003	0.056	0.171	*
6	0.000	0.018	0.001	0.000	0.000
7	0.092	0.279	0.965	0.539	0.051
8	0.320	0.077	0.504	0.921	0.203
10	0.000	0.012	0.001	0.000	0.000
11	0.458	0.045	0.357	0.724	0.305
12	0.827	0.004	0.064	0.193	0.945

	1	2	3	4	5
6	*				
7	0.001	*			
8	0.000	0.477	*		
10	0.877	0.001	0.000	*	
11	0.000	0.336	0.799	0.000	*
12	0.000	0.059	0.227	0.000	0.338

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	88	36.40	2080
2	101	51.09	2084
3	86	44.75	2087
4	101	69.33	5871
5	103	57.27	5172
6	104	93.11	5848
7	71	49.38	2091
8	98	69.88	4928
10	105	77.94	4234
11	105	62.27	4370
12	105	92.65	11201

YEAR AREA REP CULT ftotal Tftotal FITTED RESIDUAL

7	3	1	1	5.25	2.398	1.871	0.527
7	3	2	1	7.50	2.828	3.360	-0.532
7	3	3	1	13.50	3.742	4.561	-0.819
7	3	4	1	10.25	3.279	3.521	-0.242
7	3	5	1	8.75	3.041	1.975	1.066
7	3	1	2	10.75	3.354	7.172	-3.818
7	3	2	2	46.50	6.856	8.661	-1.806
7	3	3	2	97.00	9.874	9.862	0.012
7	3	4	2	157.25	12.560	8.823	3.737
7	3	5	2	83.25	9.152	7.277	1.875
7	3	1	3	5.75	2.500	5.029	-2.529
7	3	2	3	74.00	8.631	6.519	2.113
7	3	3	3	190.75	13.829	7.719	6.110
7	3	4	3	8.25	2.958	6.680	-3.722
7	3	5	3	9.50	3.162	5.134	-1.972
7	3	1	4	23.00	4.848	3.947	0.901
7	3	2	4	25.50	5.099	5.436	-0.337
7	3	3	4	32.25	5.723	6.637	-0.914
7	3	4	4	15.00	3.937	5.597	-1.660
7	3	5	4	36.25	6.062	4.051	2.011
7	3	1	5	4.00	2.121	1.329	0.793
7	3	2	5	22.50	4.796	2.818	1.978
7	3	3	5	5.00	2.345	4.019	-1.674
7	3	4	5	0.25	0.866	2.979	-2.113
7	3	5	5	5.50	2.449	1.433	1.016
7	3	1	6	365.00	19.118	11.820	7.298
7	3	2	6	198.25	14.098	13.309	0.788
7	3	3	6	106.00	10.320	14.510	-4.190
7	3	4	6	103.25	10.186	13.471	-3.285
7	3	5	6	127.50	11.314	11.925	-0.611
7	3	1	7	7.00	2.739	5.110	-2.372
7	3	2	7	35.50	6.000	6.599	-0.599

7	3	3	7	100.00	10.025	7.800	2.225
7	3	4	7	94.00	9.721	6.760	2.961
7	3	5	7	8.50	3.000	5.215	-2.215
7	3	1	8	9.33	3.135	3.761	-0.626
7	3	2	8	36.00	6.042	5.250	0.791
7	3	3	8	101.25	10.087	6.451	3.636
7	3	4	8	1.50	1.414	5.412	-3.997
7	3	5	8	16.00	4.062	3.866	0.196
7	3	1	10	167.25	12.952	12.112	0.840
7	3	2	10	170.25	13.067	13.601	-0.534
7	3	3	10	230.75	15.207	14.802	0.405
7	3	4	10	257.50	16.062	13.762	2.300
7	3	5	10	84.25	9.206	12.216	-3.010
7	3	1	11	5.75	2.500	3.280	-0.780
7	3	2	11	6.33	2.613	4.769	-2.156
7	3	3	11	11.00	3.391	5.970	-2.579
7	3	4	11	138.00	11.769	4.930	6.838
7	3	5	11	3.75	2.062	3.385	-1.323
7	3	1	12	1.00	1.225	1.457	-0.233
7	3	2	12	10.00	3.240	2.947	0.294
7	3	3	12	3.25	1.936	4.147	-2.211
7	3	4	12	4.75	2.291	3.108	-0.816
7	3	5	12	20.00	4.528	1.562	2.966

55

Appendix 3.7.4 ANOVA for number of fruit left after thinning of individual cultivars over production years and areas

JPfnoatAOV.out

file is JPfyieldAOV.gen

========== CACTUS PEAR ENVIRONMENTAL ADAPTIBILITY: FRUIT YIELD

counts transformed to stabilise treatment variances Y = sqrt(X+0.5)

===== fnoat for AREA 1 and YEAR 1 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	13.307	3.327	3.30	0.021
+ CULT	10	292.335	29.234	28.98	<.001
Residual	36	36.312	1.009		
Total	50	341.954	6.839		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as

summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

CULT	Prediction	se
1	1.379	0.450
2	1.329	0.506
3	1.137	0.506
4	2.159	0.450
5	7.517	0.450
6	4.533	0.450
7	1.165	0.590
8	5.015	0.450
10	3.930	0.450
11	6.619	0.450
12	7.443	0.450

*** Coefficient of variation and standard error of a single unit ***

%cv	se
24.82	1.004

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.941	*			
3	0.723	0.788	*		
4	0.227	0.229	0.141	*	
5	0.000	0.000	0.000	0.000	*
6	0.000	0.000	0.000	0.001	0.000
7	0.775	0.833	0.970	0.190	0.000

8	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.008	0.000
11	0.000	0.000	0.000	0.000	0.166
12	0.000	0.000	0.000	0.000	0.907

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.453	0.000	*		
10	0.349	0.001	0.097	*	
11	0.002	0.000	0.016	0.000	*
12	0.000	0.000	0.001	0.000	0.203

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	10.54	171
2	101	7.21	37
3	86	10.68	171
4	101	49.48	1862
5	103	57.74	2363
6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511
10	105	66.30	1667
11	105	52.83	1984

12 105 64.98 3436

YEAR	AREA	REP	CULT	fnoat	Tfnoat	FITTED	RESIDUAL
1	1	1	1	1.00	1.225	1.440	-0.2155
1	1	2	1	1.00	1.225	1.437	-0.2126
1	1	3	1	3.50	2.000	1.734	0.2661
1	1	4	1	1.50	1.414	1.107	0.3069
1	1	5	1	0.75	1.118	1.263	-0.1450
1	1	1	2	1.00	1.225	1.390	-0.1654
1	1	2	2	0.50	1.000	1.387	-0.3873
1	1	3	2	*	*	1.684	*
1	1	4	2	1.75	1.500	1.057	0.4428
1	1	5	2	1.25	1.323	1.213	0.1099
1	1	1	3	1.00	1.225	1.198	0.0266
1	1	2	3	1.25	1.323	1.195	0.1276
1	1	3	3	*	*	1.492	*
1	1	4	3	0.25	0.866	0.865	0.0008
1	1	5	3	0.25	0.866	1.021	-0.1550
1	1	1	4	4.00	2.121	2.220	-0.0988
1	1	2	4	6.50	2.646	2.217	0.4285
1	1	3	4	4.75	2.291	2.514	-0.2225
1	1	4	4	1.25	1.323	1.887	-0.5643
1	1	5	4	5.75	2.500	2.043	0.4571
1	1	1	5	108.25	10.428	7.579	2.8497
1	1	2	5	52.00	7.246	7.576	-0.3300
1	1	3	5	38.50	6.245	7.872	-1.6272
1	1	4	5	55.00	7.450	7.246	0.2042
1	1	5	5	39.25	6.305	7.401	-1.0967
1	1	1	6	28.00	5.339	4.594	0.7448
1	1	2	6	20.75	4.610	4.591	0.0189
1	1	3	6	20.25	4.555	4.887	-0.3322

1	1	4	6	16.75	4.153	4.261	-0.1075
1	1	5	6	16.25	4.093	4.417	-0.3239
1	1	1	7	0.75	1.118	1.226	-0.1082
1	1	2	7	0.50	1.000	1.223	-0.2233
1	1	3	7	*	*	1.520	*
1	1	4	7	1.00	1.225	0.893	0.3315
1	1	5	7	*	*	1.049	*
1	1	1	8	17.00	4.183	5.076	-0.8923
1	1	2	8	23.75	4.924	5.073	-0.1483
1	1	3	8	28.25	5.362	5.369	-0.0074
1	1	4	8	38.50	6.245	4.743	1.5023
1	1	5	8	19.25	4.444	4.898	-0.4543
1	1	1	10	5.25	2.398	3.992	-1.5937
1	1	2	10	33.25	5.809	3.989	1.8208
1	1	3	10	25.75	5.123	4.285	0.8382
1	1	4	10	12.00	3.536	3.659	-0.1231
1	1	5	10	7.75	2.872	3.814	-0.9422
1	1	1	11	47.25	6.910	6.680	0.2299
1	1	2	11	46.00	6.819	6.677	0.1418
1	1	3	11	60.25	7.794	6.974	0.8204
1	1	4	11	24.75	5.025	6.347	-1.3223
1	1	5	11	43.50	6.633	6.503	0.1302
1	1	1	12	44.75	6.727	7.504	-0.7772
1	1	2	12	38.75	6.265	7.501	-1.2362
1	1	3	12	64.50	8.062	7.798	0.2646
1	1	4	12	41.75	6.500	7.171	-0.6711
1	1	5	12	94.50	9.747	7.327	2.4199

===== fnoat for AREA 1 and YEAR 2 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	7.844	1.961	0.66	0.624
+ CULT	9	220.409	24.490	8.25	<.001
Residual	32	95.010	2.969		
Total	45	323.264	7.184		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

	Prediction	se
CULT		
1	0.935	0.771
2	1.633	0.771
3	*	*
4	2.069	1.017
5	6.723	0.771
6	3.464	0.771
7	0.856	1.017
8	5.967	0.771
10	5.186	0.771

11	5.792	0.771
12	6.227	0.771

*** Coefficient of variation and standard error of a single unit ***

%cv	se
42.07	1.723

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.527	*			
3	*	*	*		
4	0.381	0.735	*	*	
5	0.000	0.000	*	0.001	*
6	0.027	0.103	*	0.283	0.005
7	0.951	0.547	*	0.413	0.000
8	0.000	0.000	*	0.005	0.492
10	0.000	0.003	*	0.020	0.168
11	0.000	0.001	*	0.006	0.399
12	0.000	0.000	*	0.003	0.652

	1	2	3	4	5
6	*				
7	0.049	*			
8	0.028	0.000	*		
10	0.124	0.002	0.479	*	

11	0.040	0.001	0.874	0.582	*
12	0.016	0.000	0.812	0.347	0.692

6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	10.54	171
2	101	7.21	37
3	86	10.68	171
4	101	49.48	1862
5	103	57.74	2363
6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511
10	105	66.30	1667
11	105	52.83	1984
12	105	64.98	3436

YEAR	AREA	REP	CULT	fnoat	Tfnoat	FITTED	RESIDUAL
2	1	1	1	0.25	0.866	0.818	0.0480
2	1	2	1	1.00	1.225	0.552	0.6726
2	1	3	1	0.25	0.866	0.711	0.1546
2	1	4	1	0.25	0.866	0.847	0.0195
2	1	5	1	0.25	0.866	1.761	-0.8947
2	1	1	2	1.75	1.500	1.516	-0.0157
2	1	2	2	1.50	1.414	1.250	0.1644

2	1	3	2	2.25	1.658	1.409	0.2492
2	1	4	2	0.25	0.866	1.544	-0.6782
2	1	5	2	7.00	2.739	2.458	0.2802
2	1	1	3	*	*	0.818	*
2	1	2	3	*	*	0.552	*
2	1	3	3	*	*	0.711	*
2	1	4	3	*	*	0.847	*
2	1	5	3	*	*	1.761	*
2	1	1	4	0.75	1.118	1.952	-0.8338
2	1	2	4	2.00	1.581	1.686	-0.1048
2	1	3	4	7.25	2.784	1.845	0.9386
2	1	4	4	*	*	1.980	*
2	1	5	4	*	*	2.895	*
2	1	1	5	86.50	9.327	6.606	2.7211
2	1	2	5	35.50	6.000	6.340	-0.3404
2	1	3	5	20.75	4.610	6.500	-1.8899
2	1	4	5	82.50	9.110	6.635	2.4756
2	1	5	5	20.50	4.583	7.549	-2.9664
2	1	1	6	6.00	2.550	3.347	-0.7977
2	1	2	6	6.25	2.598	3.081	-0.4833
2	1	3	6	7.25	2.784	3.241	-0.4568
2	1	4	6	26.75	5.220	3.376	1.8444
2	1	5	6	17.00	4.183	4.290	-0.1066
2	1	1	7	0.50	1.000	0.739	0.2607
2	1	2	7	*	*	0.473	*
2	1	3	7	*	*	0.633	*
2	1	4	7	0.25	0.866	0.768	0.0983
2	1	5	7	1.25	1.323	1.682	-0.3590
2	1	1	8	52.25	7.263	5.849	1.4135
2	1	2	8	30.75	5.590	5.583	0.0067
2	1	3	8	19.00	4.416	5.743	-1.3269
2	1	4	8	31.00	5.612	5.878	-0.2654

2	1	5	8	48.00	6.964	6.792	0.1721
2	1	1	10	27.75	5.315	5.069	0.2460
2	1	2	10	37.00	6.124	4.803	1.3206
2	1	3	10	20.50	4.583	4.962	-0.3799
2	1	4	10	11.75	3.500	5.098	-1.5976
2	1	5	10	40.75	6.423	6.012	0.4109
2	1	1	11	26.25	5.172	5.675	-0.5030
2	1	2	11	37.25	6.144	5.409	0.7350
2	1	3	11	50.50	7.141	5.568	1.5730
2	1	4	11	33.75	5.852	5.703	0.1489
2	1	5	11	21.25	4.664	6.618	-1.9540
2	1	1	12	12.25	3.571	6.110	-2.5391
2	1	2	12	14.50	3.873	5.844	-1.9709
2	1	3	12	50.50	7.141	6.003	1.1382
2	1	4	12	16.25	4.093	6.138	-2.0456
2	1	5	12	155.00	12.470	7.052	5.4175

===== fnoat for AREA 1 and YEAR 3 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	7.0860	1.7715	2.14	0.094
+ CULT	10	472.5932	47.2593	57.14	<.001
Residual	38	31.4289	0.8271		

Total	52	511.1081	9.8290

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

CULT	Prediction	se
1	2.165	0.407
2	3.786	0.407
3	1.383	0.459
4	2.993	0.407
5	9.057	0.407
6	6.177	0.407
7	1.613	0.459
8	7.870	0.407
10	8.027	0.407
11	8.744	0.407
12	9.205	0.407

*** Coefficient of variation and standard error of a single unit ***

%cv	se
15.95	0.9094

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.008	*			
3	0.210	0.000	*		
4	0.158	0.176	0.012	*	
5	0.000	0.000	0.000	0.000	*
6	0.000	0.000	0.000	0.000	0.000
7	0.374	0.001	0.725	0.030	0.000
8	0.000	0.000	0.000	0.000	0.046
10	0.000	0.000	0.000	0.000	0.081
11	0.000	0.000	0.000	0.000	0.589
12	0.000	0.000	0.000	0.000	0.799

	1	2	3	4	5

6	*				
7	0.000	*			
8	0.006	0.000	*		
10	0.003	0.000	0.787	*	
11	0.000	0.000	0.137	0.220	*
12	0.000	0.000	0.026	0.047	0.428

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			

1	88	10.54	171
2	101	7.21	37
3	86	10.68	171
4	101	49.48	1862
5	103	57.74	2363
6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511
10	105	66.30	1667
11	105	52.83	1984
12	105	64.98	3436

YEAR	AREA	REP	CULT	fnoat	Tfnoat	FITTED	RESIDUAL
3	1	1	1	1.75	1.500	1.914	-0.4138
3	1	2	1	3.75	2.062	1.717	0.3446
3	1	3	1	8.00	2.915	2.280	0.6353
3	1	4	1	4.75	2.291	2.461	-0.1700
3	1	5	1	3.75	2.062	2.458	-0.3960
3	1	1	2	16.25	4.093	3.535	0.5579
3	1	2	2	11.75	3.500	3.338	0.1621
3	1	3	2	11.00	3.391	3.901	-0.5100
3	1	4	2	13.25	3.708	4.082	-0.3742
3	1	5	2	17.50	4.243	4.079	0.1641
3	1	1	3	*	*	1.132	*
3	1	2	3	0.75	1.118	0.935	0.1834
3	1	3	3	2.75	1.803	1.498	0.3049
3	1	4	3	3.50	2.000	1.679	0.3210
3	1	5	3	0.25	0.866	1.675	-0.8092
3	1	1	4	10.25	3.279	2.742	0.5370
3	1	2	4	4.75	2.291	2.545	-0.2536
3	1	3	4	8.75	3.041	3.108	-0.0667

3	1	4	4	8.75	3.041	3.289	-0.2479
3	1	5	4	10.50	3.317	3.285	0.0311
3	1	1	5	115.00	10.747	8.806	1.9411
3	1	2	5	71.50	8.485	8.609	-0.1238
3	1	3	5	79.00	8.916	9.172	-0.2561
3	1	4	5	102.00	10.124	9.354	0.7707
3	1	5	5	48.75	7.018	9.350	-2.3319
3	1	1	6	42.00	6.519	5.926	0.5931
3	1	2	6	40.25	6.384	5.729	0.6543
3	1	3	6	36.00	6.042	6.292	-0.2509
3	1	4	6	26.75	5.220	6.474	-1.2535
3	1	5	6	44.75	6.727	6.470	0.2570
3	1	1	7	0.75	1.118	1.362	-0.2441
3	1	2	7	1.75	1.500	1.165	0.3347
3	1	3	7	0.25	0.866	1.728	-0.8625
3	1	4	7	*	*	1.910	*
3	1	5	7	6.67	2.678	1.906	0.7718
3	1	1	8	32.00	5.701	7.619	-1.9177
3	1	2	8	56.50	7.550	7.422	0.1281
3	1	3	8	69.25	8.352	7.985	0.3667
3	1	4	8	96.75	9.862	8.166	1.6954
3	1	5	8	61.75	7.890	8.162	-0.2725
3	1	1	10	55.75	7.500	7.775	-0.2752
3	1	2	10	54.50	7.416	7.578	-0.1621
3	1	3	10	55.25	7.467	8.142	-0.6749
3	1	4	10	68.50	8.307	8.323	-0.0161
3	1	5	10	88.75	9.447	8.319	1.1283
3	1	1	11	62.25	7.921	8.493	-0.5713
3	1	2	11	53.00	7.314	8.296	-0.9816
3	1	3	11	95.50	9.798	8.859	0.9388
3	1	4	11	90.50	9.539	9.040	0.4991
3	1	5	11	83.25	9.152	9.037	0.1150

3	1	1	12	76.00	8.746	8.954	-0.2071
3	1	2	12	71.25	8.471	8.757	-0.2862
3	1	3	12	93.50	9.695	9.320	0.3754
3	1	4	12	68.00	8.276	9.501	-1.2246
3	1	5	12	117.00	10.840	9.497	1.3424

===== fnoat for AREA 1 and YEAR 4 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	9.942	2.486	1.95	0.124
+ CULT	10	452.202	45.220	35.41	<.001
Residual	36	45.976	1.277		
Total	50	508.120	10.162		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

	Prediction	se

CULT		
1	1.988	0.505
2	4.107	0.505
3	3.569	0.505
4	5.956	0.505
5	10.546	0.505
6	7.172	0.505
7	0.699	1.173
8	8.209	0.505
10	9.506	0.505
11	9.809	0.505
12	9.918	0.505

*** Coefficient of variation and standard error of a single unit ***

%cv	se
16.25	1.130

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.005	*			
3	0.033	0.457	*		
4	0.000	0.014	0.002	*	
5	0.000	0.000	0.000	0.000	*
6	0.000	0.000	0.000	0.097	0.000
7	0.320	0.011	0.031	0.000	0.000
8	0.000	0.000	0.000	0.003	0.002

10	0.000	0.000	0.000	0.000	0.154
11	0.000	0.000	0.000	0.000	0.310
12	0.000	0.000	0.000	0.000	0.386

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.155	0.000	*		
10	0.002	0.000	0.078	*	
11	0.001	0.000	0.031	0.674	*
12	0.000	0.000	0.022	0.567	0.879

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	10.54	171
2	101	7.21	37
3	86	10.68	171
4	101	49.48	1862
5	103	57.74	2363
6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511
10	105	66.30	1667
11	105	52.83	1984
12	105	64.98	3436

YEAR	AREA	REP	CULT	fnoat	Tfnoat	FITTED	RESIDUAL
4	1	1	1	2.50	1.732	1.732	0.0002
4	1	2	1	3.25	1.936	1.117	0.8192
4	1	3	1	7.25	2.784	2.044	0.7402
4	1	4	1	3.25	1.936	2.514	-0.5779
4	1	5	1	1.75	1.500	2.482	-0.9816
4	1	1	2	12.25	3.571	3.851	-0.2799
4	1	2	2	24.25	4.975	3.236	1.7389
4	1	3	2	12.25	3.571	4.162	-0.5918
4	1	4	2	10.50	3.317	4.633	-1.3166
4	1	5	2	25.00	5.050	4.600	0.4494
4	1	1	3	10.50	3.317	3.313	0.0037
4	1	2	3	6.50	2.646	2.698	-0.0526
4	1	3	3	13.25	3.708	3.625	0.0833
4	1	4	3	15.75	4.031	4.095	-0.0644
4	1	5	3	16.25	4.093	4.063	0.0300
4	1	1	4	30.25	5.545	5.700	-0.1543
4	1	2	4	23.25	4.873	5.085	-0.2116
4	1	3	4	40.00	6.364	6.011	0.3526
4	1	4	4	30.25	5.545	6.482	-0.9368
4	1	5	4	54.25	7.399	6.449	0.9500
4	1	1	5	112.25	10.618	10.290	0.3288
4	1	2	5	89.00	9.460	9.675	-0.2146
4	1	3	5	83.75	9.179	10.601	-1.4227
4	1	4	5	194.00	13.946	11.072	2.8742
4	1	5	5	89.25	9.474	11.039	-1.5657
4	1	1	6	21.75	4.717	6.916	-2.1988
4	1	2	6	30.00	5.523	6.301	-0.7785
4	1	3	6	67.75	8.261	7.228	1.0338
4	1	4	6	97.00	9.874	7.698	2.1759
4	1	5	6	54.75	7.433	7.665	-0.2325

4	1	1	7	*	*	0.442	*
4	1	2	7	*	*	-0.172	*
4	1	3	7	*	*	0.754	*
4	1	4	7	1.00	1.225	1.225	0.0000
4	1	5	7	*	*	1.192	*
4	1	1	8	72.00	8.515	7.953	0.5620
4	1	2	8	47.00	6.892	7.338	-0.4461
4	1	3	8	62.50	7.937	8.265	-0.3273
4	1	4	8	78.25	8.874	8.735	0.1389
4	1	5	8	76.50	8.775	8.702	0.0725
4	1	1	10	92.00	9.618	9.250	0.3682
4	1	2	10	92.00	9.618	8.635	0.9827
4	1	3	10	84.50	9.220	9.561	-0.3418
4	1	4	10	86.25	9.314	10.032	-0.7181
4	1	5	10	93.75	9.708	9.999	-0.2910
4	1	1	11	117.25	10.851	9.553	1.2982
4	1	2	11	71.75	8.500	8.938	-0.4385
4	1	3	11	109.25	10.476	9.865	0.6113
4	1	4	11	84.00	9.192	10.336	-1.1432
4	1	5	11	99.00	9.975	10.303	-0.3278
4	1	1	12	94.25	9.734	9.662	0.0719
4	1	2	12	58.00	7.649	9.047	-1.3989
4	1	3	12	96.25	9.836	9.974	-0.1377
4	1	4	12	99.75	10.012	10.445	-0.4321
4	1	5	12	151.00	12.309	10.412	1.8968

===== fnoat for AREA 1 and YEAR 5 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	9.130	2.282	2.20	0.090
+ CULT	10	570.371	57.037	54.91	<.001
Residual	34	35.315	1.039		
Total	48	614.816	12.809		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

	Prediction	se
CULT		
1	1.349	0.456
2	2.529	0.456
3	1.593	0.741
4	7.301	0.456
5	9.435	0.456
6	6.227	0.456
7	0.853	0.741
8	8.330	0.456
10	6.047	0.456
11	10.539	0.456
12	11.282	0.456

*** Coefficient of variation and standard error of a single unit ***

%cv	se
15.60	1.019

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.076	*			
3	0.781	0.291	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.002	*
6	0.000	0.000	0.000	0.105	0.000
7	0.574	0.063	0.473	0.000	0.000
8	0.000	0.000	0.000	0.120	0.095
10	0.000	0.000	0.000	0.060	0.000
11	0.000	0.000	0.000	0.000	0.096
12	0.000	0.000	0.000	0.000	0.007

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.003	0.000	*		
10	0.782	0.000	0.001	*	
11	0.000	0.000	0.002	0.000	*
12	0.000	0.000	0.000	0.000	0.257

6 7 8 10 11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	10.54	171
2	101	7.21	37
3	86	10.68	171
4	101	49.48	1862
5	103	57.74	2363
6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511
10	105	66.30	1667
11	105	52.83	1984
12	105	64.98	3436

YEAR	AREA	REP	CULT	fnoat	Tfnoat	FITTED	RESIDUAL
5	1	1	1	0.25	0.866	1.544	-0.6782
5	1	2	1	2.50	1.732	1.023	0.7095
5	1	3	1	2.75	1.803	1.446	0.3564
5	1	4	1	0.25	0.866	1.140	-0.2736
5	1	5	1	1.50	1.414	1.528	-0.1140
5	1	1	2	3.50	2.000	2.725	-0.7249
5	1	2	2	7.75	2.872	2.203	0.6691
5	1	3	2	6.00	2.550	2.627	-0.0775
5	1	4	2	3.50	2.000	2.320	-0.3203
5	1	5	2	9.50	3.162	2.709	0.4535

5	1	1	3	*	*	1.789	*
5	1	2	3	*	*	1.267	*
5	1	3	3	2.50	1.732	1.691	0.0409
5	1	4	3	*	*	1.384	*
5	1	5	3	2.50	1.732	1.773	-0.0409
5	1	1	4	70.50	8.426	7.497	0.9294
5	1	2	4	46.50	6.856	6.975	-0.1194
5	1	3	4	57.00	7.583	7.399	0.1840
5	1	4	4	36.25	6.062	7.092	-1.0300
5	1	5	4	56.00	7.517	7.481	0.0359
5	1	1	5	113.50	10.677	9.631	1.0461
5	1	2	5	91.50	9.592	9.109	0.4824
5	1	3	5	80.00	8.972	9.533	-0.5610
5	1	4	5	99.50	10.000	9.226	0.7736
5	1	5	5	61.50	7.874	9.615	-1.7410
5	1	1	6	41.00	6.442	6.422	0.0197
5	1	2	6	38.75	6.265	5.901	0.3643
5	1	3	6	35.25	5.979	6.325	-0.3454
5	1	4	6	57.50	7.616	6.018	1.5980
5	1	5	6	22.25	4.770	6.406	-1.6366
5	1	1	7	*	*	1.049	*
5	1	2	7	*	*	0.527	*
5	1	3	7	0.25	0.866	0.951	-0.0851
5	1	4	7	*	*	0.644	*
5	1	5	7	0.75	1.118	1.033	0.0851
5	1	1	8	56.75	7.566	8.525	-0.9589
5	1	2	8	56.25	7.533	8.004	-0.4703
5	1	3	8	58.00	7.649	8.427	-0.7788
5	1	4	8	84.75	9.233	8.121	1.1125
5	1	5	8	91.75	9.605	8.509	1.0955
5	1	1	10	29.00	5.431	6.242	-0.8110
5	1	2	10	49.00	7.036	5.721	1.3149

5	1	3	10	41.25	6.461	6.145	0.3169
5	1	4	10	32.75	5.766	5.838	-0.0716
5	1	5	10	29.50	5.477	6.226	-0.7492
5	1	1	11	123.00	11.113	10.735	0.3779
5	1	2	11	84.75	9.233	10.213	-0.9804
5	1	3	11	132.50	11.533	10.637	0.8952
5	1	4	11	91.00	9.566	10.331	-0.7650
5	1	5	11	124.75	11.192	10.719	0.4723
5	1	1	12	150.25	12.278	11.478	0.8000
5	1	2	12	80.25	8.986	10.956	-1.9702
5	1	3	12	130.25	11.435	11.380	0.0544
5	1	4	12	100.50	10.050	11.073	-1.0236
5	1	5	12	184.50	13.601	11.462	2.1394

===== fnoat for AREA 1 and YEAR 6 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	7.8768	1.9692	2.94	0.032
+ CULT	10	413.6961	41.3696	61.78	<.001
Residual	39	26.1150	0.6696		
Total	53	447.6879	8.4469		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

	Prediction	se
CULT		
1	2.078	0.366
2	3.597	0.366
3	1.832	0.366
4	6.149	0.366
5	7.533	0.366
6	4.966	0.366
7	1.288	0.413
8	7.590	0.366
10	6.882	0.366
11	9.451	0.366
12	9.159	0.366

*** Coefficient of variation and standard error of a single unit ***

%cv	se
14.66	0.8183

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.006	*			
3	0.637	0.002	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.011	*
6	0.000	0.012	0.000	0.028	0.000
7	0.161	0.000	0.331	0.000	0.000
8	0.000	0.000	0.000	0.008	0.913
10	0.000	0.000	0.000	0.164	0.216
11	0.000	0.000	0.000	0.000	0.001
12	0.000	0.000	0.000	0.000	0.003

	1	2	3	4	5

6	*				
7	0.000	*			
8	0.000	0.000	*		
10	0.001	0.000	0.179	*	
11	0.000	0.000	0.001	0.000	*
12	0.000	0.000	0.004	0.000	0.576

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	88	10.54	171
2	101	7.21	37
3	86	10.68	171
4	101	49.48	1862

5	103	57.74	2363
6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511
10	105	66.30	1667
11	105	52.83	1984
12	105	64.98	3436

YEAR	AREA	REP	CULT	fnoat	Tfnoat	FITTED	RESIDUAL
6	1	1	3.00	1.871	2.361	-0.4902	
6	1	2	9.00	3.082	2.105	0.9769	
6	1	3	1.25	1.323	2.108	-0.7847	
6	1	4	1.00	1.225	1.572	-0.3470	
6	1	5	8.00	2.915	2.270	0.6450	
6	1	1	8.75	3.041	3.880	-0.8390	
6	1	2	19.00	4.416	3.625	0.7912	
6	1	3	8.00	2.915	3.627	-0.7114	
6	1	4	12.75	3.640	3.091	0.5490	
6	1	5	15.50	4.000	3.790	0.2102	
6	1	1	4.25	2.179	2.115	0.0649	
6	1	2	2.50	1.732	1.859	-0.1269	
6	1	3	4.75	2.291	1.861	0.4302	
6	1	4	1.25	1.323	1.325	-0.0024	
6	1	5	2.25	1.658	2.024	-0.3657	
6	1	1	41.50	6.481	6.432	0.0491	
6	1	2	25.75	5.123	6.176	-1.0526	
6	1	3	57.00	7.583	6.178	1.4047	
6	1	4	21.50	4.690	5.642	-0.9520	
6	1	5	47.00	6.892	6.341	0.5509	
6	1	1	72.50	8.544	7.816	0.7280	
6	1	2	56.00	7.517	7.560	-0.0437	

6	1	3	5	51.00	7.176	7.563	-0.3862
6	1	4	5	49.75	7.089	7.027	0.0620
6	1	5	5	53.75	7.365	7.725	-0.3600
6	1	1	6	39.50	6.325	5.249	1.0753
6	1	2	6	19.00	4.416	4.994	-0.5777
6	1	3	6	18.50	4.359	4.996	-0.6368
6	1	4	6	31.25	5.635	4.460	1.1748
6	1	5	6	16.50	4.123	5.159	-1.0356
6	1	1	7	*	*	1.571	*
6	1	2	7	2.00	1.581	1.316	0.2654
6	1	3	7	0.25	0.866	1.318	-0.4519
6	1	4	7	1.00	1.225	0.782	0.4426
6	1	5	7	1.00	1.225	1.481	-0.2561
6	1	1	8	66.00	8.155	7.873	0.2820
6	1	2	8	63.50	8.000	7.617	0.3829
6	1	3	8	65.25	8.109	7.619	0.4894
6	1	4	8	46.50	6.856	7.083	-0.2278
6	1	5	8	46.50	6.856	7.782	-0.9265
6	1	1	10	45.25	6.764	7.165	-0.4012
6	1	2	10	50.25	7.124	6.909	0.2145
6	1	3	10	63.50	8.000	6.912	1.0884
6	1	4	10	40.00	6.364	6.376	-0.0118
6	1	5	10	37.75	6.185	7.075	-0.8899
6	1	1	11	88.25	9.421	9.734	-0.3137
6	1	2	11	92.33	9.635	9.479	0.1561
6	1	3	11	87.00	9.354	9.481	-0.1268
6	1	4	11	83.50	9.165	8.945	0.2200
6	1	5	11	93.75	9.708	9.644	0.0644
6	1	1	12	85.75	9.287	9.442	-0.1553
6	1	2	12	66.75	8.201	9.187	-0.9861
6	1	3	12	78.25	8.874	9.189	-0.3148
6	1	4	12	59.50	7.746	8.653	-0.9072

6 1 5 12 136.75 11.715 9.352 2.3635

===== fnoat for AREA 1 and YEAR 7 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	4.2145	1.0536	1.46	0.233
+ CULT	10	199.6728	19.9673	27.62	<.001
Residual	40	28.9136	0.7228		
Total	54	232.8009	4.3111		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

	Prediction	se
CULT		
1	2.261	0.380
2	3.376	0.380
3	1.492	0.380

4	4.089	0.380
5	6.299	0.380
6	3.313	0.380
7	1.534	0.380
8	5.243	0.380
10	6.134	0.380
11	6.497	0.380
12	6.604	0.380

*** Coefficient of variation and standard error of a single unit ***

%cv	se
19.97	0.8502

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.045	*			
3	0.160	0.001	*		
4	0.002	0.192	0.000	*	
5	0.000	0.000	0.000	0.000	*
6	0.057	0.907	0.002	0.157	0.000
7	0.184	0.001	0.937	0.000	0.000
8	0.000	0.001	0.000	0.038	0.057
10	0.000	0.000	0.000	0.000	0.760
11	0.000	0.000	0.000	0.000	0.714
12	0.000	0.000	0.000	0.000	0.573

	1	2	3	4	5
6	*				
7	0.002	*			
8	0.001	0.000	*		
10	0.000	0.000	0.106	*	
11	0.000	0.000	0.025	0.503	*
12	0.000	0.000	0.015	0.386	0.843

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	10.54	171
2	101	7.21	37
3	86	10.68	171
4	101	49.48	1862
5	103	57.74	2363
6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511
10	105	66.30	1667
11	105	52.83	1984
12	105	64.98	3436

YEAR	AREA	REP	CULT	fnoat	Tfnoat	FITTED	RESIDUAL
7	1	1	1	1.75	1.500	2.233	-0.7325
7	1	2	1	8.00	2.915	2.668	0.2476

7	1	3	1	7.75	2.872	2.106	0.7660
7	1	4	1	1.25	1.323	1.859	-0.5360
7	1	5	1	6.75	2.693	2.438	0.2550
7	1	1	2	8.25	2.958	3.348	-0.3899
7	1	2	2	13.75	3.775	3.783	-0.0083
7	1	3	2	16.00	4.062	3.222	0.8403
7	1	4	2	12.00	3.536	2.974	0.5613
7	1	5	2	6.00	2.550	3.553	-1.0035
7	1	1	3	1.25	1.323	1.464	-0.1407
7	1	2	3	2.00	1.581	1.899	-0.3178
7	1	3	3	3.25	1.936	1.337	0.5991
7	1	4	3	0.75	1.118	1.090	0.0281
7	1	5	3	1.75	1.500	1.669	-0.1687
7	1	1	4	24.25	4.975	4.061	0.9139
7	1	2	4	38.25	6.225	4.496	1.7286
7	1	3	4	6.50	2.646	3.935	-1.2891
7	1	4	4	3.25	1.936	3.687	-1.7509
7	1	5	4	21.25	4.664	4.266	0.3975
7	1	1	5	40.50	6.403	6.271	0.1323
7	1	2	5	47.75	6.946	6.706	0.2401
7	1	3	5	42.00	6.519	6.145	0.3746
7	1	4	5	30.00	5.523	5.897	-0.3745
7	1	5	5	36.75	6.103	6.476	-0.3726
7	1	1	6	10.75	3.354	3.285	0.0695
7	1	2	6	9.00	3.082	3.720	-0.6377
7	1	3	6	7.75	2.872	3.158	-0.2861
7	1	4	6	9.50	3.162	2.911	0.2513
7	1	5	6	16.25	4.093	3.490	0.6030
7	1	1	7	0.75	1.118	1.506	-0.3882
7	1	2	7	1.75	1.500	1.941	-0.4415
7	1	3	7	1.50	1.414	1.380	0.0342
7	1	4	7	1.00	1.225	1.133	0.0922

7	1	5	7	5.33	2.415	1.711	0.7032
7	1	1	8	13.33	3.719	5.215	-1.4965
7	1	2	8	31.25	5.635	5.651	-0.0159
7	1	3	8	23.75	4.924	5.089	-0.1647
7	1	4	8	44.75	6.727	4.842	1.8851
7	1	5	8	26.67	5.212	5.420	-0.2080
7	1	1	10	56.50	7.550	6.106	1.4443
7	1	2	10	37.25	6.144	6.541	-0.3967
7	1	3	10	31.00	5.612	5.979	-0.3669
7	1	4	10	28.25	5.362	5.732	-0.3700
7	1	5	10	35.50	6.000	6.311	-0.3107
7	1	1	11	43.50	6.633	6.469	0.1642
7	1	2	11	34.33	5.902	6.904	-1.0026
7	1	3	11	51.50	7.211	6.343	0.8683
7	1	4	11	43.00	6.595	6.095	0.5001
7	1	5	11	37.25	6.144	6.674	-0.5300
7	1	1	12	48.50	7.000	6.576	0.4236
7	1	2	12	57.50	7.616	7.012	0.6041
7	1	3	12	25.25	5.074	6.450	-1.3757
7	1	4	12	34.50	5.916	6.203	-0.2867
7	1	5	12	54.50	7.416	6.781	0.6347

===== fnoat for AREA 2 and YEAR 1 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	15.447	3.862	3.22	0.022
+ CULT	10	652.139	65.214	54.41	<.001
Residual	39	46.744	1.199		
Total	53	714.331	13.478		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

	Prediction	se
CULT		
1	3.460	0.490
2	1.578	0.490
3	1.682	0.552
4	4.760	0.490
5	9.723	0.490
6	8.526	0.490
7	1.664	0.490
8	8.492	0.490
10	7.908	0.490
11	10.241	0.490
12	10.761	0.490

*** Coefficient of variation and standard error of a single unit ***

%cv	se
17.27	1.095

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.010	*			
3	0.021	0.888	*		
4	0.068	0.000	0.000	*	
5	0.000	0.000	0.000	0.000	*
6	0.000	0.000	0.000	0.000	0.092
7	0.013	0.901	0.979	0.000	0.000
8	0.000	0.000	0.000	0.000	0.083
10	0.000	0.000	0.000	0.000	0.012
11	0.000	0.000	0.000	0.000	0.459
12	0.000	0.000	0.000	0.000	0.142

	1	2	3	4	5

6	*				
7	0.000	*			
8	0.960	0.000	*		
10	0.378	0.000	0.405	*	
11	0.018	0.000	0.016	0.002	*
12	0.003	0.000	0.002	0.000	0.457

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	10.54	171
2	101	7.21	37
3	86	10.68	171
4	101	49.48	1862
5	103	57.74	2363
6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511
10	105	66.30	1667
11	105	52.83	1984
12	105	64.98	3436

YEAR	AREA	REP	CULT	fnoat	Tfnoat	FITTED	RESIDUAL
1	2	1	1	20.00	4.528	3.336	1.1917
1	2	2	1	10.75	3.354	3.019	0.3350
1	2	3	1	15.00	3.937	4.055	-0.1178
1	2	4	1	10.75	3.354	3.805	-0.4511
1	2	5	1	4.25	2.179	3.137	-0.9578
1	2	1	2	1.00	1.225	1.454	-0.2292
1	2	2	2	1.25	1.323	1.137	0.1858
1	2	3	2	2.25	1.658	2.173	-0.5144
1	2	4	2	4.50	2.236	1.923	0.3129
1	2	5	2	1.75	1.500	1.255	0.2448
1	2	1	3	0.50	1.000	1.558	-0.5583
1	2	2	3	2.75	1.803	1.241	0.5613
1	2	3	3	*	*	2.277	*
1	2	4	3	2.75	1.803	2.027	-0.2247

1	2	5	3	2.00	1.581	1.360	0.2216
1	2	1	4	20.25	4.555	4.637	-0.0815
1	2	2	4	29.50	5.477	4.320	1.1574
1	2	3	4	17.00	4.183	5.356	-1.1722
1	2	4	4	19.25	4.444	5.106	-0.6618
1	2	5	4	26.50	5.196	4.438	0.7582
1	2	1	5	109.25	10.476	9.600	0.8766
1	2	2	5	35.00	5.958	9.283	-3.3246
1	2	3	5	127.75	11.325	10.318	1.0063
1	2	4	5	135.25	11.651	10.069	1.5824
1	2	5	5	85.25	9.260	9.401	-0.1407
1	2	1	6	80.50	9.000	8.402	0.5976
1	2	2	6	74.00	8.631	8.086	0.5458
1	2	3	6	67.00	8.216	9.121	-0.9054
1	2	4	6	69.75	8.382	8.872	-0.4901
1	2	5	6	71.00	8.456	8.204	0.2521
1	2	1	7	4.00	2.121	1.540	0.5811
1	2	2	7	2.75	1.803	1.223	0.5794
1	2	3	7	1.00	1.225	2.259	-1.0343
1	2	4	7	1.00	1.225	2.009	-0.7847
1	2	5	7	3.50	2.000	1.341	0.6585
1	2	1	8	54.25	7.399	8.368	-0.9689
1	2	2	8	49.00	7.036	8.051	-1.0158
1	2	3	8	84.00	9.192	9.087	0.1053
1	2	4	8	111.75	10.595	8.837	1.7574
1	2	5	8	68.25	8.292	8.170	0.1221
1	2	1	10	36.25	6.062	7.785	-1.7226
1	2	2	10	79.75	8.958	7.468	1.4903
1	2	3	10	93.00	9.670	8.504	1.1660
1	2	4	10	65.50	8.124	8.254	-0.1299
1	2	5	10	45.50	6.782	7.586	-0.8037
1	2	1	11	95.50	9.798	10.117	-0.3189

1	2	2	11	85.50	9.274	9.800	-0.5264
1	2	3	11	161.75	12.738	10.836	1.9020
1	2	4	11	111.00	10.559	10.586	-0.0267
1	2	5	11	78.50	8.888	9.918	-1.0299
1	2	1	12	126.50	11.269	10.637	0.6325
1	2	2	12	106.25	10.332	10.320	0.0119
1	2	3	12	118.75	10.920	11.356	-0.4356
1	2	4	12	104.00	10.223	11.106	-0.8836
1	2	5	12	123.00	11.113	10.438	0.6749

===== fnoat for AREA 2 and YEAR 2 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	4.807	1.202	1.11	0.365
+ CULT	10	136.406	13.641	12.64	<.001
Residual	36	38.835	1.079		
Total	50	180.049	3.601		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as

summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

	Prediction	se
CULT		
1	2.901	0.465
2	1.419	0.524
3	1.352	0.524
4	2.423	0.612
5	5.047	0.465
6	2.811	0.465
7	1.829	0.465
8	4.358	0.465
10	5.491	0.465
11	4.672	0.465
12	6.294	0.465

*** Coefficient of variation and standard error of a single unit ***

%cv	se
28.58	1.039

***** Pairwise differences *****

t probabilities of pairwise differences

1	*			
2	0.041	*		
3	0.034	0.927	*	
4	0.537	0.224	0.196	*

5	0.002	0.000	0.000	0.002	*
6	0.892	0.055	0.045	0.616	0.002
7	0.111	0.562	0.501	0.444	0.000
8	0.033	0.000	0.000	0.016	0.301
10	0.000	0.000	0.000	0.000	0.503
11	0.011	0.000	0.000	0.006	0.571
12	0.000	0.000	0.000	0.000	0.066

	1	2	3	4	5
6	*				
7	0.143	*			
8	0.024	0.000	*		
10	0.000	0.000	0.093	*	
11	0.008	0.000	0.636	0.220	*
12	0.000	0.000	0.006	0.230	0.018

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	10.54	171
2	101	7.21	37
3	86	10.68	171
4	101	49.48	1862
5	103	57.74	2363
6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511

10	105	66.30	1667
11	105	52.83	1984
12	105	64.98	3436

YEAR	AREA	REP	CULT	fnoat	Tfnoat	FITTED	RESIDUAL
2	2	1	1	6.00	2.550	2.859	-0.3096
2	2	2	1	13.00	3.674	2.668	1.0059
2	2	3	1	7.75	2.872	2.929	-0.0566
2	2	4	1	8.75	3.041	2.763	0.2786
2	2	5	1	5.25	2.398	3.316	-0.9183
2	2	1	2	0.50	1.000	1.377	-0.3767
2	2	2	2	4.50	2.236	1.186	1.0501
2	2	3	2	*	*	1.447	*
2	2	4	2	1.25	1.323	1.280	0.0425
2	2	5	2	0.75	1.118	1.834	-0.7158
2	2	1	3	4.75	2.291	1.310	0.9815
2	2	2	3	0.75	1.118	1.119	-0.0011
2	2	3	3	*	*	1.380	*
2	2	4	3	0.50	1.000	1.213	-0.2135
2	2	5	3	0.50	1.000	1.767	-0.7670
2	2	1	4	6.75	2.693	2.381	0.3119
2	2	2	4	1.75	1.500	2.190	-0.6899
2	2	3	4	7.50	2.828	2.450	0.3780
2	2	4	4	*	*	2.284	*
2	2	5	4	*	*	2.838	*
2	2	1	5	19.75	4.500	5.005	-0.5049
2	2	2	5	5.50	2.449	4.814	-2.3647
2	2	3	5	37.25	6.144	5.075	1.0694
2	2	4	5	23.25	4.873	4.909	-0.0351
2	2	5	5	52.75	7.297	5.462	1.8352
2	2	1	6	10.75	3.354	2.769	0.5846

2	2	2	6	6.25	2.598	2.579	0.0193
2	2	3	6	3.75	2.062	2.839	-0.7778
2	2	4	6	6.50	2.646	2.673	-0.0274
2	2	5	6	11.25	3.428	3.227	0.2012
2	2	1	7	2.75	1.803	1.787	0.0162
2	2	2	7	1.50	1.414	1.596	-0.1817
2	2	3	7	2.25	1.658	1.856	-0.1981
2	2	4	7	4.50	2.236	1.690	0.5458
2	2	5	7	3.75	2.062	2.244	-0.1822
2	2	1	8	13.25	3.708	4.316	-0.6081
2	2	2	8	9.50	3.162	4.125	-0.9632
2	2	3	8	20.00	4.528	4.386	0.1417
2	2	4	8	40.75	6.423	4.220	2.2028
2	2	5	8	15.50	4.000	4.773	-0.7733
2	2	1	10	17.25	4.213	5.449	-1.2360
2	2	2	10	45.25	6.764	5.258	1.5055
2	2	3	10	20.00	4.528	5.519	-0.9912
2	2	4	10	22.75	4.822	5.353	-0.5309
2	2	5	10	50.75	7.159	5.906	1.2527
2	2	1	11	30.00	5.523	4.630	0.8930
2	2	2	11	15.75	4.031	4.439	-0.4079
2	2	3	11	27.50	5.292	4.700	0.5920
2	2	4	11	17.25	4.213	4.533	-0.3203
2	2	5	11	18.25	4.330	5.087	-0.7567
2	2	1	12	41.75	6.500	6.252	0.2481
2	2	2	12	49.75	7.089	6.061	1.0275
2	2	3	12	37.50	6.164	6.322	-0.1573
2	2	4	12	17.25	4.213	6.156	-1.9425
2	2	5	12	56.25	7.533	6.709	0.8242

===== fnoat for AREA 2 and YEAR 3 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	11.171	2.793	2.42	0.064
+ CULT	10	215.668	21.567	18.71	<.001
Residual	39	44.951	1.153		
Total	53	271.791	5.128		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

	Prediction	se
CULT		
1	6.200	0.541
2	2.919	0.480
3	4.580	0.480
4	7.238	0.480
5	7.820	0.480
6	8.552	0.480
7	3.935	0.480

8	7.155	0.480
10	8.274	0.480
11	8.011	0.480
12	9.373	0.480

*** Coefficient of variation and standard error of a single unit ***

%cv	se
15.92	1.074

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.000	*			
3	0.031	0.019	*		
4	0.160	0.000	0.000	*	
5	0.031	0.000	0.000	0.396	*
6	0.002	0.000	0.000	0.060	0.288
7	0.003	0.142	0.349	0.000	0.000
8	0.195	0.000	0.001	0.903	0.333
10	0.007	0.000	0.000	0.135	0.508
11	0.017	0.000	0.000	0.262	0.781
12	0.000	0.000	0.000	0.003	0.028

	1	2	3	4	5
6	*				
7	0.000	*			

8	0.046	0.000	*		
10	0.685	0.000	0.107	*	
11	0.430	0.000	0.215	0.700	*
12	0.234	0.000	0.002	0.114	0.052

6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	10.54	171
2	101	7.21	37
3	86	10.68	171
4	101	49.48	1862
5	103	57.74	2363
6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511
10	105	66.30	1667
11	105	52.83	1984
12	105	64.98	3436

YEAR	AREA	REP	CULT	fnoat	Tfnoat	FITTED	RESIDUAL
3	2	1	1	37.75	6.185	5.597	0.5876
3	2	2	1	29.25	5.454	5.895	-0.4403
3	2	3	1	40.00	6.364	6.132	0.2320
3	2	4	1	*	*	6.722	*
3	2	5	1	39.50	6.325	6.704	-0.3793
3	2	1	2	3.25	1.936	2.315	-0.3789

3	2	2	2	9.00	3.082	2.613	0.4692
3	2	3	2	7.00	2.739	2.850	-0.1117
3	2	4	2	15.25	3.969	3.440	0.5283
3	2	5	2	8.00	2.915	3.422	-0.5068
3	2	1	3	10.25	3.279	3.976	-0.6976
3	2	2	3	14.00	3.808	4.274	-0.4661
3	2	3	3	24.75	5.025	4.511	0.5137
3	2	4	3	33.25	5.809	5.101	0.7082
3	2	5	3	24.75	5.025	5.083	-0.0583
3	2	1	4	56.00	7.517	6.634	0.8824
3	2	2	4	50.75	7.159	6.932	0.2270
3	2	3	4	66.50	8.185	7.169	1.0161
3	2	4	4	46.50	6.856	7.759	-0.9035
3	2	5	4	42.00	6.519	7.741	-1.2220
3	2	1	5	42.00	6.519	7.217	-0.6978
3	2	2	5	75.00	8.689	7.515	1.1744
3	2	3	5	50.75	7.159	7.752	-0.5930
3	2	4	5	75.00	8.689	8.342	0.3471
3	2	5	5	65.00	8.093	8.324	-0.2307
3	2	1	6	32.75	5.766	7.949	-2.1822
3	2	2	6	81.00	9.028	8.246	0.7816
3	2	3	6	70.75	8.441	8.483	-0.0425
3	2	4	6	86.00	9.301	9.073	0.2271
3	2	5	6	105.00	10.271	9.055	1.2159
3	2	1	7	15.33	3.979	3.332	0.6466
3	2	2	7	13.25	3.708	3.630	0.0784
3	2	3	7	14.50	3.873	3.867	0.0060
3	2	4	7	23.75	4.924	4.457	0.4675
3	2	5	7	10.00	3.240	4.439	-1.1985
3	2	1	8	78.00	8.860	6.552	2.3084
3	2	2	8	23.25	4.873	6.849	-1.9758
3	2	3	8	35.75	6.021	7.087	-1.0657

3	2	4	8	57.00	7.583	7.677	-0.0936
3	2	5	8	71.50	8.485	7.658	0.8268
3	2	1	10	60.25	7.794	7.671	0.1232
3	2	2	10	74.00	8.631	7.969	0.6627
3	2	3	10	64.50	8.062	8.206	-0.1437
3	2	4	10	61.75	7.890	8.796	-0.9060
3	2	5	10	81.25	9.042	8.778	0.2637
3	2	1	11	81.00	9.028	7.407	1.6205
3	2	2	11	63.25	7.984	7.705	0.2795
3	2	3	11	57.25	7.599	7.942	-0.3429
3	2	4	11	57.25	7.599	8.532	-0.9328
3	2	5	11	61.75	7.890	8.514	-0.6243
3	2	1	12	42.50	6.557	8.770	-2.2121
3	2	2	12	68.00	8.276	9.067	-0.7907
3	2	3	12	96.25	9.836	9.304	0.5317
3	2	4	12	108.75	10.452	9.894	0.5578
3	2	5	12	138.50	11.790	9.876	1.9134

===== fnoat for AREA 2 and YEAR 4 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	4.1592	1.0398	1.06	0.389
+ CULT	10	553.1954	55.3195	56.38	<.001

Residual	40	39.2444	0.9811
Total	54	596.5990	11.0481

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

CULT	Prediction	se
1	4.052	0.443
2	2.843	0.443
3	5.723	0.443
4	8.212	0.443
5	10.258	0.443
6	9.449	0.443
7	2.442	0.443
8	9.435	0.443
10	11.577	0.443
11	10.192	0.443
12	10.542	0.443

*** Coefficient of variation and standard error of a single unit ***

%cv	se
12.86	0.9905

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.061	*			
3	0.011	0.000	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.002	*
6	0.000	0.000	0.000	0.055	0.204
7	0.014	0.525	0.000	0.000	0.000
8	0.000	0.000	0.000	0.058	0.196
10	0.000	0.000	0.000	0.000	0.042
11	0.000	0.000	0.000	0.003	0.916
12	0.000	0.000	0.000	0.001	0.652

	1	2	3	4	5

6	*				
7	0.000	*			
8	0.980	0.000	*		
10	0.002	0.000	0.001	*	
11	0.242	0.000	0.234	0.033	*
12	0.089	0.000	0.085	0.107	0.579

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			

1	88	10.54	171
2	101	7.21	37
3	86	10.68	171
4	101	49.48	1862
5	103	57.74	2363
6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511
10	105	66.30	1667
11	105	52.83	1984
12	105	64.98	3436

YEAR	AREA	REP	CULT	fnoat	Tfnoat	FITTED	RESIDUAL
4	2	1	1	14.25	3.841	3.928	-0.0870
4	2	2	1	15.00	3.937	3.749	0.1875
4	2	3	1	15.75	4.031	3.910	0.1216
4	2	4	1	25.50	5.099	4.547	0.5520
4	2	5	1	10.75	3.354	4.128	-0.7741
4	2	1	2	3.75	2.062	2.718	-0.6569
4	2	2	2	6.00	2.550	2.540	0.0092
4	2	3	2	8.25	2.958	2.700	0.2576
4	2	4	2	12.50	3.606	3.338	0.2677
4	2	5	2	8.75	3.041	2.919	0.1223
4	2	1	3	32.50	5.745	5.599	0.1459
4	2	2	3	13.00	3.674	5.421	-1.7463
4	2	3	3	29.50	5.477	5.581	-0.1034
4	2	4	3	60.75	7.826	6.218	1.6082
4	2	5	3	34.25	5.895	5.799	0.0956
4	2	1	4	67.25	8.231	8.087	0.1436
4	2	2	4	59.50	7.746	7.909	-0.1634
4	2	3	4	68.00	8.276	8.069	0.2071

4	2	4	4	70.75	8.441	8.707	-0.2659
4	2	5	4	69.50	8.367	8.288	0.0785
4	2	1	5	119.00	10.932	10.133	0.7984
4	2	2	5	121.25	11.034	9.955	1.0789
4	2	3	5	119.00	10.932	10.115	0.8164
4	2	4	5	143.25	11.990	10.753	1.2370
4	2	5	5	40.50	6.403	10.334	-3.9307
4	2	1	6	69.00	8.337	9.324	-0.9873
4	2	2	6	86.75	9.341	9.146	0.1949
4	2	3	6	83.75	9.179	9.306	-0.1271
4	2	4	6	90.00	9.513	9.943	-0.4302
4	2	5	6	117.75	10.874	9.525	1.3497
4	2	1	7	6.25	2.598	2.317	0.2811
4	2	2	7	2.75	1.803	2.139	-0.3361
4	2	3	7	3.50	2.000	2.299	-0.2990
4	2	4	7	9.50	3.162	2.936	0.2259
4	2	5	7	6.50	2.646	2.518	0.1281
4	2	1	8	103.00	10.173	9.310	0.8637
4	2	2	8	71.00	8.456	9.132	-0.6760
4	2	3	8	92.00	9.618	9.292	0.3259
4	2	4	8	70.50	8.426	9.929	-1.5031
4	2	5	8	109.75	10.500	9.510	0.9895
4	2	1	10	125.75	11.236	11.452	-0.2156
4	2	2	10	150.25	12.278	11.274	1.0044
4	2	3	10	124.75	11.192	11.434	-0.2422
4	2	4	10	127.25	11.303	12.071	-0.7685
4	2	5	10	140.50	11.874	11.652	0.2220
4	2	1	11	101.00	10.075	10.067	0.0074
4	2	2	11	97.25	9.887	9.889	-0.0024
4	2	3	11	92.00	9.618	10.049	-0.4316
4	2	4	11	101.75	10.112	10.687	-0.5749
4	2	5	11	126.50	11.269	10.268	1.0015

4	2	1	12	102.00	10.124	10.418	-0.2933
4	2	2	12	113.75	10.689	10.239	0.4493
4	2	3	12	97.00	9.874	10.400	-0.5253
4	2	4	12	113.75	10.689	11.037	-0.3482
4	2	5	12	128.00	11.336	10.618	0.7176

===== fnoat for AREA 2 and YEAR 5 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	1.2612	0.3153	0.33	0.855
+ CULT	10	444.7800	44.4780	46.88	<.001
Residual	40	37.9492	0.9487		
Total	54	483.9903	8.9628		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

Prediction se

CULT		
1	4.685	0.436
2	3.246	0.436
3	4.462	0.436
4	8.717	0.436
5	9.956	0.436
6	7.696	0.436
7	2.562	0.436
8	9.491	0.436
10	8.351	0.436
11	9.183	0.436
12	11.367	0.436

*** Coefficient of variation and standard error of a single unit ***

%cv	se
13.44	0.9740

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.025	*			
3	0.720	0.055	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.051	*
6	0.000	0.000	0.000	0.105	0.001
7	0.001	0.274	0.004	0.000	0.000
8	0.000	0.000	0.000	0.216	0.454

10	0.000	0.000	0.000	0.557	0.013
11	0.000	0.000	0.000	0.453	0.217
12	0.000	0.000	0.000	0.000	0.027

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.006	0.000	*		
10	0.294	0.000	0.072	*	
11	0.020	0.000	0.620	0.185	*
12	0.000	0.000	0.004	0.000	0.001

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	10.54	171
2	101	7.21	37
3	86	10.68	171
4	101	49.48	1862
5	103	57.74	2363
6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511
10	105	66.30	1667
11	105	52.83	1984
12	105	64.98	3436

YEAR	AREA	REP	CULT	fnoat	Tfnoat	FITTED	RESIDUAL
5	2	1	1	22.75	4.822	4.571	0.2509
5	2	2	1	40.00	6.364	4.921	1.4431
5	2	3	1	18.00	4.301	4.603	-0.3020
5	2	4	1	14.75	3.905	4.525	-0.6203
5	2	5	1	15.75	4.031	4.803	-0.7717
5	2	1	2	5.75	2.500	3.132	-0.6321
5	2	2	2	12.75	3.640	3.482	0.1580
5	2	3	2	11.25	3.428	3.164	0.2635
5	2	4	2	15.25	3.969	3.087	0.8820
5	2	5	2	6.75	2.693	3.364	-0.6714
5	2	1	3	26.00	5.148	4.349	0.7993
5	2	2	3	14.25	3.841	4.698	-0.8579
5	2	3	3	18.50	4.359	4.381	-0.0219
5	2	4	3	25.75	5.123	4.303	0.8204
5	2	5	3	14.25	3.841	4.580	-0.7398
5	2	1	4	75.75	8.732	8.603	0.1291
5	2	2	4	93.50	9.695	8.953	0.7425
5	2	3	4	92.00	9.618	8.635	0.9825
5	2	4	4	37.25	6.144	8.558	-2.4134
5	2	5	4	87.75	9.394	8.835	0.5593
5	2	1	5	119.25	10.943	9.843	1.1005
5	2	2	5	86.00	9.301	10.192	-0.8919
5	2	3	5	65.50	8.124	9.875	-1.7507
5	2	4	5	121.50	11.045	9.797	1.2483
5	2	5	5	107.00	10.368	10.074	0.2938
5	2	1	6	61.50	7.874	7.582	0.2917
5	2	2	6	66.00	8.155	7.932	0.2225
5	2	3	6	64.25	8.047	7.615	0.4322
5	2	4	6	51.75	7.228	7.537	-0.3085
5	2	5	6	51.00	7.176	7.814	-0.6379

5	2	1	7	4.75	2.291	2.449	-0.1573
5	2	2	7	3.75	2.062	2.799	-0.7370
5	2	3	7	5.50	2.449	2.481	-0.0313
5	2	4	7	10.50	3.317	2.403	0.9135
5	2	5	7	6.75	2.693	2.680	0.0121
5	2	1	8	95.75	9.811	9.377	0.4336
5	2	2	8	74.25	8.646	9.727	-1.0812
5	2	3	8	63.75	8.016	9.409	-1.3937
5	2	4	8	104.25	10.235	9.332	0.9031
5	2	5	8	115.00	10.747	9.609	1.1381
5	2	1	10	54.25	7.399	8.238	-0.8384
5	2	2	10	95.50	9.798	8.588	1.2103
5	2	3	10	74.00	8.631	8.270	0.3614
5	2	4	10	52.75	7.297	8.192	-0.8950
5	2	5	10	74.00	8.631	8.470	0.1617
5	2	1	11	82.25	9.097	9.069	0.0272
5	2	2	11	84.25	9.206	9.419	-0.2134
5	2	3	11	87.25	9.367	9.102	0.2658
5	2	4	11	85.50	9.274	9.024	0.2496
5	2	5	11	80.00	8.972	9.301	-0.3292
5	2	1	12	96.50	9.849	11.253	-1.4045
5	2	2	12	134.25	11.608	11.603	0.0049
5	2	3	12	155.25	12.480	11.286	1.1944
5	2	4	12	108.25	10.428	11.208	-0.7796
5	2	5	12	155.00	12.470	11.485	0.9847

===== fnoat for AREA 2 and YEAR 6 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	14.8513	3.7128	4.56	0.004
+ CULT	10	696.1256	69.6126	85.43	<.001
Residual	40	32.5925	0.8148		
Total	54	743.5694	13.7698		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

	Prediction	se
CULT		
1	6.558	0.404
2	3.656	0.404
3	6.479	0.404
4	12.280	0.404
5	13.055	0.404
6	10.138	0.404
7	4.133	0.404
8	11.877	0.404
10	10.086	0.404
11	12.046	0.404
12	14.525	0.404

*** Coefficient of variation and standard error of a single unit ***

%cv	se
9.47	0.9027

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.000	*			
3	0.890	0.000	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.182	*
6	0.000	0.000	0.000	0.001	0.000
7	0.000	0.408	0.000	0.000	0.000
8	0.000	0.000	0.000	0.484	0.046
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.683	0.085
12	0.000	0.000	0.000	0.000	0.014

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.004	0.000	*		
10	0.927	0.000	0.003	*	
11	0.002	0.000	0.769	0.001	*
12	0.000	0.000	0.000	0.000	0.000

6 7 8 10 11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	10.54	171
2	101	7.21	37
3	86	10.68	171
4	101	49.48	1862
5	103	57.74	2363
6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511
10	105	66.30	1667
11	105	52.83	1984
12	105	64.98	3436

YEAR	AREA	REP	CULT	fnoat	Tfnoat	FITTED	RESIDUAL
6	2	1	1	50.5	7.141	6.218	0.9231
6	2	2	1	40.2	6.384	5.787	0.5962
6	2	3	1	27.8	5.315	6.689	-1.3741
6	2	4	1	52.5	7.280	6.780	0.4998
6	2	5	1	44.0	6.671	7.316	-0.6450
6	2	1	2	4.0	2.121	3.316	-1.1951
6	2	2	2	9.0	3.082	2.885	0.1968
6	2	3	2	21.5	4.690	3.787	0.9031
6	2	4	2	15.5	4.000	3.878	0.1216
6	2	5	2	18.8	4.387	4.414	-0.0264

6	2	1	3	42.8	6.576	6.139	0.4376
6	2	2	3	30.0	5.523	5.708	-0.1852
6	2	3	3	41.0	6.442	6.610	-0.1677
6	2	4	3	49.8	7.089	6.701	0.3878
6	2	5	3	45.2	6.764	7.236	-0.4725
6	2	1	4	134.5	11.619	11.940	-0.3215
6	2	2	4	140.5	11.874	11.510	0.3648
6	2	3	4	178.0	13.360	12.411	0.9491
6	2	4	4	136.0	11.683	12.502	-0.8191
6	2	5	4	165.0	12.865	13.038	-0.1732
6	2	1	5	159.8	12.659	12.715	-0.0562
6	2	2	5	135.0	11.640	12.284	-0.6437
6	2	3	5	194.0	13.946	13.186	0.7603
6	2	4	5	173.5	13.191	13.277	-0.0862
6	2	5	5	191.0	13.838	13.813	0.0258
6	2	1	6	117.3	10.855	9.798	1.0566
6	2	2	6	66.8	8.201	9.367	-1.1668
6	2	3	6	100.0	10.025	10.269	-0.2443
6	2	4	6	103.5	10.198	10.360	-0.1623
6	2	5	6	129.8	11.413	10.896	0.5169
6	2	1	7	18.8	4.387	3.793	0.5940
6	2	2	7	16.5	4.123	3.362	0.7606
6	2	3	7	12.0	3.536	4.264	-0.7287
6	2	4	7	16.2	4.093	4.355	-0.2627
6	2	5	7	20.0	4.528	4.891	-0.3632
6	2	1	8	126.5	11.269	11.537	-0.2675
6	2	2	8	103.5	10.198	11.106	-0.9079
6	2	3	8	167.2	12.952	12.008	0.9440
6	2	4	8	149.0	12.227	12.099	0.1281
6	2	5	8	161.8	12.738	12.634	0.1033
6	2	1	10	64.2	8.047	9.746	-1.6992
6	2	2	10	106.0	10.320	9.315	1.0049

6	2	3	10	108.8	10.452	10.217	0.2355
6	2	4	10	116.2	10.805	10.308	0.4971
6	2	5	10	116.2	10.805	10.843	-0.0383
6	2	1	11	161.0	12.708	11.706	1.0025
6	2	2	11	103.2	10.186	11.275	-1.0891
6	2	3	11	154.8	12.460	12.177	0.2833
6	2	4	11	168.5	13.000	12.268	0.7322
6	2	5	11	140.5	11.874	12.803	-0.9289
6	2	1	12	187.5	13.711	14.185	-0.4742
6	2	2	12	219.2	14.824	13.755	1.0694
6	2	3	12	171.0	13.096	14.656	-1.5605
6	2	4	12	187.5	13.711	14.747	-1.0362
6	2	5	12	298.2	17.284	15.283	2.0015

===== fnoat for AREA 2 and YEAR 7 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	11.958	2.989	1.63	0.185
+ CULT	10	99.517	9.952	5.44	<.001
Residual	40	73.165	1.829		
Total	54	184.640	3.419		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

	Prediction	se
CULT		
1	4.978	0.605
2	3.884	0.605
3	3.574	0.605
4	4.876	0.605
5	6.304	0.605
6	5.266	0.605
7	4.506	0.605
8	5.618	0.605
10	8.792	0.605
11	5.335	0.605
12	6.193	0.605

*** Coefficient of variation and standard error of a single unit ***

%cv	se
25.08	1.352

***** Pairwise differences *****

t probabilities of pairwise differences

1	*

2	0.208	*			
3	0.108	0.718	*		
4	0.905	0.253	0.136	*	
5	0.129	0.007	0.003	0.103	*
6	0.739	0.114	0.055	0.651	0.232
7	0.584	0.472	0.282	0.668	0.042
8	0.459	0.049	0.022	0.391	0.427
10	0.000	0.000	0.000	0.000	0.006
11	0.679	0.098	0.046	0.594	0.264
12	0.163	0.010	0.004	0.132	0.897

	1	2	3	4	5
6	*				
7	0.380	*			
8	0.683	0.201	*		
10	0.000	0.000	0.001	*	
11	0.935	0.338	0.743	0.000	*
12	0.285	0.056	0.505	0.004	0.322

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	10.54	171
2	101	7.21	37
3	86	10.68	171
4	101	49.48	1862
5	103	57.74	2363

6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511
10	105	66.30	1667
11	105	52.83	1984
12	105	64.98	3436

YEAR	AREA	REP	CULT	fnoat	Tfnoat	FITTED	RESIDUAL
7	2	1	1	21.75	4.717	5.647	-0.9299
7	2	2	1	28.00	5.339	4.994	0.3443
7	2	3	1	19.50	4.472	4.373	0.0989
7	2	4	1	20.25	4.555	4.571	-0.0159
7	2	5	1	33.25	5.809	5.307	0.5027
7	2	1	2	10.25	3.279	4.553	-1.2742
7	2	2	2	13.50	3.742	3.900	-0.1586
7	2	3	2	11.50	3.464	3.279	0.1848
7	2	4	2	26.50	5.196	3.477	1.7191
7	2	5	2	13.50	3.742	4.213	-0.4711
7	2	1	3	12.75	3.640	4.242	-0.6020
7	2	2	3	6.00	2.550	3.589	-1.0399
7	2	3	3	15.50	4.000	2.968	1.0315
7	2	4	3	15.00	3.937	3.166	0.7707
7	2	5	3	13.50	3.742	3.902	-0.1603
7	2	1	4	45.00	6.745	5.544	1.2010
7	2	2	4	18.00	4.301	4.892	-0.5905
7	2	3	4	35.50	6.000	4.271	1.7293
7	2	4	4	11.25	3.428	4.469	-1.0407
7	2	5	4	14.75	3.905	5.204	-1.2991
7	2	1	5	31.75	5.679	6.972	-1.2934
7	2	2	5	61.50	7.874	6.320	1.5544
7	2	3	5	9.00	3.082	5.699	-2.6165

7	2	4	5	18.00	4.301	5.896	-1.5953
7	2	5	5	111.50	10.583	6.632	3.9508
7	2	1	6	36.00	6.042	5.934	0.1074
7	2	2	6	30.25	5.545	5.281	0.2638
7	2	3	6	22.25	4.770	4.660	0.1093
7	2	4	6	28.25	5.362	4.858	0.5036
7	2	5	6	20.75	4.610	5.594	-0.9842
7	2	1	7	21.67	4.709	5.174	-0.4660
7	2	2	7	26.25	5.172	4.522	0.6502
7	2	3	7	10.25	3.279	3.901	-0.6221
7	2	4	7	17.75	4.272	4.099	0.1733
7	2	5	7	25.50	5.099	4.834	0.2646
7	2	1	8	89.75	9.500	6.286	3.2140
7	2	2	8	16.25	4.093	5.633	-1.5407
7	2	3	8	14.25	3.841	5.012	-1.1718
7	2	4	8	39.50	6.325	5.210	1.1143
7	2	5	8	18.25	4.330	5.946	-1.6158
7	2	1	10	85.50	9.274	9.460	-0.1867
7	2	2	10	81.75	9.069	8.808	0.2615
7	2	3	10	82.75	9.124	8.187	0.9375
7	2	4	10	67.50	8.246	8.384	-0.1383
7	2	5	10	67.50	8.246	9.120	-0.8740
7	2	1	11	43.50	6.633	6.004	0.6297
7	2	2	11	38.25	6.225	5.351	0.8740
7	2	3	11	21.00	4.637	4.730	-0.0931
7	2	4	11	9.75	3.202	4.928	-1.7262
7	2	5	11	35.25	5.979	5.663	0.3157
7	2	1	12	41.25	6.461	6.861	-0.3999
7	2	2	12	30.75	5.590	6.209	-0.6185
7	2	3	12	35.50	6.000	5.588	0.4123
7	2	4	12	35.75	6.021	5.786	0.2353
7	2	5	12	47.00	6.892	6.521	0.3708

===== fnoat for AREA 3 and YEAR 1 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	3.7113	0.9278	1.62	0.204
+ CULT	9	72.6071	8.0675	14.11	<.001
Residual	22	12.5762	0.5716		
Total	35	88.8946	2.5398		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

	Prediction	se
CULT		
1	0.784	0.558
2	2.155	0.383
3	0.860	0.797
4	2.002	0.338

5	1.391	0.448
6	5.039	0.338
7	*	*
8	1.449	0.819
10	4.324	0.338
11	1.543	0.338
12	1.541	0.338

*** Coefficient of variation and standard error of a single unit ***

%cv	se
30.61	0.7561

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.053	*			
3	0.939	0.156	*		
4	0.076	0.768	0.202	*	
5	0.409	0.204	0.562	0.290	*
6	0.000	0.000	0.000	0.000	0.000
7	*	*	*	*	*
8	0.517	0.454	0.617	0.537	0.952
10	0.000	0.000	0.001	0.000	0.000
11	0.258	0.245	0.440	0.347	0.791
12	0.259	0.244	0.441	0.345	0.793

	1	2	3	4	5

6	*				
7	*	*			
8	0.001	*	*		
10	0.149	*	0.004	*	
11	0.000	*	0.916	0.000	*
12	0.000	*	0.918	0.000	0.992

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	10.54	171
2	101	7.21	37
3	86	10.68	171
4	101	49.48	1862
5	103	57.74	2363
6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511
10	105	66.30	1667
11	105	52.83	1984
12	105	64.98	3436

YEAR	AREA	REP	CULT	fnoat	Tfnoat	FITTED	RESIDUAL
1	3	1	1	0.500	1.000	1.282	-0.2820
1	3	2	1	*	*	0.924	*

1	3	3	1	*	*	0.174	*
1	3	4	1	0.750	1.118	0.836	0.2820
1	3	5	1	*	*	0.657	*
1	3	1	2	2.750	1.803	2.653	-0.8506
1	3	2	2	4.250	2.179	2.295	-0.1159
1	3	3	2	6.250	2.598	1.546	1.0525
1	3	4	2	4.000	2.121	2.207	-0.0860
1	3	5	2	*	*	2.029	*
1	3	1	3	*	*	1.358	*
1	3	2	3	0.500	1.000	1.000	0.0000
1	3	3	3	*	*	0.250	*
1	3	4	3	*	*	0.912	*
1	3	5	3	*	*	0.734	*
1	3	1	4	4.250	2.179	2.500	-0.3210
1	3	2	4	5.500	2.449	2.142	0.3071
1	3	3	4	0.250	0.866	1.393	-0.5266
1	3	4	4	2.500	1.732	2.054	-0.3223
1	3	5	4	7.000	2.739	1.876	0.8627
1	3	1	5	*	*	1.890	*
1	3	2	5	1.000	1.225	1.532	-0.3068
1	3	3	5	1.500	1.414	0.782	0.6324
1	3	4	5	0.750	1.118	1.444	-0.3256
1	3	5	5	*	*	1.265	*
1	3	1	6	38.250	6.225	5.537	0.6877
1	3	2	6	34.000	5.874	5.179	0.6945
1	3	3	6	13.500	3.742	4.429	-0.6878
1	3	4	6	30.500	5.568	5.091	0.4766
1	3	5	6	13.500	3.742	4.913	-1.1710
1	3	1	7	*	*	1.282	*
1	3	2	7	*	*	0.924	*
1	3	3	7	*	*	0.174	*
1	3	4	7	*	*	0.836	*

1	3	5	7	*	*	0.657	*
1	3	1	8	*	*	1.947	*
1	3	2	8	*	*	1.589	*
1	3	3	8	*	*	0.840	*
1	3	4	8	*	*	1.501	*
1	3	5	8	1.250	1.323	1.323	0.0000
1	3	1	10	36.250	6.062	4.822	1.2404
1	3	2	10	16.500	4.123	4.464	-0.3406
1	3	3	10	5.500	2.449	3.714	-1.2645
1	3	4	10	26.500	5.196	4.376	0.8204
1	3	5	10	13.500	3.742	4.197	-0.4556
1	3	1	11	2.750	1.803	2.041	-0.2379
1	3	2	11	1.250	1.323	1.683	-0.3598
1	3	3	11	2.250	1.658	0.933	0.7254
1	3	4	11	1.000	1.225	1.595	-0.3699
1	3	5	11	2.250	1.658	1.416	0.2422
1	3	1	12	2.750	1.803	2.039	-0.2365
1	3	2	12	2.750	1.803	1.681	0.1215
1	3	3	12	0.500	1.000	0.931	0.0685
1	3	4	12	0.750	1.118	1.593	-0.4752
1	3	5	12	3.250	1.936	1.415	0.5217

===== fnoat for AREA 3 and YEAR 2 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	5.9817	1.4954	3.14	0.028
+ CULT	9	62.6186	6.9576	14.60	<.001
Residual	32	15.2516	0.4766		
Total	45	83.8520	1.8634		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

	Prediction	se
CULT		
1	1.134	0.503
2	2.073	0.309
3	1.270	0.309
4	3.548	0.309
5	2.909	0.309
6	3.890	0.309
7	*	*
8	2.295	0.348
10	5.422	0.309
11	3.190	0.309
12	2.999	0.309

*** Coefficient of variation and standard error of a single unit ***

%cv	se
23.02	0.6904

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.122	*			
3	0.820	0.075	*		
4	0.000	0.002	0.000	*	
5	0.005	0.064	0.001	0.153	*
6	0.000	0.000	0.000	0.439	0.032
7	*	*	*	*	*
8	0.066	0.637	0.035	0.011	0.197
10	0.000	0.000	0.000	0.000	0.000
11	0.001	0.015	0.000	0.418	0.524
12	0.004	0.042	0.000	0.218	0.838

	1	2	3	4	5
6	*				
7	*	*			
8	0.002	*	*		
10	0.001	*	0.000	*	
11	0.119	*	0.064	0.000	*
12	0.050	*	0.141	0.000	0.664

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	10.54	171
2	101	7.21	37
3	86	10.68	171
4	101	49.48	1862
5	103	57.74	2363
6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511
10	105	66.30	1667
11	105	52.83	1984
12	105	64.98	3436

YEAR	AREA	REP	CULT	fnoat	Tfnoat	FITTED	RESIDUAL
2	3	1	1	*	*	1.372	*
2	3	2	1	*	*	1.428	*
2	3	3	1	0.25	0.866	0.943	-0.0770
2	3	4	1	0.25	0.866	0.789	0.0770
2	3	5	1	*	*	1.231	*
2	3	1	2	5.75	2.500	2.310	0.1898
2	3	2	2	1.00	1.225	2.367	-1.1422
2	3	3	2	4.00	2.121	1.881	0.2399
2	3	4	2	3.00	1.871	1.727	0.1434
2	3	5	2	7.00	2.739	2.170	0.5691
2	3	1	3	1.00	1.225	1.507	-0.2826
2	3	2	3	1.00	1.225	1.564	-0.3393
2	3	3	3	2.75	1.803	1.079	0.7242
2	3	4	3	0.25	0.866	0.925	-0.0585

2	3	5	3	1.25	1.323	1.367	-0.0438
2	3	1	4	17.25	4.213	3.785	0.4279
2	3	2	4	23.25	4.873	3.842	1.0315
2	3	3	4	8.00	2.915	3.356	-0.4409
2	3	4	4	8.50	3.000	3.202	-0.2024
2	3	5	4	7.50	2.828	3.645	-0.8161
2	3	1	5	10.75	3.354	3.146	0.2079
2	3	2	5	10.50	3.317	3.203	0.1137
2	3	3	5	5.75	2.500	2.717	-0.2175
2	3	4	5	6.00	2.550	2.563	-0.0140
2	3	5	5	8.00	2.915	3.006	-0.0901
2	3	1	6	13.00	3.674	4.128	-0.4533
2	3	2	6	26.00	5.148	4.184	0.9636
2	3	3	6	13.50	3.742	3.699	0.0429
2	3	4	6	15.00	3.937	3.545	0.3923
2	3	5	6	8.75	3.041	3.987	-0.9455
2	3	1	7	*	*	1.372	*
2	3	2	7	*	*	1.428	*
2	3	3	7	*	*	0.943	*
2	3	4	7	*	*	0.789	*
2	3	5	7	*	*	1.231	*
2	3	1	8	5.00	2.345	2.532	-0.1869
2	3	2	8	*	*	2.589	*
2	3	3	8	1.00	1.225	2.103	-0.8786
2	3	4	8	3.00	1.871	1.949	-0.0785
2	3	5	8	12.00	3.536	2.391	1.1441
2	3	1	10	34.00	5.874	5.660	0.2142
2	3	2	10	37.00	6.124	5.716	0.4075
2	3	3	10	21.50	4.690	5.231	-0.5403
2	3	4	10	32.50	5.745	5.077	0.6678
2	3	5	10	22.25	4.770	5.519	-0.7492
2	3	1	11	7.75	2.872	3.427	-0.5550

2	3	2	11	7.25	2.784	3.484	-0.7001
2	3	3	11	20.25	4.555	2.998	1.5567
2	3	4	11	4.00	2.121	2.844	-0.7232
2	3	5	11	13.25	3.708	3.287	0.4215
2	3	1	12	13.00	3.674	3.236	0.4381
2	3	2	12	8.25	2.958	3.293	-0.3348
2	3	3	12	5.25	2.398	2.807	-0.4095
2	3	4	12	5.50	2.449	2.653	-0.2039
2	3	5	12	12.50	3.606	3.095	0.5101

===== fnoat for AREA 3 and YEAR 3 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	3.8993	0.9748	1.17	0.345
+ CULT	10	361.7552	36.1755	43.24	<.001
Residual	32	26.7714	0.8366		
Total	46	392.4259	8.5310		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

CULT	Prediction	se
1	0.497	0.672
2	2.293	0.409
3	2.001	0.409
4	6.822	0.409
5	3.179	0.409
6	9.276	0.409
7	1.097	0.667
8	3.041	0.540
10	8.107	0.409
11	2.535	0.409
12	2.733	0.409

*** Coefficient of variation and standard error of a single unit ***

%cv	se
21.82	0.9147

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.029	*			
3	0.065	0.617	*		
4	0.000	0.000	0.000	*	
5	0.002	0.135	0.050	0.000	*

6	0.000	0.000	0.000	0.000	0.000
7	0.540	0.137	0.258	0.000	0.012
8	0.007	0.278	0.135	0.000	0.840
10	0.000	0.000	0.000	0.033	0.000
11	0.014	0.679	0.363	0.000	0.273
12	0.008	0.453	0.215	0.000	0.446

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.028	*		
10	0.052	0.000	0.000	*	
11	0.000	0.076	0.461	0.000	*
12	0.000	0.045	0.652	0.000	0.734

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	10.54	171
2	101	7.21	37
3	86	10.68	171
4	101	49.48	1862
5	103	57.74	2363
6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511
10	105	66.30	1667

11	105	52.83	1984
12	105	64.98	3436

YEAR	AREA	REP	CULT	fnoat	Tfnoat	FITTED	RESIDUAL
3	3	1	1	0.25	0.866	0.829	0.0370
3	3	2	1	*	*	0.399	*
3	3	3	1	0.25	0.866	0.903	-0.0370
3	3	4	1	*	*	-0.157	*
3	3	5	1	*	*	0.520	*
3	3	1	2	4.25	2.179	2.625	-0.4454
3	3	2	2	2.00	1.581	2.195	-0.6135
3	3	3	2	6.75	2.693	2.699	-0.0062
3	3	4	2	8.25	2.958	1.639	1.3188
3	3	5	2	3.75	2.062	2.315	-0.2539
3	3	1	3	3.00	1.871	2.333	-0.4619
3	3	2	3	4.75	2.291	1.903	0.3888
3	3	3	3	4.75	2.291	2.407	-0.1154
3	3	4	3	1.25	1.323	1.347	-0.0242
3	3	5	3	4.50	2.236	2.023	0.2127
3	3	1	4	43.25	6.614	7.154	-0.5396
3	3	2	4	58.00	7.649	6.724	0.9247
3	3	3	4	55.50	7.483	7.228	0.2554
3	3	4	4	45.50	6.782	6.168	0.6139
3	3	5	4	30.75	5.590	6.845	-1.2544
3	3	1	5	22.25	4.770	3.511	1.2584
3	3	2	5	5.50	2.449	3.081	-0.6316
3	3	3	5	15.75	4.031	3.585	0.4459
3	3	4	5	7.25	2.784	2.526	0.2582
3	3	5	5	3.00	1.871	3.202	-1.3310
3	3	1	6	85.50	9.274	9.608	-0.3347
3	3	2	6	83.75	9.179	9.178	0.0007

3	3	3	6	85.75	9.287	9.682	-0.3951
3	3	4	6	96.75	9.862	8.623	1.2389
3	3	5	6	76.75	8.789	9.299	-0.5097
3	3	1	7	*	*	1.429	*
3	3	2	7	0.75	1.118	0.999	0.1194
3	3	3	7	*	*	1.503	*
3	3	4	7	*	*	0.443	*
3	3	5	7	0.50	1.000	1.119	-0.1194
3	3	1	8	*	*	3.373	*
3	3	2	8	4.50	2.236	2.943	-0.7067
3	3	3	8	*	*	3.447	*
3	3	4	8	1.50	1.414	2.387	-0.9731
3	3	5	8	22.00	4.743	3.064	1.6798
3	3	1	10	78.75	8.902	8.439	0.4629
3	3	2	10	80.50	9.000	8.009	0.9909
3	3	3	10	68.25	8.292	8.513	-0.2217
3	3	4	10	35.50	6.000	7.454	-1.4537
3	3	5	10	69.25	8.352	8.130	0.2217
3	3	1	11	9.00	3.082	2.867	0.2156
3	3	2	11	6.25	2.598	2.436	0.1616
3	3	3	11	14.00	3.808	2.941	0.8673
3	3	4	11	1.25	1.323	1.881	-0.5581
3	3	5	11	3.00	1.871	2.557	-0.6864
3	3	1	12	7.75	2.872	3.065	-0.1923
3	3	2	12	3.50	2.000	2.634	-0.6344
3	3	3	12	5.00	2.345	3.139	-0.7933
3	3	4	12	2.25	1.658	2.079	-0.4207
3	3	5	12	22.50	4.796	2.755	2.0406

===== fnoat for AREA 3 and YEAR 4 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	2.1127	0.5282	0.93	0.457
+ CULT	10	643.6309	64.3631	113.16	<.001
Residual	39	22.1826	0.5688		
Total	53	667.9261	12.6024		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

	Prediction	se
CULT		
1	1.693	0.380
2	2.553	0.337
3	3.745	0.337
4	9.353	0.337
5	5.186	0.337
6	9.600	0.337
7	2.099	0.337
8	2.998	0.337
10	12.632	0.337

11	3.830	0.337
12	3.830	0.337

*** Coefficient of variation and standard error of a single unit ***

%cv	se
14.24	0.7542

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.099	*			
3	0.000	0.017	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.004	0.000	*
6	0.000	0.000	0.000	0.606	0.000
7	0.430	0.347	0.001	0.000	0.000
8	0.014	0.356	0.125	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.011	0.861	0.000	0.007
12	0.000	0.011	0.859	0.000	0.007

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.067	*		
10	0.000	0.000	0.000	*	

11	0.000	0.001	0.089	0.000	*
12	0.000	0.001	0.089	0.000	0.992

6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	10.54	171
2	101	7.21	37
3	86	10.68	171
4	101	49.48	1862
5	103	57.74	2363
6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511
10	105	66.30	1667
11	105	52.83	1984
12	105	64.98	3436

YEAR	AREA	REP	CULT	fnoat	Tfnoat	FITTED	RESIDUAL
4	3	1	1	4.25	2.179	1.967	0.2120
4	3	2	1	2.50	1.732	1.845	-0.1134
4	3	3	1	2.00	1.581	1.400	0.1812
4	3	4	1	*	*	1.361	*
4	3	5	1	2.00	1.581	1.861	-0.2798
4	3	1	2	4.25	2.179	2.827	-0.6476
4	3	2	2	5.75	2.500	2.705	-0.2050
4	3	3	2	6.50	2.646	2.259	0.3863

4	3	4	2	8.25	2.958	2.221	0.7373
4	3	5	2	5.50	2.449	2.721	-0.2710
4	3	1	3	10.75	3.354	4.020	-0.6658
4	3	2	3	17.00	4.183	3.898	0.2855
4	3	3	3	20.50	4.583	3.452	1.1303
4	3	4	3	8.75	3.041	3.414	-0.3722
4	3	5	3	12.00	3.536	3.913	-0.3778
4	3	1	4	93.50	9.695	9.627	0.0682
4	3	2	4	100.00	10.025	9.505	0.5198
4	3	3	4	76.00	8.746	9.060	-0.3132
4	3	4	4	88.25	9.421	9.021	0.3999
4	3	5	4	77.75	8.846	9.521	-0.6747
4	3	1	5	34.50	5.916	5.461	0.4553
4	3	2	5	21.50	4.690	5.339	-0.6484
4	3	3	5	16.25	4.093	4.893	-0.8006
4	3	4	5	31.25	5.635	4.855	0.7802
4	3	5	5	30.50	5.568	5.354	0.2135
4	3	1	6	106.75	10.356	9.875	0.4813
4	3	2	6	106.75	10.356	9.753	0.6033
4	3	3	6	77.00	8.803	9.307	-0.5039
4	3	4	6	93.50	9.695	9.269	0.4268
4	3	5	6	76.25	8.761	9.768	-1.0076
4	3	1	7	5.25	2.398	2.373	0.0247
4	3	2	7	8.00	2.915	2.251	0.6643
4	3	3	7	4.50	2.236	1.806	0.4304
4	3	4	7	1.75	1.500	1.767	-0.2669
4	3	5	7	1.50	1.414	2.267	-0.8525
4	3	1	8	9.67	3.189	3.273	-0.0837
4	3	2	8	4.25	2.179	3.151	-0.9713
4	3	3	8	2.25	1.658	2.705	-1.0469
4	3	4	8	6.00	2.550	2.666	-0.1170
4	3	5	8	28.50	5.385	3.166	2.2189

4	3	1	10	188.75	13.757	12.907	0.8503
4	3	2	10	149.75	12.258	12.785	-0.5268
4	3	3	10	153.50	12.410	12.339	0.0707
4	3	4	10	148.00	12.186	12.300	-0.1142
4	3	5	10	156.25	12.520	12.800	-0.2800
4	3	1	11	16.50	4.123	4.104	0.0190
4	3	2	11	21.75	4.717	3.982	0.7349
4	3	3	11	12.25	3.571	3.537	0.0342
4	3	4	11	7.00	2.739	3.498	-0.7592
4	3	5	11	15.25	3.969	3.998	-0.0290
4	3	1	12	11.00	3.391	4.105	-0.7138
4	3	2	12	12.75	3.640	3.983	-0.3429
4	3	3	12	15.25	3.969	3.537	0.4313
4	3	4	12	7.25	2.784	3.499	-0.7148
4	3	5	12	28.00	5.339	3.998	1.3401

===== fnoat for AREA 3 and YEAR 5 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	6.853	1.713	1.59	0.201
+ CULT	10	497.314	49.731	46.12	<.001
Residual	32	34.504	1.078		

Total	46	538.672	11.710

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

CULT	Prediction	se
1	1.012	1.082
2	1.424	0.464
3	1.732	0.464
4	10.947	0.464
5	3.636	0.464
6	9.316	0.464
7	1.130	1.082
8	3.335	0.464
10	7.421	0.464
11	3.347	0.464
12	3.133	0.464

*** Coefficient of variation and standard error of a single unit ***

%cv	se
21.83	1.038

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.729	*			
3	0.545	0.641	*		
4	0.000	0.000	0.000	*	
5	0.033	0.002	0.007	0.000	*
6	0.000	0.000	0.000	0.018	0.000
7	0.939	0.805	0.613	0.000	0.041
8	0.057	0.007	0.020	0.000	0.650
10	0.000	0.000	0.000	0.000	0.000
11	0.056	0.006	0.020	0.000	0.663
12	0.081	0.014	0.041	0.000	0.449

	1	2	3	4	5

6	*				
7	0.000	*			
8	0.000	0.071	*		
10	0.007	0.000	0.000	*	
11	0.000	0.069	0.984	0.000	*
12	0.000	0.099	0.760	0.000	0.746

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	88	10.54	171
2	101	7.21	37

3	86	10.68	171
4	101	49.48	1862
5	103	57.74	2363
6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511
10	105	66.30	1667
11	105	52.83	1984
12	105	64.98	3436

YEAR	AREA	REP	CULT	fnoat	Tfnoat	FITTED	RESIDUAL
5	3	1	1	0.75	1.118	1.118	0.0000
5	3	2	1	*	*	0.946	*
5	3	3	1	*	*	1.000	*
5	3	4	1	*	*	0.429	*
5	3	5	1	*	*	1.557	*
5	3	1	2	2.50	1.732	1.530	0.2023
5	3	2	2	1.00	1.225	1.358	-0.1331
5	3	3	2	1.50	1.414	1.411	0.0029
5	3	4	2	0.25	0.866	0.840	0.0255
5	3	5	2	3.00	1.871	1.968	-0.0977
5	3	1	3	0.75	1.118	1.839	-0.7205
5	3	2	3	0.50	1.000	1.667	-0.6667
5	3	3	3	4.00	2.121	1.720	0.4012
5	3	4	3	4.00	2.121	1.149	0.9720
5	3	5	3	4.75	2.291	2.277	0.0140
5	3	1	4	111.00	10.559	11.054	-0.4942
5	3	2	4	141.00	11.895	10.882	1.0138
5	3	3	4	108.50	10.440	10.935	-0.4948
5	3	4	4	91.75	9.605	10.364	-0.7596
5	3	5	4	149.00	12.227	11.492	0.7347

5	3	1	5	7.25	2.784	3.742	-0.9578
5	3	2	5	18.75	4.387	3.570	0.8177
5	3	3	5	8.50	3.000	3.623	-0.6232
5	3	4	5	14.50	3.873	3.052	0.8206
5	3	5	5	16.50	4.123	4.180	-0.0573
5	3	1	6	101.00	10.075	9.422	0.6527
5	3	2	6	71.00	8.456	9.250	-0.7943
5	3	3	6	87.25	9.367	9.304	0.0640
5	3	4	6	71.50	8.485	8.733	-0.2475
5	3	5	6	103.25	10.186	9.861	0.3250
5	3	1	7	*	*	1.236	*
5	3	2	7	*	*	1.065	*
5	3	3	7	0.75	1.118	1.118	0.0000
5	3	4	7	*	*	0.547	*
5	3	5	7	*	*	1.675	*
5	3	1	8	10.33	3.291	3.441	-0.1504
5	3	2	8	1.50	1.414	3.269	-1.8552
5	3	3	8	10.00	3.240	3.323	-0.0825
5	3	4	8	8.75	3.041	2.752	0.2893
5	3	5	8	31.75	5.679	3.880	1.7988
5	3	1	10	105.50	10.296	7.527	2.7683
5	3	2	10	61.25	7.858	7.355	0.5027
5	3	3	10	52.25	7.263	7.409	-0.1459
5	3	4	10	27.75	5.315	6.838	-1.5230
5	3	5	10	40.00	6.364	7.966	-1.6021
5	3	1	11	11.00	3.391	3.453	-0.0617
5	3	2	11	17.33	4.223	3.281	0.9416
5	3	3	11	10.00	3.240	3.334	-0.0941
5	3	4	11	3.75	2.062	2.764	-0.7021
5	3	5	11	14.00	3.808	3.892	-0.0837
5	3	1	12	3.50	2.000	3.239	-1.2388
5	3	2	12	10.00	3.240	3.067	0.1735

5	3	3	12	16.25	4.093	3.120	0.9724
5	3	4	12	13.00	3.674	2.550	1.1247
5	3	5	12	6.50	2.646	3.678	-1.0318

===== fnoat for AREA 3 and YEAR 6 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	11.2532	2.8133	5.26	0.003
+ CULT	10	473.3833	47.3383	88.44	<.001
Residual	29	15.5217	0.5352		
Total	43	500.1582	11.6316		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

	Prediction	se
CULT		
1	1.197	0.433

2	1.099	0.370
3	1.016	0.537
4	10.840	0.327
5	4.451	0.327
6	9.194	0.370
7	0.756	0.768
8	3.216	0.327
10	8.071	0.327
11	3.129	0.327
12	4.421	0.327

*** Coefficient of variation and standard error of a single unit ***

%cv	se
14.75	0.7316

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.865	*			
3	0.790	0.901	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.000	*
6	0.000	0.000	0.000	0.002	0.000
7	0.626	0.688	0.787	0.000	0.000
8	0.001	0.000	0.002	0.000	0.012
10	0.000	0.000	0.000	0.000	0.000
11	0.001	0.000	0.002	0.000	0.008

12	0.000	0.000	0.000	0.000	0.948

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.006	*		
10	0.031	0.000	0.000	*	
11	0.000	0.008	0.852	0.000	*
12	0.000	0.000	0.014	0.000	0.009

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	10.54	171
2	101	7.21	37
3	86	10.68	171
4	101	49.48	1862
5	103	57.74	2363
6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511
10	105	66.30	1667
11	105	52.83	1984
12	105	64.98	3436

YEAR AREA REP CULT fnoat Tfnoat FITTED RESIDUAL

6	3	1	1	1.25	1.323	0.800	0.5228
6	3	2	1	0.00	0.707	1.270	-0.5633
6	3	3	1	*	*	1.442	*
6	3	4	1	0.75	1.118	1.078	0.0405
6	3	5	1	*	*	1.364	*
6	3	1	2	*	*	0.702	*
6	3	2	2	1.00	1.225	1.172	0.0529
6	3	3	2	0.25	0.866	1.343	-0.4772
6	3	4	2	2.75	1.803	0.979	0.8237
6	3	5	2	0.25	0.866	1.265	-0.3994
6	3	1	3	0.00	0.707	0.618	0.0887
6	3	2	3	0.50	1.000	1.089	-0.0887
6	3	3	3	*	*	1.260	*
6	3	4	3	*	*	0.896	*
6	3	5	3	*	*	1.182	*
6	3	1	4	119.25	10.943	10.443	0.5003
6	3	2	4	137.50	11.747	10.913	0.8343
6	3	3	4	125.50	11.225	11.084	0.1406
6	3	4	4	111.75	10.595	10.720	-0.1254
6	3	5	4	92.75	9.657	11.007	-1.3499
6	3	1	5	9.50	3.162	4.054	-0.8914
6	3	2	5	17.75	4.272	4.524	-0.2520
6	3	3	5	26.25	5.172	4.695	0.4767
6	3	4	5	16.25	4.093	4.331	-0.2385
6	3	5	5	30.00	5.523	4.618	0.9052
6	3	1	6	*	*	8.797	*
6	3	2	6	103.00	10.173	9.267	0.9062
6	3	3	6	71.75	8.500	9.439	-0.9387
6	3	4	6	91.00	9.566	9.074	0.4911
6	3	5	6	78.75	8.902	9.361	-0.4586
6	3	1	7	*	*	0.358	*
6	3	2	7	*	*	0.829	*

6	3	3	7	0.50	1.000	1.000	0.0000
6	3	4	7	*	*	0.636	*
6	3	5	7	*	*	0.922	*
6	3	1	8	6.00	2.550	2.819	-0.2690
6	3	2	8	3.75	2.062	3.289	-1.2273
6	3	3	8	18.25	4.330	3.460	0.8699
6	3	4	8	6.00	2.550	3.096	-0.5465
6	3	5	8	20.25	4.555	3.382	1.1728
6	3	1	10	66.00	8.155	7.674	0.4811
6	3	2	10	68.00	8.276	8.144	0.1325
6	3	3	10	60.50	7.810	8.315	-0.5051
6	3	4	10	69.50	8.367	7.951	0.4155
6	3	5	10	59.00	7.714	8.238	-0.5239
6	3	1	11	5.50	2.449	2.731	-0.2819
6	3	2	11	12.67	3.629	3.202	0.4273
6	3	3	11	15.50	4.000	3.373	0.6269
6	3	4	11	5.50	2.449	3.009	-0.5594
6	3	5	11	9.00	3.082	3.295	-0.2130
6	3	1	12	14.50	3.873	4.024	-0.1506
6	3	2	12	17.75	4.272	4.494	-0.2219
6	3	3	12	19.50	4.472	4.665	-0.1932
6	3	4	12	15.50	4.000	4.301	-0.3011
6	3	5	12	29.25	5.454	4.587	0.8669

===== fnoat for AREA 3 and YEAR 7 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	16.1142	4.0285	4.47	0.004
+ CULT	10	655.1853	65.5185	72.73	<.001
Residual	40	36.0329	0.9008		
Total	54	707.3325	13.0987		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

	Prediction	se
CULT		
1	2.338	0.424
2	1.254	0.424
3	2.912	0.424
4	7.217	0.424
5	2.635	0.424
6	10.938	0.424
7	2.097	0.424
8	2.262	0.424
10	11.265	0.424
11	2.584	0.424
12	3.614	0.424

*** Coefficient of variation and standard error of a single unit ***

%cv	se
21.26	0.9491

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.078	*			
3	0.345	0.009	*		
4	0.000	0.000	0.000	*	
5	0.624	0.027	0.647	0.000	*
6	0.000	0.000	0.000	0.000	0.000
7	0.690	0.168	0.182	0.000	0.376
8	0.899	0.101	0.285	0.000	0.538
10	0.000	0.000	0.000	0.000	0.000
11	0.684	0.032	0.589	0.000	0.933
12	0.040	0.000	0.249	0.000	0.111

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.785	*		
10	0.589	0.000	0.000	*	
11	0.000	0.422	0.594	0.000	*
12	0.000	0.016	0.030	0.000	0.094

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	88	10.54	171
2	101	7.21	37
3	86	10.68	171
4	101	49.48	1862
5	103	57.74	2363
6	104	54.35	1408
7	71	6.02	48
8	98	45.87	1511
10	105	66.30	1667
11	105	52.83	1984
12	105	64.98	3436

YEAR	AREA	REP	CULT	fnoat	Tfnoat	FITTED	RESIDUAL
7	3	1	1	10.75	3.354	2.957	0.3967
7	3	2	1	9.50	3.162	2.884	0.2787
7	3	3	1	5.50	2.449	2.414	0.0354
7	3	4	1	1.75	1.500	1.653	-0.1527
7	3	5	1	1.00	1.225	1.783	-0.5581
7	3	1	2	1.00	1.225	1.873	-0.6485
7	3	2	2	2.50	1.732	1.799	-0.0674
7	3	3	2	0.25	0.866	1.330	-0.4640
7	3	4	2	2.00	1.581	0.569	1.0126
7	3	5	2	0.25	0.866	0.699	0.1673
7	3	1	3	4.00	2.121	3.531	-1.4095
7	3	2	3	22.25	4.770	3.457	1.3127

7	3	3	3	1.00	1.225	2.988	-1.7628
7	3	4	3	10.00	3.240	2.226	1.0143
7	3	5	3	9.75	3.202	2.356	0.8453
7	3	1	4	49.50	7.071	7.836	-0.7652
7	3	2	4	69.00	8.337	7.762	0.5743
7	3	3	4	61.25	7.858	7.293	0.5651
7	3	4	4	35.50	6.000	6.532	-0.5316
7	3	5	4	46.00	6.819	6.662	0.1574
7	3	1	5	8.25	2.958	3.254	-0.2959
7	3	2	5	4.75	2.291	3.180	-0.8888
7	3	3	5	14.00	3.808	2.711	1.0973
7	3	4	5	4.25	2.179	1.949	0.2302
7	3	5	5	3.25	1.936	2.079	-0.1429
7	3	1	6	190.75	13.829	11.557	2.2719
7	3	2	6	122.75	11.102	11.484	-0.3817
7	3	3	6	101.25	10.087	11.014	-0.9270
7	3	4	6	95.50	9.798	10.253	-0.4547
7	3	5	6	97.00	9.874	10.383	-0.5086
7	3	1	7	9.50	3.162	2.716	0.4460
7	3	2	7	2.50	1.732	2.642	-0.9104
7	3	3	7	11.75	3.500	2.173	1.3270
7	3	4	7	1.00	1.225	1.412	-0.1868
7	3	5	7	0.25	0.866	1.542	-0.6757
7	3	1	8	6.33	2.613	2.881	-0.2674
7	3	2	8	6.25	2.598	2.807	-0.2089
7	3	3	8	2.00	1.581	2.338	-0.7564
7	3	4	8	1.33	1.353	1.576	-0.2233
7	3	5	8	9.50	3.162	1.706	1.4560
7	3	1	10	171.75	13.124	11.884	1.2400
7	3	2	10	157.25	12.560	11.811	0.7493
7	3	3	10	138.00	11.769	11.341	0.4275
7	3	4	10	94.00	9.721	10.580	-0.8586

7	3	5	10	83.25	9.152	10.710	-1.5583
7	3	1	11	5.75	2.500	3.204	-0.7037
7	3	2	11	6.67	2.678	3.130	-0.4521
7	3	3	11	14.00	3.808	2.660	1.1475
7	3	4	11	3.25	1.936	1.899	0.0375
7	3	5	11	3.50	2.000	2.029	-0.0291
7	3	1	12	15.25	3.969	4.233	-0.2644
7	3	2	12	16.75	4.153	4.159	-0.0058
7	3	3	12	8.50	3.000	3.690	-0.6897
7	3	4	12	8.75	3.041	2.928	0.1131
7	3	5	12	14.75	3.905	3.058	0.8467

10

Appendix 3.7.5 ANOVA for fruit yield of individual cultivars over production years and areas

JPfyieldAOV.out

file is JPfyieldAOV.gen

========== CACTUS PEAR ENVIRONMENTAL ADAPTIBILITY: FRUIT YIELD

counts transformed to stabilise treatment variances Y = sqrt(X+0.5)

===== fyield for AREA 1 and YEAR 1 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	6.446	1.612	0.68	0.607
+ CULT	10	328.535	32.854	13.96	<.001
Residual	40	94.153	2.354		
Total	54	429.134	7.947		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as

summaries of the data rather than as forecasts of new observations.

Response variate: fyield

	Prediction	se
CULT		

*** Coefficient of variation and standard error of a single unit ***

%cv	se
64.21	1.534

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.929	*			
3	0.886	0.955	*		
4	0.567	0.509	0.475	*	
5	0.000	0.000	0.000	0.000	*
6	0.033	0.027	0.023	0.110	0.000
7	0.895	0.965	0.987	0.482	0.000
8	0.009	0.007	0.006	0.035	0.000
10	0.114	0.096	0.086	0.306	0.000
11	0.000	0.000	0.000	0.000	0.212
12	0.000	0.000	0.000	0.000	0.500

	1	2	3	4	5

6	*				
7	0.024	*			
8	0.592	0.006	*		
10	0.552	0.089	0.261	*	
11	0.002	0.000	0.010	0.000	*
12	0.000	0.000	0.002	0.000	0.560

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	5	0.186	0.021
2	5	0.100	0.006
3	5	0.046	0.002
4	5	0.746	0.088
5	5	6.698	13.623
6	5	2.334	0.527
7	5	0.058	0.004
8	5	2.858	1.296
10	5	1.752	1.612
11	5	5.468	3.810
12	5	6.038	4.160

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
1	1	1	1	0.100	0.100	0.521	-0.4211
1	1	2	1	0.110	0.110	0.210	-0.1002

1	1	3	1	0.440	0.440	0.585	-0.1447
1	1	4	1	0.180	0.180	-0.309	0.4889
1	1	5	1	0.100	0.100	-0.077	0.1771
1	1	1	2	0.160	0.160	0.435	-0.2751
1	1	2	2	0.040	0.040	0.124	-0.0842
1	1	3	2	0.000	0.000	0.499	-0.4987
1	1	4	2	0.170	0.170	-0.395	0.5649
1	1	5	2	0.130	0.130	-0.163	0.2931
1	1	1	3	0.100	0.100	0.381	-0.2811
1	1	2	3	0.090	0.090	0.070	0.0198
1	1	3	3	0.000	0.000	0.445	-0.4447
1	1	4	3	0.020	0.020	-0.449	0.4689
1	1	5	3	0.020	0.020	-0.217	0.2371
1	1	1	4	0.650	0.650	1.081	-0.4311
1	1	2	4	1.050	1.050	0.770	0.2798
1	1	3	4	0.790	0.790	1.145	-0.3547
1	1	4	4	0.290	0.290	0.251	0.0389
1	1	5	4	0.950	0.950	0.483	0.4671
1	1	1	5	13.170	13.170	7.033	6.1369 ?
1	1	2	5	6.220	6.220	6.722	-0.5022
1	1	3	5	4.650	4.650	7.097	-2.4467
1	1	4	5	5.170	5.170	6.203	-1.0331
1	1	5	5	4.280	4.280	6.435	-2.1549
1	1	1	6	3.520	3.520	2.669	0.8509
1	1	2	6	2.480	2.480	2.358	0.1218
1	1	3	6	1.990	1.990	2.733	-0.7427
1	1	4	6	1.650	1.650	1.839	-0.1891
1	1	5	6	2.030	2.030	2.071	-0.0409
1	1	1	7	0.080	0.080	0.393	-0.3131
1	1	2	7	0.060	0.060	0.082	-0.0222
1	1	3	7	0.000	0.000	0.457	-0.4567
1	1	4	7	0.150	0.150	-0.437	0.5869

1	1	5	7	0.000	0.000	-0.205	0.2051
1	1	1	8	1.600	1.600	3.193	-1.5931
1	1	2	8	3.010	3.010	2.882	0.1278
1	1	3	8	3.480	3.480	3.257	0.2233
1	1	4	8	4.340	4.340	2.363	1.9769
1	1	5	8	1.860	1.860	2.595	-0.7349
1	1	1	10	0.490	0.490	2.087	-1.5971
1	1	2	10	3.200	3.200	1.776	1.4238
1	1	3	10	2.980	2.980	2.151	0.8293
1	1	4	10	1.400	1.400	1.257	0.1429
1	1	5	10	0.690	0.690	1.489	-0.7989
1	1	1	11	5.010	5.010	5.803	-0.7931
1	1	2	11	6.100	6.100	5.492	0.6078
1	1	3	11	8.350	8.350	5.867	2.4833
1	1	4	11	3.030	3.030	4.973	-1.9431
1	1	5	11	4.850	4.850	5.205	-0.3549
1	1	1	12	5.090	5.090	6.373	-1.2831
1	1	2	12	4.190	4.190	6.062	-1.8722
1	1	3	12	7.990	7.990	6.437	1.5533
1	1	4	12	4.440	4.440	5.543	-1.1031
1	1	5	12	8.480	8.480	5.775	2.7051

===== fyield for AREA 1 and YEAR 2 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	16.203	4.051	0.70	0.599
+ CULT	10	235.786	23.579	4.05	<.001
Residual	40	232.885	5.822		
Total	54	484.874	8.979		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

	Prediction	se
CULT		
1	0.03	1.08
2	0.23	1.08
3	0.00	1.08
4	0.28	1.08
5	5.47	1.08
6	1.13	1.08
7	0.03	1.08
8	4.08	1.08
10	2.85	1.08
11	3.66	1.08
12	4.96	1.08

*** Coefficient of variation and standard error of a single unit ***

%cv	se
116.77	2.413

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.896	*			
3	0.983	0.882	*		
4	0.867	0.970	0.853	*	
5	0.001	0.001	0.001	0.002	*
6	0.473	0.556	0.462	0.581	0.007
7	0.991	0.899	0.981	0.870	0.001
8	0.011	0.016	0.011	0.017	0.367
10	0.072	0.093	0.069	0.100	0.094
11	0.022	0.030	0.021	0.033	0.243
12	0.002	0.004	0.002	0.004	0.741

	1	2	3	4	5
6	*				
7	0.475	*			
8	0.061	0.011	*		
10	0.267	0.072	0.426	*	
11	0.105	0.022	0.786	0.598	*
12	0.016	0.002	0.566	0.174	0.399

6 7 8 10 11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	5	0.028	0.001
2	5	0.228	0.076
3	5	0.000	0.000
4	5	0.284	0.204
5	5	5.470	14.340
6	5	1.134	0.675
7	5	0.034	0.002
8	5	4.078	2.641
10	5	2.850	1.630
11	5	3.662	1.849
12	5	4.962	40.855

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
2	1	1	1	0.010	0.010	0.034	-0.024
2	1	2	1	0.080	0.080	-0.529	0.609
2	1	3	1	0.020	0.020	-0.369	0.389
2	1	4	1	0.010	0.010	-0.025	0.035
2	1	5	1	0.020	0.020	1.029	-1.009
2	1	1	2	0.130	0.130	0.234	-0.104
2	1	2	2	0.090	0.090	-0.329	0.419
2	1	3	2	0.180	0.180	-0.169	0.349

2	1	4	2	0.030	0.030	0.175	-0.145
2	1	5	2	0.710	0.710	1.229	-0.519
2	1	1	3	0.000	0.000	0.006	-0.006
2	1	2	3	0.000	0.000	-0.557	0.557
2	1	3	3	0.000	0.000	-0.397	0.397
2	1	4	3	0.000	0.000	-0.053	0.053
2	1	5	3	0.000	0.000	1.001	-1.001
2	1	1	4	0.100	0.100	0.290	-0.190
2	1	2	4	0.250	0.250	-0.273	0.523
2	1	3	4	1.070	1.070	-0.113	1.183
2	1	4	4	0.000	0.000	0.231	-0.231
2	1	5	4	0.000	0.000	1.285	-1.285
2	1	1	5	9.910	9.910	5.476	4.434 ?
2	1	2	5	3.590	3.590	4.913	-1.323
2	1	3	5	2.350	2.350	5.073	-2.723
2	1	4	5	9.230	9.230	5.417	3.813
2	1	5	5	2.270	2.270	6.471	-4.201 ?
2	1	1	6	0.510	0.510	1.140	-0.630
2	1	2	6	0.580	0.580	0.577	0.003
2	1	3	6	0.590	0.590	0.737	-0.147
2	1	4	6	2.330	2.330	1.081	1.249
2	1	5	6	1.660	1.660	2.135	-0.475
2	1	1	7	0.040	0.040	0.040	0.000
2	1	2	7	0.000	0.000	-0.523	0.523
2	1	3	7	0.000	0.000	-0.363	0.363
2	1	4	7	0.020	0.020	-0.019	0.039
2	1	5	7	0.110	0.110	1.035	-0.925
2	1	1	8	5.340	5.340	4.084	1.256
2	1	2	8	3.220	3.220	3.521	-0.301
2	1	3	8	2.030	2.030	3.681	-1.651
2	1	4	8	3.740	3.740	4.025	-0.285
2	1	5	8	6.060	6.060	5.079	0.981

2	1	1	10	3.020	3.020	2.856	0.164
2	1	2	10	3.620	3.620	2.293	1.327
2	1	3	10	1.970	1.970	2.453	-0.483
2	1	4	10	1.220	1.220	2.797	-1.577
2	1	5	10	4.420	4.420	3.851	0.569
2	1	1	11	2.510	2.510	3.668	-1.158
2	1	2	11	3.740	3.740	3.105	0.635
2	1	3	11	5.710	5.710	3.265	2.445
2	1	4	11	4.010	4.010	3.609	0.401
2	1	5	11	2.340	2.340	4.663	-2.323
2	1	1	12	1.230	1.230	4.968	-3.738
2	1	2	12	1.430	1.430	4.405	-2.975
2	1	3	12	4.440	4.440	4.565	-0.125
2	1	4	12	1.560	1.560	4.909	-3.349
2	1	5	12	16.150	16.150	5.963	10.187 ?

===== fyield for AREA 1 and YEAR 3 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	17.263	4.316	1.41	0.249
+ CULT	10	1036.066	103.607	33.78	<.001
Residual	40	122.694	3.067		

Total	54	1176.023	21.778

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

CULT	Prediction	se
1	0.526	0.783
2	1.556	0.783
3	0.122	0.783
4	1.254	0.783
5	10.976	0.783
6	4.038	0.783
7	0.204	0.783
8	8.354	0.783
10	8.028	0.783
11	9.856	0.783
12	10.824	0.783

*** Coefficient of variation and standard error of a single unit ***

%cv	se
34.56	1.751

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.358	*			
3	0.717	0.203	*		
4	0.515	0.786	0.313	*	
5	0.000	0.000	0.000	0.000	*
6	0.003	0.031	0.001	0.016	0.000
7	0.773	0.229	0.941	0.349	0.000
8	0.000	0.000	0.000	0.000	0.023
10	0.000	0.000	0.000	0.000	0.011
11	0.000	0.000	0.000	0.000	0.318
12	0.000	0.000	0.000	0.000	0.891

	1	2	3	4	5

6	*				
7	0.001	*			
8	0.000	0.000	*		
10	0.001	0.000	0.770	*	
11	0.000	0.000	0.183	0.107	*
12	0.000	0.000	0.031	0.016	0.387

	6	7	8	10	11

12	*

	12

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	5	0.526	0.091
2	5	1.556	0.190
3	5	0.122	0.017
4	5	1.254	0.149
5	5	10.976	10.602
6	5	4.038	0.459
7	5	0.204	0.107
8	5	8.354	8.743
10	5	8.028	2.295
11	5	9.856	7.815
12	5	10.824	4.521

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
3	1	1	1	0.190	0.190	0.160	0.030
3	1	2	1	0.430	0.430	-0.389	0.819
3	1	3	1	1.010	1.010	0.963	0.047
3	1	4	1	0.560	0.560	1.106	-0.546
3	1	5	1	0.440	0.440	0.790	-0.350
3	1	1	2	1.800	1.800	1.190	0.610
3	1	2	2	1.260	1.260	0.641	0.619
3	1	3	2	1.120	1.120	1.993	-0.873
3	1	4	2	1.410	1.410	2.136	-0.726
3	1	5	2	2.190	2.190	1.820	0.370

3	1	1	3	0.000	0.000	-0.244	0.244
3	1	2	3	0.070	0.070	-0.793	0.863
3	1	3	3	0.240	0.240	0.559	-0.319
3	1	4	3	0.280	0.280	0.702	-0.422
3	1	5	3	0.020	0.020	0.386	-0.366
3	1	1	4	1.700	1.700	0.888	0.812
3	1	2	4	0.660	0.660	0.339	0.321
3	1	3	4	1.240	1.240	1.691	-0.451
3	1	4	4	1.210	1.210	1.834	-0.624
3	1	5	4	1.460	1.460	1.518	-0.058
3	1	1	5	14.520	14.520	10.610	3.910
3	1	2	5	9.070	9.070	10.061	-0.991
3	1	3	5	11.230	11.230	11.413	-0.183
3	1	4	5	13.520	13.520	11.556	1.964
3	1	5	5	6.540	6.540	11.240	-4.700
3	1	1	6	4.220	4.220	3.672	0.548
3	1	2	6	4.510	4.510	3.123	1.387
3	1	3	6	4.020	4.020	4.475	-0.455
3	1	4	6	2.890	2.890	4.618	-1.728
3	1	5	6	4.550	4.550	4.302	0.248
3	1	1	7	0.070	0.070	-0.162	0.232
3	1	2	7	0.150	0.150	-0.711	0.861
3	1	3	7	0.020	0.020	0.641	-0.621
3	1	4	7	0.000	0.000	0.784	-0.784
3	1	5	7	0.780	0.780	0.468	0.312
3	1	1	8	4.040	4.040	7.988	-3.948
3	1	2	8	7.420	7.420	7.439	-0.019
3	1	3	8	9.720	9.720	8.791	0.929
3	1	4	8	12.040	12.040	8.934	3.106
3	1	5	8	8.550	8.550	8.618	-0.068
3	1	1	10	6.810	6.810	7.662	-0.852
3	1	2	10	7.230	7.230	7.113	0.117

3	1	3	10	6.850	6.850	8.465	-1.615
3	1	4	10	9.090	9.090	8.608	0.482
3	1	5	10	10.160	10.160	8.292	1.868
3	1	1	11	7.750	7.750	9.490	-1.740
3	1	2	11	6.260	6.260	8.941	-2.681
3	1	3	11	12.770	12.770	10.293	2.477
3	1	4	11	12.120	12.120	10.436	1.684
3	1	5	11	10.380	10.380	10.120	0.260
3	1	1	12	10.610	10.610	10.458	0.152
3	1	2	12	8.610	8.610	9.909	-1.299
3	1	3	12	12.330	12.330	11.261	1.069
3	1	4	12	9.000	9.000	11.404	-2.404
3	1	5	12	13.570	13.570	11.088	2.482

===== fyield for AREA 1 and YEAR 4 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	59.787	14.947	2.49	0.058
+ CULT	10	1348.604	134.860	22.46	<.001
Residual	40	240.143	6.004		
Total	54	1648.534	30.528		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

CULT	Prediction	se
1	0.48	1.10
2	1.95	1.10
3	1.61	1.10
4	5.95	1.10
5	14.36	1.10
6	6.22	1.10
7	0.01	1.10
8	9.25	1.10
10	11.42	1.10
11	11.56	1.10
12	11.80	1.10

*** Coefficient of variation and standard error of a single unit ***

%cv	se
36.12	2.450

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.347	*			
3	0.468	0.828	*		
4	0.001	0.014	0.008	*	
5	0.000	0.000	0.000	0.000	*
6	0.001	0.009	0.005	0.864	0.000
7	0.765	0.218	0.307	0.000	0.000
8	0.000	0.000	0.000	0.040	0.002
10	0.000	0.000	0.000	0.001	0.065
11	0.000	0.000	0.000	0.001	0.078
12	0.000	0.000	0.000	0.001	0.107

	1	2	3	4	5

6	*				
7	0.000	*			
8	0.057	0.000	*		
10	0.002	0.000	0.168	*	
11	0.001	0.000	0.144	0.930	*
12	0.001	0.000	0.107	0.806	0.874

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	5	0.478	0.091
2	5	1.952	0.882
3	5	1.614	0.397
4	5	5.950	4.911
5	5	14.362	39.216
6	5	6.216	14.257
7	5	0.012	0.001
8	5	9.248	4.581
10	5	11.422	0.244
11	5	11.558	1.383
12	5	11.804	9.021

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
4	1	1	1	0.320	0.320	0.083	0.237
4	1	2	1	0.460	0.460	-0.992	1.452
4	1	3	1	0.990	0.990	0.043	0.947
4	1	4	1	0.410	0.410	2.006	-1.596
4	1	5	1	0.210	0.210	1.250	-1.040
4	1	1	2	1.220	1.220	1.557	-0.337
4	1	2	2	2.500	2.500	0.482	2.018
4	1	3	2	1.320	1.320	1.517	-0.197
4	1	4	2	1.370	1.370	3.480	-2.110
4	1	5	2	3.350	3.350	2.724	0.626
4	1	1	3	1.270	1.270	1.219	0.051
4	1	2	3	0.750	0.750	0.144	0.606
4	1	3	3	1.640	1.640	1.179	0.461
4	1	4	3	2.100	2.100	3.142	-1.042
4	1	5	3	2.310	2.310	2.386	-0.076
4	1	1	4	5.110	5.110	5.555	-0.445

4	1	2	4	3.860	3.860	4.480	-0.620
4	1	3	4	6.530	6.530	5.515	1.015
4	1	4	4	4.730	4.730	7.478	-2.748
4	1	5	4	9.520	9.520	6.722	2.798
4	1	1	5	13.890	13.890	13.967	-0.077
4	1	2	5	10.760	10.760	12.892	-2.132
4	1	3	5	10.320	10.320	13.927	-3.607
4	1	4	5	25.290	25.290	15.890	9.400 ?
4	1	5	5	11.550	11.550	15.134	-3.584
4	1	1	6	2.160	2.160	5.821	-3.661
4	1	2	6	3.340	3.340	4.746	-1.406
4	1	3	6	7.460	7.460	5.781	1.679
4	1	4	6	11.760	11.760	7.744	4.016
4	1	5	6	6.360	6.360	6.988	-0.628
4	1	1	7	0.000	0.000	-0.383	0.383
4	1	2	7	0.000	0.000	-1.458	1.458
4	1	3	7	0.000	0.000	-0.423	0.423
4	1	4	7	0.060	0.060	1.540	-1.480
4	1	5	7	0.000	0.000	0.784	-0.784
4	1	1	8	10.560	10.560	8.853	1.707
4	1	2	8	6.040	6.040	7.778	-1.738
4	1	3	8	8.060	8.060	8.813	-0.753
4	1	4	8	11.060	11.060	10.776	0.284
4	1	5	8	10.520	10.520	10.020	0.500
4	1	1	10	11.770	11.770	11.027	0.743
4	1	2	10	11.590	11.590	9.952	1.638
4	1	3	10	10.560	10.560	10.987	-0.427
4	1	4	10	11.700	11.700	12.950	-1.250
4	1	5	10	11.490	11.490	12.194	-0.704
4	1	1	11	12.810	12.810	11.163	1.647
4	1	2	11	10.350	10.350	10.088	0.262
4	1	3	11	12.810	12.810	11.123	1.687

4	1	4	11	10.690	10.690	13.086	-2.396
4	1	5	11	11.130	11.130	12.330	-1.200
4	1	1	12	11.160	11.160	11.409	-0.249
4	1	2	12	8.800	8.800	10.334	-1.534
4	1	3	12	10.140	10.140	11.369	-1.229
4	1	4	12	12.250	12.250	13.332	-1.082
4	1	5	12	16.670	16.670	12.576	4.094 ?

===== fyield for AREA 1 and YEAR 5 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	15.373	3.843	0.81	0.529
+ CULT	10	1727.104	172.710	36.21	<.001
Residual	40	190.800	4.770		
Total	54	1933.277	35.801		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as

summaries of the data rather than as forecasts of new observations.

Response variate: fyield

	Prediction	se
CULT		
1	0.216	0.977
2	0.762	0.977
3	0.102	0.977
4	7.564	0.977
5	12.562	0.977
6	5.030	0.977
7	0.024	0.977
8	8.704	0.977
10	4.542	0.977
11	14.300	0.977
12	15.500	0.977

*** Coefficient of variation and standard error of a single unit ***

%cv	se
34.66	2.184

***** Pairwise differences *****

t probabilities of pairwise differences

1	*	
2	0.695	*

3	0.934	0.635	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.001	*
6	0.001	0.004	0.001	0.074	0.000
7	0.890	0.596	0.955	0.000	0.000
8	0.000	0.000	0.000	0.414	0.008
10	0.003	0.009	0.003	0.035	0.000
11	0.000	0.000	0.000	0.000	0.216
12	0.000	0.000	0.000	0.000	0.040

	1	2	3	4	5
6	*				
7	0.001	*			
8	0.011	0.000	*		
10	0.726	0.002	0.004	*	
11	0.000	0.000	0.000	0.000	*
12	0.000	0.000	0.000	0.000	0.390

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	5	0.216	0.032
2	5	0.762	0.099
3	5	0.102	0.021
4	5	7.564	4.673

5	5	12.562	6.171
6	5	5.030	2.926
7	5	0.024	0.001
8	5	8.704	4.114
10	5	4.542	1.778
11	5	14.300	7.504
12	5	15.500	24.223

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
5	1	1	1	0.040	0.040	0.907	-0.867
5	1	2	1	0.350	0.350	-0.545	0.895
5	1	3	1	0.430	0.430	0.460	-0.030
5	1	4	1	0.030	0.030	-0.236	0.266
5	1	5	1	0.230	0.230	0.494	-0.264
5	1	1	2	0.440	0.440	1.453	-1.013
5	1	2	2	0.900	0.900	0.001	0.899
5	1	3	2	0.870	0.870	1.006	-0.136
5	1	4	2	0.440	0.440	0.310	0.130
5	1	5	2	1.160	1.160	1.040	0.120
5	1	1	3	0.000	0.000	0.793	-0.793
5	1	2	3	0.000	0.000	-0.659	0.659
5	1	3	3	0.210	0.210	0.346	-0.136
5	1	4	3	0.000	0.000	-0.350	0.350
5	1	5	3	0.300	0.300	0.380	-0.080
5	1	1	4	10.710	10.710	8.255	2.455
5	1	2	4	6.870	6.870	6.803	0.067
5	1	3	4	8.300	8.300	7.808	0.492
5	1	4	4	4.810	4.810	7.112	-2.302
5	1	5	4	7.130	7.130	7.842	-0.712
5	1	1	5	14.740	14.740	13.253	1.487
5	1	2	5	13.400	13.400	11.801	1.599

5	1	3	5	12.180	12.180	12.806	-0.626
5	1	4	5	14.040	14.040	12.110	1.930
5	1	5	5	8.450	8.450	12.840	-4.390
5	1	1	6	4.920	4.920	5.721	-0.801
5	1	2	6	5.190	5.190	4.269	0.921
5	1	3	6	4.540	4.540	5.274	-0.734
5	1	4	6	7.630	7.630	4.578	3.052
5	1	5	6	2.870	2.870	5.308	-2.438
5	1	1	7	0.000	0.000	0.715	-0.715
5	1	2	7	0.000	0.000	-0.737	0.737
5	1	3	7	0.040	0.040	0.268	-0.228
5	1	4	7	0.000	0.000	-0.428	0.428
5	1	5	7	0.080	0.080	0.302	-0.222
5	1	1	8	7.720	7.720	9.395	-1.675
5	1	2	8	6.990	6.990	7.943	-0.953
5	1	3	8	7.220	7.220	8.948	-1.728
5	1	4	8	9.900	9.900	8.252	1.648
5	1	5	8	11.690	11.690	8.982	2.708
5	1	1	10	3.570	3.570	5.233	-1.663
5	1	2	10	6.430	6.430	3.781	2.649
5	1	3	10	5.450	5.450	4.786	0.664
5	1	4	10	3.870	3.870	4.090	-0.220
5	1	5	10	3.390	3.390	4.820	-1.430
5	1	1	11	15.520	15.520	14.991	0.529
5	1	2	11	11.240	11.240	13.539	-2.299
5	1	3	11	17.500	17.500	14.544	2.956
5	1	4	11	11.620	11.620	13.848	-2.228
5	1	5	11	15.620	15.620	14.578	1.042
5	1	1	12	19.250	19.250	16.191	3.059
5	1	2	12	9.570	9.570	14.739	-5.169 ?
5	1	3	12	15.250	15.250	15.744	-0.494
5	1	4	12	11.990	11.990	15.048	-3.058

5 1 5 12 21.440 21.440 15.778 5.662 ?

===== fyield for AREA 1 and YEAR 6 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	14.523	3.631	1.29	0.291
+ CULT	10	1041.321	104.132	36.95	<.001
Residual	40	112.714	2.818		
Total	54	1168.558	21.640		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

	Prediction	se
CULT		
1	0.632	0.751

2	1.710	0.751
3	0.274	0.751
4	6.060	0.751
5	8.552	0.751
6	3.078	0.751
7	0.098	0.751
8	7.908	0.751
10	6.794	0.751
11	12.882	0.751
12	11.528	0.751

*** Coefficient of variation and standard error of a single unit ***

%cv	se
31.03	1.679

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.316	*			
3	0.738	0.184	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.024	*
6	0.027	0.205	0.012	0.008	0.000
7	0.618	0.137	0.869	0.000	0.000
8	0.000	0.000	0.000	0.089	0.547

10	0.000	0.000	0.000	0.493	0.106
11	0.000	0.000	0.000	0.000	0.000
12	0.000	0.000	0.000	0.000	0.008

	1	2	3	4	5
6	*				
7	0.008	*			
8	0.000	0.000	*		
10	0.001	0.000	0.300	*	
11	0.000	0.000	0.000	0.000	*
12	0.000	0.000	0.001	0.000	0.210

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	5	0.632	0.279
2	5	1.710	0.494
3	5	0.274	0.021
4	5	6.060	5.601
5	5	8.552	1.559
6	5	3.078	1.664
7	5	0.098	0.008
8	5	7.908	2.718
10	5	6.794	1.158
11	5	12.882	0.380

12 5 11.528 17.926

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
6	1	1	1	0.430	0.430	0.910	-0.4796
6	1	2	1	1.280	1.280	0.508	0.7722
6	1	3	1	0.180	0.180	0.795	-0.6151
6	1	4	1	0.160	0.160	-0.285	0.4449
6	1	5	1	1.110	1.110	1.232	-0.1224
6	1	1	2	0.880	0.880	1.988	-1.1076
6	1	2	2	2.310	2.310	1.586	0.7242
6	1	3	2	1.070	1.070	1.873	-0.8031
6	1	4	2	1.880	1.880	0.793	1.0869
6	1	5	2	2.410	2.410	2.310	0.0996
6	1	1	3	0.400	0.400	0.552	-0.1516
6	1	2	3	0.220	0.220	0.150	0.0702
6	1	3	3	0.450	0.450	0.437	0.0129
6	1	4	3	0.110	0.110	-0.643	0.7529
6	1	5	3	0.190	0.190	0.874	-0.6844
6	1	1	4	5.950	5.950	6.338	-0.3876
6	1	2	4	4.070	4.070	5.936	-1.8658
6	1	3	4	8.970	8.970	6.223	2.7469
6	1	4	4	3.460	3.460	5.143	-1.6831
6	1	5	4	7.850	7.850	6.660	1.1896
6	1	1	5	10.650	10.650	8.830	1.8204
6	1	2	5	8.730	8.730	8.428	0.3022
6	1	3	5	7.660	7.660	8.715	-1.0551
6	1	4	5	7.700	7.700	7.635	0.0649
6	1	5	5	8.020	8.020	9.152	-1.1324
6	1	1	6	4.870	4.870	3.356	1.5144
6	1	2	6	2.360	2.360	2.954	-0.5938
6	1	3	6	2.140	2.140	3.241	-1.1011

6	1	4	6	4.020	4.020	2.161	1.8589
6	1	5	6	2.000	2.000	3.678	-1.6784
6	1	1	7	0.000	0.000	0.376	-0.3756
6	1	2	7	0.220	0.220	-0.026	0.2462
6	1	3	7	0.030	0.030	0.261	-0.2311
6	1	4	7	0.120	0.120	-0.819	0.9389
6	1	5	7	0.120	0.120	0.698	-0.5784
6	1	1	8	8.720	8.720	8.186	0.5344
6	1	2	8	9.640	9.640	7.784	1.8562
6	1	3	8	8.870	8.870	8.071	0.7989
6	1	4	8	5.890	5.890	6.991	-1.1011
6	1	5	8	6.420	6.420	8.508	-2.0884
6	1	1	10	6.660	6.660	7.072	-0.4116
6	1	2	10	7.470	7.470	6.670	0.8002
6	1	3	10	8.230	8.230	6.957	1.2729
6	1	4	10	6.070	6.070	5.877	0.1929
6	1	5	10	5.540	5.540	7.394	-1.8544
6	1	1	11	12.510	12.510	13.160	-0.6496
6	1	2	11	12.930	12.930	12.758	0.1722
6	1	3	11	12.990	12.990	13.045	-0.0551
6	1	4	11	12.170	12.170	11.965	0.2049
6	1	5	11	13.810	13.810	13.482	0.3276
6	1	1	12	11.500	11.500	11.806	-0.3056
6	1	2	12	8.920	8.920	11.404	-2.4838
6	1	3	12	10.720	10.720	11.691	-0.9711
6	1	4	12	7.850	7.850	10.611	-2.7611
6	1	5	12	18.650	18.650	12.128	6.5216 ?

===== fyield for AREA 1 and YEAR 7 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	6.268	1.567	1.30	0.285
+ CULT	10	202.336	20.234	16.83	<.001
Residual	40	48.097	1.202		
Total	54	256.702	4.754		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

	Prediction	se
CULT		
1	0.588	0.490
2	0.932	0.490
3	0.186	0.490
4	2.938	0.490
5	4.682	0.490
6	1.190	0.490
7	0.212	0.490

8	3.352 0.490
10	3.950 0.490
11	4.974 0.490
12	5.366 0.490

*** Coefficient of variation and standard error of a single unit ***

%cv	se
42.52	1.097

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.623	*			
3	0.565	0.288	*		
4	0.002	0.006	0.000	*	
5	0.000	0.000	0.000	0.016	*
6	0.391	0.712	0.155	0.016	0.000
7	0.591	0.305	0.969	0.000	0.000
8	0.000	0.001	0.000	0.554	0.062
10	0.000	0.000	0.000	0.152	0.298
11	0.000	0.000	0.000	0.005	0.676
12	0.000	0.000	0.000	0.001	0.330

1	2	3	4	5

6	*				
7	0.166	*			
8	0.003	0.000	*		
10	0.000	0.000	0.394	*	
11	0.000	0.000	0.024	0.148	*
12	0.000	0.000	0.006	0.048	0.575

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	5	0.588	0.156
2	5	0.932	0.116
3	5	0.186	0.014
4	5	2.938	5.663
5	5	4.682	0.723
6	5	1.190	0.123
7	5	0.212	0.030
8	5	3.352	2.083
10	5	3.950	1.708
11	5	4.974	0.565
12	5	5.366	2.410

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
7	1	1	1	0.200	0.200	0.761	-0.5607
7	1	2	1	0.950	0.950	1.116	-0.1662

7	1	3	1	0.920	0.920	0.283	0.6365
7	1	4	1	0.130	0.130	0.178	-0.0480
7	1	5	1	0.740	0.740	0.602	0.1384
7	1	1	2	0.690	0.690	1.105	-0.4147
7	1	2	2	1.200	1.200	1.460	-0.2602
7	1	3	2	1.300	1.300	0.627	0.6725
7	1	4	2	0.980	0.980	0.522	0.4580
7	1	5	2	0.490	0.490	0.946	-0.4556
7	1	1	3	0.110	0.110	0.359	-0.2487
7	1	2	3	0.220	0.220	0.714	-0.4942
7	1	3	3	0.370	0.370	-0.119	0.4885
7	1	4	3	0.060	0.060	-0.224	0.2840
7	1	5	3	0.170	0.170	0.200	-0.0296
7	1	1	4	3.840	3.840	3.111	0.7293
7	1	2	4	6.320	6.320	3.466	2.8538
7	1	3	4	0.900	0.900	2.633	-1.7335
7	1	4	4	0.450	0.450	2.528	-2.0780
7	1	5	4	3.180	3.180	2.952	0.2284
7	1	1	5	4.780	4.780	4.855	-0.0747
7	1	2	5	5.490	5.490	5.210	0.2798
7	1	3	5	5.470	5.470	4.377	1.0925
7	1	4	5	3.540	3.540	4.272	-0.7320
7	1	5	5	4.130	4.130	4.696	-0.5656
7	1	1	6	1.260	1.260	1.363	-0.1027
7	1	2	6	1.050	1.050	1.718	-0.6682
7	1	3	6	0.850	0.850	0.885	-0.0355
7	1	4	6	1.030	1.030	0.780	0.2500
7	1	5	6	1.760	1.760	1.204	0.5564
7	1	1	7	0.090	0.090	0.385	-0.2947
7	1	2	7	0.190	0.190	0.740	-0.5502
7	1	3	7	0.170	0.170	-0.093	0.2625
7	1	4	7	0.100	0.100	-0.198	0.2980

7	1	5	7	0.510	0.510	0.226	0.2844
7	1	1	8	1.640	1.640	3.525	-1.8847
7	1	2	8	3.890	3.890	3.880	0.0098
7	1	3	8	2.580	2.580	3.047	-0.4675
7	1	4	8	5.470	5.470	2.942	2.5280
7	1	5	8	3.180	3.180	3.366	-0.1856
7	1	1	10	6.200	6.200	4.123	2.0773
7	1	2	10	3.880	3.880	4.478	-0.5982
7	1	3	10	3.440	3.440	3.645	-0.2055
7	1	4	10	2.880	2.880	3.540	-0.6600
7	1	5	10	3.350	3.350	3.964	-0.6136
7	1	1	11	5.770	5.770	5.147	0.6233
7	1	2	11	4.150	4.150	5.502	-1.3522
7	1	3	11	5.580	5.580	4.669	0.9105
7	1	4	11	5.140	5.140	4.564	0.5760
7	1	5	11	4.230	4.230	4.988	-0.7576
7	1	1	12	5.690	5.690	5.539	0.1513
7	1	2	12	6.840	6.840	5.894	0.9458
7	1	3	12	3.440	3.440	5.061	-1.6215
7	1	4	12	4.080	4.080	4.956	-0.8760
7	1	5	12	6.780	6.780	5.380	1.4004

===== fyield for AREA 2 and YEAR 1 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	38.132	9.533	1.63	0.185
+ CULT	10	1498.405	149.841	25.64	<.001
Residual	40	233.792	5.845		
Total	54	1770.329	32.784		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

	Prediction	se
CULT		
1	1.70	1.08
2	0.33	1.08
3	0.15	1.08
4	4.29	1.08
5	13.53	1.08
6	8.71	1.08
7	0.28	1.08
8	9.09	1.08
10	7.49	1.08
11	12.75	1.08
12	13.83	1.08

*** Coefficient of variation and standard error of a single unit ***

%cv	se
36.86	2.418

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.378	*			
3	0.318	0.906	*		
4	0.098	0.013	0.010	*	
5	0.000	0.000	0.000	0.000	*
6	0.000	0.000	0.000	0.006	0.003
7	0.361	0.973	0.931	0.012	0.000
8	0.000	0.000	0.000	0.003	0.006
10	0.001	0.000	0.000	0.043	0.000
11	0.000	0.000	0.000	0.000	0.616
12	0.000	0.000	0.000	0.000	0.845

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.804	0.000	*		
10	0.429	0.000	0.300	*	
11	0.012	0.000	0.021	0.001	*
12	0.002	0.000	0.004	0.000	0.487

6 7 8 10 11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	5	1.696	0.672
2	5	0.332	0.064
3	5	0.150	0.013
4	5	4.290	1.080
5	5	13.526	25.160
6	5	8.710	0.833
7	5	0.282	0.021
8	5	9.092	10.547
10	5	7.488	5.953
11	5	12.754	20.301
12	5	13.826	3.337

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
1	2	1	1	2.760	2.760	1.229	1.531
1	2	2	1	1.290	1.290	0.566	0.724
1	2	3	1	2.130	2.130	2.845	-0.715
1	2	4	1	1.700	1.700	2.445	-0.745
1	2	5	1	0.600	0.600	1.395	-0.795
1	2	1	2	0.100	0.100	-0.135	0.235
1	2	2	2	0.200	0.200	-0.798	0.998
1	2	3	2	0.320	0.320	1.481	-1.161

1	2	4	2	0.760	0.760	1.081	-0.321
1	2	5	2	0.280	0.280	0.031	0.249
1	2	1	3	0.060	0.060	-0.317	0.377
1	2	2	3	0.260	0.260	-0.980	1.240
1	2	3	3	0.000	0.000	1.299	-1.299
1	2	4	3	0.250	0.250	0.899	-0.649
1	2	5	3	0.180	0.180	-0.151	0.331
1	2	1	4	4.140	4.140	3.823	0.317
1	2	2	4	6.040	6.040	3.160	2.880
1	2	3	4	3.540	3.540	5.439	-1.899
1	2	4	4	3.470	3.470	5.039	-1.569
1	2	5	4	4.260	4.260	3.989	0.271
1	2	1	5	15.240	15.240	13.059	2.181
1	2	2	5	5.390	5.390	12.396	-7.006 ?
1	2	3	5	14.740	14.740	14.675	0.065
1	2	4	5	19.000	19.000	14.275	4.725
1	2	5	5	13.260	13.260	13.225	0.035
1	2	1	6	8.190	8.190	8.243	-0.053
1	2	2	6	9.950	9.950	7.580	2.370
1	2	3	6	8.660	8.660	9.859	-1.199
1	2	4	6	7.570	7.570	9.459	-1.889
1	2	5	6	9.180	9.180	8.409	0.771
1	2	1	7	0.410	0.410	-0.185	0.595
1	2	2	7	0.360	0.360	-0.848	1.208
1	2	3	7	0.120	0.120	1.431	-1.311
1	2	4	7	0.130	0.130	1.031	-0.901
1	2	5	7	0.390	0.390	-0.019	0.409
1	2	1	8	7.140	7.140	8.625	-1.485
1	2	2	8	5.090	5.090	7.962	-2.872
1	2	3	8	10.210	10.210	10.241	-0.031
1	2	4	8	13.680	13.680	9.841	3.839
1	2	5	8	9.340	9.340	8.791	0.549

1	2	1	10	4.300	4.300	7.021	-2.721
1	2	2	10	9.450	9.450	6.358	3.092
1	2	3	10	10.310	10.310	8.637	1.673
1	2	4	10	7.220	7.220	8.237	-1.017
1	2	5	10	6.160	6.160	7.187	-1.027
1	2	1	11	11.120	11.120	12.287	-1.167
1	2	2	11	10.320	10.320	11.624	-1.304
1	2	3	11	20.280	20.280	13.903	6.377 ?
1	2	4	11	13.260	13.260	13.503	-0.243
1	2	5	11	8.790	8.790	12.453	-3.663
1	2	1	12	13.550	13.550	13.359	0.191
1	2	2	12	11.370	11.370	12.696	-1.326
1	2	3	12	14.480	14.480	14.975	-0.495
1	2	4	12	13.340	13.340	14.575	-1.235
1	2	5	12	16.390	16.390	13.525	2.865

===== fyield for AREA 2 and YEAR 2 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	3.729	0.932	0.71	0.588
+ CULT	10	128.823	12.882	9.86	<.001
Residual	40	52.251	1.306		

Total	54	184.804	3.422

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

	Prediction	se
CULT		
1	1.028	0.511
2	0.174	0.511
3	0.136	0.511
4	0.732	0.511
5	3.196	0.511
6	0.980	0.511
7	0.314	0.511
8	2.310	0.511
10	3.610	0.511
11	2.640	0.511
12	4.890	0.511

*** Coefficient of variation and standard error of a single unit ***

%cv	se
62.83	1.143

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.244	*			
3	0.224	0.958	*		
4	0.684	0.445	0.415	*	
5	0.005	0.000	0.000	0.002	*
6	0.947	0.271	0.250	0.733	0.004
7	0.329	0.847	0.807	0.566	0.000
8	0.084	0.005	0.005	0.035	0.227
10	0.001	0.000	0.000	0.000	0.570
11	0.031	0.001	0.001	0.012	0.446
12	0.000	0.000	0.000	0.000	0.024

	1	2	3	4	5

6	*				
7	0.362	*			
8	0.073	0.009	*		
10	0.001	0.000	0.080	*	
11	0.027	0.003	0.650	0.187	*
12	0.000	0.000	0.001	0.084	0.003

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	5	1.028	0.186
2	5	0.174	0.048
3	5	0.136	0.038
4	5	0.732	0.709
5	5	3.196	3.669
6	5	0.980	0.171
7	5	0.314	0.015
8	5	2.310	1.921
10	5	3.610	3.443
11	5	2.640	0.772
12	5	4.890	3.024

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
2	2	1	1	0.610	0.610	0.905	-0.2953
2	2	2	1	1.640	1.640	0.932	0.7084
2	2	3	1	1.090	1.090	1.109	-0.0189
2	2	4	1	1.180	1.180	0.711	0.4693
2	2	5	1	0.620	0.620	1.483	-0.8635
2	2	1	2	0.060	0.060	0.051	0.0087
2	2	2	2	0.550	0.550	0.078	0.4724
2	2	3	2	0.000	0.000	0.255	-0.2549
2	2	4	2	0.160	0.160	-0.143	0.3033
2	2	5	2	0.100	0.100	0.629	-0.5295
2	2	1	3	0.480	0.480	0.013	0.4667
2	2	2	3	0.080	0.080	0.040	0.0404
2	2	3	3	0.000	0.000	0.217	-0.2169
2	2	4	3	0.070	0.070	-0.181	0.2513

2	2	5	3	0.050	0.050	0.591	-0.5415
2	2	1	4	1.410	1.410	0.609	0.8007
2	2	2	4	0.420	0.420	0.636	-0.2156
2	2	3	4	1.830	1.830	0.813	1.0171
2	2	4	4	0.000	0.000	0.415	-0.4147
2	2	5	4	0.000	0.000	1.187	-1.1875
2	2	1	5	2.440	2.440	3.073	-0.6333
2	2	2	5	0.810	0.810	3.100	-2.2896
2	2	3	5	4.210	4.210	3.277	0.9331
2	2	4	5	2.660	2.660	2.879	-0.2187
2	2	5	5	5.860	5.860	3.651	2.2085
2	2	1	6	1.360	1.360	0.857	0.5027
2	2	2	6	0.760	0.760	0.884	-0.1236
2	2	3	6	0.490	0.490	1.061	-0.5709
2	2	4	6	0.830	0.830	0.663	0.1673
2	2	5	6	1.460	1.460	1.435	0.0245
2	2	1	7	0.280	0.280	0.191	0.0887
2	2	2	7	0.170	0.170	0.218	-0.0476
2	2	3	7	0.250	0.250	0.395	-0.1449
2	2	4	7	0.480	0.480	-0.003	0.4833
2	2	5	7	0.390	0.390	0.769	-0.3795
2	2	1	8	1.530	1.530	2.187	-0.6573
2	2	2	8	1.110	1.110	2.214	-1.1036
2	2	3	8	2.350	2.350	2.391	-0.0409
2	2	4	8	4.650	4.650	1.993	2.6573
2	2	5	8	1.910	1.910	2.765	-0.8555
2	2	1	10	2.030	2.030	3.487	-1.4573
2	2	2	10	5.420	5.420	3.514	1.9064
2	2	3	10	2.410	2.410	3.691	-1.2809
2	2	4	10	2.350	2.350	3.293	-0.9427
2	2	5	10	5.840	5.840	4.065	1.7745
2	2	1	11	3.850	3.850	2.517	1.3327

2	2	2	11	1.930	1.930	2.544	-0.6136
2	2	3	11	3.300	3.300	2.721	0.5791
2	2	4	11	1.990	1.990	2.323	-0.3327
2	2	5	11	2.130	2.130	3.095	-0.9655
2	2	1	12	4.610	4.610	4.767	-0.1573
2	2	2	12	6.060	6.060	4.794	1.2664
2	2	3	12	4.970	4.970	4.971	-0.0009
2	2	4	12	2.150	2.150	4.573	-2.4227
2	2	5	12	6.660	6.660	5.345	1.3145

===== fyield for AREA 2 and YEAR 3 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	34.182	8.545	1.23	0.315
+ CULT	10	837.553	83.755	12.03	<.001
Residual	40	278.557	6.964		
Total	54	1150.291	21.302		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

CULT	Prediction	se
1	4.54	1.18
2	1.35	1.18
3	3.08	1.18
4	12.23	1.18
5	9.75	1.18
6	11.25	1.18
7	2.16	1.18
8	7.67	1.18
10	9.95	1.18
11	10.04	1.18
12	11.86	1.18

*** Coefficient of variation and standard error of a single unit ***

%cv	se
34.60	2.639

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.064	*			
3	0.386	0.308	*		
4	0.000	0.000	0.000	*	
5	0.003	0.000	0.000	0.145	*
6	0.000	0.000	0.000	0.560	0.373
7	0.162	0.632	0.586	0.000	0.000
8	0.068	0.001	0.009	0.009	0.221
10	0.002	0.000	0.000	0.179	0.904
11	0.002	0.000	0.000	0.197	0.862
12	0.000	0.000	0.000	0.826	0.212

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.038	0.002	*		
10	0.440	0.000	0.180	*	
11	0.472	0.000	0.164	0.957	*
12	0.716	0.000	0.016	0.258	0.281

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	5	4.538	6.715
2	5	1.354	0.514

3	5	3.076	1.787
4	5	12.232	6.495
5	5	9.748	6.259
6	5	11.252	14.493
7	5	2.160	0.391
8	5	7.672	10.830
10	5	9.950	4.073
11	5	10.040	3.180
12	5	11.864	23.447

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
3	2	1	1	5.900	5.900	3.383	2.517
3	2	2	1	4.760	4.760	4.114	0.646
3	2	3	1	6.030	6.030	4.626	1.404
3	2	4	1	0.000	0.000	4.797	-4.797 ?
3	2	5	1	6.000	6.000	5.770	0.230
3	2	1	2	0.420	0.420	0.199	0.221
3	2	2	2	1.380	1.380	0.930	0.450
3	2	3	2	1.110	1.110	1.442	-0.332
3	2	4	2	2.410	2.410	1.613	0.797
3	2	5	2	1.450	1.450	2.586	-1.136
3	2	1	3	1.520	1.520	1.921	-0.401
3	2	2	3	1.900	1.900	2.652	-0.752
3	2	3	3	3.650	3.650	3.164	0.486
3	2	4	3	4.740	4.740	3.335	1.405
3	2	5	3	3.570	3.570	4.308	-0.738
3	2	1	4	12.800	12.800	11.077	1.723
3	2	2	4	11.850	11.850	11.808	0.042
3	2	3	4	16.200	16.200	12.320	3.880
3	2	4	4	10.910	10.910	12.491	-1.581
3	2	5	4	9.400	9.400	13.464	-4.064

3	2	1	5	6.990	6.990	8.593	-1.603
3	2	2	5	11.800	11.800	9.324	2.476
3	2	3	5	7.210	7.210	9.836	-2.626
3	2	4	5	12.240	12.240	10.007	2.233
3	2	5	5	10.500	10.500	10.980	-0.480
3	2	1	6	4.960	4.960	10.097	-5.137 ?
3	2	2	6	11.950	11.950	10.828	1.122
3	2	3	6	11.140	11.140	11.340	-0.200
3	2	4	6	13.210	13.210	11.511	1.699
3	2	5	6	15.000	15.000	12.484	2.516
3	2	1	7	2.280	2.280	1.005	1.275
3	2	2	7	1.870	1.870	1.736	0.134
3	2	3	7	2.080	2.080	2.248	-0.168
3	2	4	7	3.130	3.130	2.419	0.711
3	2	5	7	1.440	1.440	3.392	-1.952
3	2	1	8	9.800	9.800	6.517	3.283
3	2	2	8	3.200	3.200	7.248	-4.048
3	2	3	8	5.150	5.150	7.760	-2.610
3	2	4	8	9.560	9.560	7.931	1.629
3	2	5	8	10.650	10.650	8.904	1.746
3	2	1	10	7.970	7.970	8.795	-0.825
3	2	2	10	11.640	11.640	9.526	2.114
3	2	3	10	9.770	9.770	10.038	-0.268
3	2	4	10	8.020	8.020	10.209	-2.189
3	2	5	10	12.350	12.350	11.182	1.168
3	2	1	11	13.190	13.190	8.885	4.305
3	2	2	11	9.630	9.630	9.616	0.014
3	2	3	11	9.310	9.310	10.128	-0.818
3	2	4	11	9.230	9.230	10.299	-1.069
3	2	5	11	8.840	8.840	11.272	-2.432
3	2	1	12	5.350	5.350	10.709	-5.359 ?
3	2	2	12	9.240	9.240	11.440	-2.200

3	2	3	12	13.200	13.200	11.952	1.248
3	2	4	12	13.290	13.290	12.123	1.167
3	2	5	12	18.240	18.240	13.096	5.144 ?

===== fyield for AREA 2 and YEAR 4 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	23.288	5.822	1.02	0.407
+ CULT	10	2042.231	204.223	35.87	<.001
Residual	40	227.761	5.694		
Total	54	2293.280	42.468		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

Prediction se

CULT		
1	2.82	1.07
2	1.09	1.07
3	4.12	1.07
4	15.13	1.07
5	13.35	1.07
6	13.96	1.07
7	0.99	1.07
8	11.53	1.07
10	18.12	1.07
11	13.23	1.07
12	15.46	1.07

*** Coefficient of variation and standard error of a single unit ***

%cv	se
23.91	2.386

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.260	*			
3	0.393	0.052	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.244	*
6	0.000	0.000	0.000	0.443	0.686

7	0.232	0.943	0.044	0.000	0.000
8	0.000	0.000	0.000	0.022	0.235
10	0.000	0.000	0.000	0.054	0.003
11	0.000	0.000	0.000	0.216	0.941
12	0.000	0.000	0.000	0.830	0.170

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.115	0.000	*		
10	0.009	0.000	0.000	*	
11	0.633	0.000	0.264	0.002	*
12	0.327	0.000	0.013	0.085	0.149

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	5	2.818	1.356
2	5	1.094	0.179
3	5	4.122	4.110
4	5	15.130	2.763
5	5	13.346	24.457
6	5	13.960	8.193
7	5	0.986	0.202

8	5	11.526	8.552
10	5	18.124	3.097
11	5	13.234	7.208
12	5	15.456	2.646

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
4	2	1	1	2.240	2.240	2.178	0.062
4	2	2	1	2.440	2.440	2.119	0.321
4	2	3	1	2.830	2.830	2.622	0.208
4	2	4	1	4.790	4.790	3.631	1.159
4	2	5	1	1.790	1.790	3.539	-1.749
4	2	1	2	0.510	0.510	0.454	0.056
4	2	2	2	0.860	0.860	0.395	0.465
4	2	3	2	1.220	1.220	0.898	0.322
4	2	4	2	1.620	1.620	1.907	-0.287
4	2	5	2	1.260	1.260	1.815	-0.555
4	2	1	3	3.750	3.750	3.482	0.268
4	2	2	3	1.550	1.550	3.423	-1.873
4	2	3	3	3.850	3.850	3.926	-0.076
4	2	4	3	7.220	7.220	4.935	2.285
4	2	5	3	4.240	4.240	4.843	-0.603
4	2	1	4	15.390	15.390	14.490	0.900
4	2	2	4	12.330	12.330	14.431	-2.101
4	2	3	4	16.000	16.000	14.934	1.066
4	2	4	4	16.670	16.670	15.943	0.727
4	2	5	4	15.260	15.260	15.851	-0.591
4	2	1	5	15.050	15.050	12.706	2.344
4	2	2	5	14.730	14.730	12.647	2.083
4	2	3	5	15.110	15.110	13.150	1.960
4	2	4	5	17.170	17.170	14.159	3.011
4	2	5	5	4.670	4.670	14.067	-9.397 ?

4	2	1	6	9.770	9.770	13.320	-3.550
4	2	2	6	14.600	14.600	13.261	1.339
4	2	3	6	13.600	13.600	13.764	-0.164
4	2	4	6	14.040	14.040	14.773	-0.733
4	2	5	6	17.790	17.790	14.681	3.109
4	2	1	7	1.250	1.250	0.346	0.904
4	2	2	7	0.440	0.440	0.287	0.153
4	2	3	7	0.590	0.590	0.790	-0.200
4	2	4	7	1.490	1.490	1.799	-0.309
4	2	5	7	1.160	1.160	1.707	-0.547
4	2	1	8	13.440	13.440	10.886	2.554
4	2	2	8	9.410	9.410	10.827	-1.417
4	2	3	8	10.780	10.780	11.330	-0.550
4	2	4	8	8.460	8.460	12.339	-3.879
4	2	5	8	15.540	15.540	12.247	3.293
4	2	1	10	17.400	17.400	17.484	-0.084
4	2	2	10	18.440	18.440	17.425	1.015
4	2	3	10	16.630	16.630	17.928	-1.298
4	2	4	10	17.110	17.110	18.937	-1.827
4	2	5	10	21.040	21.040	18.845	2.195
4	2	1	11	10.990	10.990	12.594	-1.604
4	2	2	11	11.630	11.630	12.535	-0.905
4	2	3	11	11.870	11.870	13.038	-1.168
4	2	4	11	14.140	14.140	14.047	0.093
4	2	5	11	17.540	17.540	13.955	3.585
4	2	1	12	12.970	12.970	14.816	-1.846
4	2	2	12	15.680	15.680	14.757	0.923
4	2	3	12	15.160	15.160	15.260	-0.100
4	2	4	12	16.030	16.030	16.269	-0.239
4	2	5	12	17.440	17.440	16.177	1.263

===== fyield for AREA 2 and YEAR 5 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	16.649	4.162	0.54	0.709
+ CULT	10	2374.551	237.455	30.66	<.001
Residual	40	309.813	7.745		
Total	54	2701.013	50.019		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

	Prediction	se
CULT		
1	3.96	1.24
2	1.73	1.24
3	3.18	1.24
4	17.91	1.24

5	16.39	1.24
6	9.78	1.24
7	1.03	1.24
8	13.39	1.24
10	11.37	1.24
11	14.88	1.24
12	20.19	1.24

*** Coefficient of variation and standard error of a single unit ***

%cv	se
26.90	2.783

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.211	*			
3	0.657	0.415	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.394	*
6	0.002	0.000	0.001	0.000	0.001
7	0.103	0.695	0.230	0.000	0.000
8	0.000	0.000	0.000	0.014	0.096
10	0.000	0.000	0.000	0.001	0.007
11	0.000	0.000	0.000	0.093	0.396
12	0.000	0.000	0.000	0.203	0.037

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.047	0.000	*		
10	0.371	0.000	0.259	*	
11	0.006	0.000	0.401	0.053	*
12	0.000	0.000	0.000	0.000	0.004

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	5	3.96	3.412
2	5	1.73	0.574
3	5	3.18	0.713
4	5	17.91	27.911
5	5	16.39	10.573
6	5	9.78	0.922
7	5	1.03	0.177
8	5	13.39	11.430
10	5	11.37	7.304
11	5	14.88	0.429
12	5	20.19	18.169

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
5	2	1	1	4.11	4.11	3.52	0.593
5	2	2	1	7.12	7.12	4.42	2.703
5	2	3	1	2.97	2.97	3.93	-0.965
5	2	4	1	2.72	2.72	3.23	-0.512
5	2	5	1	2.90	2.90	4.72	-1.820
5	2	1	2	0.87	0.87	1.28	-0.409
5	2	2	2	2.06	2.06	2.18	-0.119
5	2	3	2	1.75	1.75	1.70	0.053
5	2	4	2	2.79	2.79	0.99	1.796
5	2	5	2	1.16	1.16	2.48	-1.322
5	2	1	3	3.92	3.92	2.73	1.191
5	2	2	3	2.48	2.48	3.63	-1.149
5	2	3	3	3.24	3.24	3.15	0.093
5	2	4	3	4.07	4.07	2.44	1.626
5	2	5	3	2.17	2.17	3.93	-1.762
5	2	1	4	19.61	19.61	17.46	2.151
5	2	2	4	20.39	20.39	18.36	2.031
5	2	3	4	20.87	20.87	17.88	2.993
5	2	4	4	8.49	8.49	17.17	-8.684 ?
5	2	5	4	20.17	20.17	18.66	1.508
5	2	1	5	18.15	18.15	15.94	2.207
5	2	2	5	14.99	14.99	16.84	-1.853
5	2	3	5	11.34	11.34	16.36	-5.021
5	2	4	5	19.34	19.34	15.66	3.682
5	2	5	5	18.13	18.13	17.15	0.984
5	2	1	6	9.69	9.69	9.33	0.359
5	2	2	6	10.81	10.81	10.23	0.579
5	2	3	6	10.65	10.65	9.75	0.901
5	2	4	6	8.55	8.55	9.05	-0.496
5	2	5	6	9.19	9.19	10.53	-1.344
5	2	1	7	0.74	0.74	0.58	0.157

5	2	2	7	0.60	0.60	1.48	-0.883
5	2	3	7	0.92	0.92	1.00	-0.081
5	2	4	7	1.65	1.65	0.30	1.352
5	2	5	7	1.24	1.24	1.79	-0.546
5	2	1	8	14.14	14.14	12.94	1.201
5	2	2	8	10.91	10.91	13.84	-2.929
5	2	3	8	9.17	9.17	13.36	-4.187
5	2	4	8	15.01	15.01	12.65	2.356
5	2	5	8	17.70	17.70	14.14	3.558
5	2	1	10	8.58	8.58	10.92	-2.343
5	2	2	10	15.38	15.38	11.82	3.557
5	2	3	10	11.49	11.49	11.34	0.149
5	2	4	10	9.21	9.21	10.64	-1.428
5	2	5	10	12.19	12.19	12.13	0.064
5	2	1	11	15.05	15.05	14.43	0.617
5	2	2	11	13.80	13.80	15.33	-1.533
5	2	3	11	15.58	15.58	14.85	0.729
5	2	4	11	15.05	15.05	14.15	0.902
5	2	5	11	14.92	14.92	15.64	-0.716
5	2	1	12	14.01	14.01	19.74	-5.729
5	2	2	12	20.23	20.23	20.64	-0.409
5	2	3	12	25.49	25.49	20.16	5.333
5	2	4	12	18.86	18.86	19.45	-0.594
5	2	5	12	22.34	22.34	20.94	1.398

===== fyield for AREA 2 and YEAR 6 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	208.109	52.027	6.05	<.001
+ CULT	10	5996.460	599.646	69.71	<.001
Residual	40	344.099	8.602		
Total	54	6548.668	121.272		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

CULT	Prediction	se
1	8.15	1.31
2	2.28	1.31
3	6.29	1.31
4	33.92	1.31
5	26.90	1.31
6	14.65	1.31
7	3.06	1.31
8	22.23	1.31
10	14.07	1.31
11	23.73	1.31

12	28.21	1.31

*** Coefficient of variation and standard error of a single unit ***

%cv	se
17.58	2.933

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.003	*			
3	0.324	0.037	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.001	*
6	0.001	0.000	0.000	0.000	0.000
7	0.009	0.676	0.089	0.000	0.000
8	0.000	0.000	0.000	0.000	0.016
10	0.003	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.095
12	0.000	0.000	0.000	0.004	0.484

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.000	*		

10	0.756	0.000	0.000	*	
11	0.000	0.000	0.423	0.000	*
12	0.000	0.000	0.003	0.000	0.020

6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	5	8.15	5.20
2	5	2.28	1.66
3	5	6.29	3.01
4	5	33.92	22.59
5	5	26.90	16.40
6	5	14.65	11.17
7	5	3.06	0.31
8	5	22.23	20.76
10	5	14.07	8.83
11	5	23.73	18.87
12	5	28.21	29.25

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
6	2	1	1	9.79	9.79	7.44	2.349
6	2	2	1	7.07	7.07	5.01	2.057
6	2	3	1	4.93	4.93	8.44	-3.513
6	2	4	1	10.71	10.71	8.87	1.839
6	2	5	1	8.24	8.24	10.97	-2.733

6	2	1	2	0.56	0.56	1.57	-1.015
6	2	2	2	1.42	1.42	-0.85	2.273
6	2	3	2	3.77	3.77	2.58	1.193
6	2	4	2	2.60	2.60	3.00	-0.405
6	2	5	2	3.06	3.06	5.11	-2.047
6	2	1	3	6.17	6.17	5.59	0.583
6	2	2	3	3.66	3.66	3.16	0.501
6	2	3	3	6.26	6.26	6.59	-0.329
6	2	4	3	8.46	8.46	7.02	1.443
6	2	5	3	6.92	6.92	9.12	-2.199
6	2	1	4	32.33	32.33	33.21	-0.883
6	2	2	4	28.24	28.24	30.78	-2.545
6	2	3	4	38.62	38.62	34.22	4.405
6	2	4	4	31.32	31.32	34.64	-3.323
6	2	5	4	39.09	39.09	36.74	2.345
6	2	1	5	22.13	22.13	26.19	-4.061
6	2	2	5	23.43	23.43	23.76	-0.333
6	2	3	5	27.51	27.51	27.19	0.317
6	2	4	5	29.87	29.87	27.62	2.249
6	2	5	5	31.55	31.55	29.72	1.827
6	2	1	6	14.21	14.21	13.94	0.269
6	2	2	6	9.88	9.88	11.51	-1.633
6	2	3	6	14.61	14.61	14.94	-0.333
6	2	4	6	15.27	15.27	15.37	-0.101
6	2	5	6	19.27	19.27	17.47	1.797
6	2	1	7	3.19	3.19	2.35	0.835
6	2	2	7	3.43	3.43	-0.07	3.503
6	2	3	7	2.22	2.22	3.36	-1.137
6	2	4	7	2.83	2.83	3.78	-0.955
6	2	5	7	3.64	3.64	5.89	-2.247
6	2	1	8	21.54	21.54	21.52	0.021
6	2	2	8	14.54	14.54	19.09	-4.551

6	2	3	8	24.75	24.75	22.52	2.229
6	2	4	8	25.01	25.01	22.95	2.061
6	2	5	8	25.29	25.29	25.05	0.239
6	2	1	10	9.59	9.59	13.36	-3.771
6	2	2	10	13.61	13.61	10.93	2.677
6	2	3	10	16.48	16.48	14.36	2.117
6	2	4	10	13.59	13.59	14.79	-1.201
6	2	5	10	17.07	17.07	16.89	0.177
6	2	1	11	30.38	30.38	23.02	7.361 ?
6	2	2	11	18.36	18.36	20.59	-2.231
6	2	3	11	22.79	22.79	24.02	-1.231
6	2	4	11	24.41	24.41	24.45	-0.039
6	2	5	11	22.69	22.69	26.55	-3.861
6	2	1	12	25.81	25.81	27.50	-1.691
6	2	2	12	25.35	25.35	25.07	0.277
6	2	3	12	24.79	24.79	28.50	-3.713
6	2	4	12	27.36	27.36	28.93	-1.571
6	2	5	12	37.73	37.73	31.03	6.697 ?

===== fyield for AREA 2 and YEAR 7 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.

+ REP	4	43.896	10.974	1.39 0.255
+ CULT	10	310.459	31.046	3.93 <.001
Residual	40	316.245	7.906	
Total	54	670.600	12.419	

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

	Prediction	se
CULT		
1	4.47	1.26
2	2.44	1.26
3	1.86	1.26
4	5.37	1.26
5	7.62	1.26
6	3.99	1.26
7	3.28	1.26
8	4.96	1.26
10	10.80	1.26
11	4.91	1.26
12	5.88	1.26

*** Coefficient of variation and standard error of a single unit ***

%cv	se
55.63	2.812

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.262	*			
3	0.151	0.745	*		
4	0.613	0.107	0.055	*	
5	0.083	0.006	0.002	0.213	*
6	0.791	0.389	0.238	0.442	0.048
7	0.510	0.639	0.429	0.247	0.019
8	0.782	0.165	0.089	0.818	0.142
10	0.001	0.000	0.000	0.004	0.081
11	0.805	0.174	0.094	0.795	0.135
12	0.431	0.060	0.029	0.776	0.333

	1	2	3	4	5
6	*				
7	0.693	*			
8	0.589	0.352	*		
10	0.000	0.000	0.002	*	
11	0.609	0.367	0.976	0.002	*
12	0.294	0.152	0.607	0.009	0.587

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	5	4.466	1.450
2	5	2.444	1.364
3	5	1.862	0.358
4	5	5.372	10.327
5	5	7.624	49.154
6	5	3.992	0.750
7	5	3.284	1.167
8	5	4.960	16.754
10	5	10.804	2.201
11	5	4.908	5.691
12	5	5.882	0.819

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
7	2	1	1	3.990	3.990	5.647	-1.657
7	2	2	1	4.720	4.720	4.323	0.397
7	2	3	1	3.910	3.910	3.552	0.358
7	2	4	1	3.290	3.290	3.473	-0.183
7	2	5	1	6.420	6.420	5.334	1.086
7	2	1	2	1.680	1.680	3.625	-1.945
7	2	2	2	2.120	2.120	2.301	-0.181
7	2	3	2	1.610	1.610	1.530	0.080
7	2	4	2	4.460	4.460	1.451	3.009
7	2	5	2	2.350	2.350	3.312	-0.962
7	2	1	3	1.900	1.900	3.043	-1.143

7	2	2	3	0.830	0.830	1.719	-0.889
7	2	3	3	2.340	2.340	0.948	1.392
7	2	4	3	2.160	2.160	0.869	1.291
7	2	5	3	2.080	2.080	2.730	-0.650
7	2	1	4	9.930	9.930	6.553	3.377
7	2	2	4	4.060	4.060	5.229	-1.169
7	2	3	4	7.440	7.440	4.458	2.982
7	2	4	4	2.260	2.260	4.379	-2.119
7	2	5	4	3.170	3.170	6.240	-3.070
7	2	1	5	4.860	4.860	8.805	-3.945
7	2	2	5	10.020	10.020	7.481	2.539
7	2	3	5	1.450	1.450	6.710	-5.260
7	2	4	5	3.030	3.030	6.631	-3.601
7	2	5	5	18.760	18.760	8.492	10.268 ?
7	2	1	6	5.280	5.280	5.173	0.107
7	2	2	6	4.110	4.110	3.849	0.261
7	2	3	6	3.180	3.180	3.078	0.102
7	2	4	6	4.190	4.190	2.999	1.191
7	2	5	6	3.200	3.200	4.860	-1.660
7	2	1	7	3.450	3.450	4.465	-1.015
7	2	2	7	4.170	4.170	3.141	1.029
7	2	3	7	1.630	1.630	2.370	-0.740
7	2	4	7	2.900	2.900	2.291	0.609
7	2	5	7	4.270	4.270	4.152	0.118
7	2	1	8	11.800	11.800	6.141	5.659
7	2	2	8	2.310	2.310	4.817	-2.507
7	2	3	8	2.300	2.300	4.046	-1.746
7	2	4	8	5.770	5.770	3.967	1.803
7	2	5	8	2.620	2.620	5.828	-3.208
7	2	1	10	12.110	12.110	11.985	0.125
7	2	2	10	10.600	10.600	10.661	-0.061
7	2	3	10	12.530	12.530	9.890	2.640

7	2	4	10	9.190	9.190	9.811	-0.621
7	2	5	10	9.590	9.590	11.672	-2.082
7	2	1	11	7.160	7.160	6.089	1.071
7	2	2	11	6.640	6.640	4.765	1.875
7	2	3	11	3.360	3.360	3.994	-0.634
7	2	4	11	1.530	1.530	3.915	-2.385
7	2	5	11	5.850	5.850	5.776	0.074
7	2	1	12	6.430	6.430	7.063	-0.633
7	2	2	12	4.450	4.450	5.739	-1.289
7	2	3	12	5.790	5.790	4.968	0.822
7	2	4	12	5.900	5.900	4.889	1.011
7	2	5	12	6.840	6.840	6.750	0.090

===== fyield for AREA 3 and YEAR 1 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	2.3546	0.5886	1.93	0.124
+ CULT	10	51.0100	5.1010	16.76	<.001
Residual	40	12.1745	0.3044		
Total	54	65.5391	1.2137		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

CULT	Prediction	se
1	0.018	0.247
2	0.468	0.247
3	0.008	0.247
4	0.684	0.247
5	0.076	0.247
6	3.216	0.247
7	0.000	0.247
8	0.024	0.247
10	1.784	0.247
11	0.228	0.247
12	0.226	0.247

*** Coefficient of variation and standard error of a single unit ***

%cv	se
90.15	0.5517

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.205	*			
3	0.976	0.195	*		
4	0.063	0.539	0.060	*	
5	0.869	0.268	0.846	0.089	*
6	0.000	0.000	0.000	0.000	0.000
7	0.958	0.187	0.980	0.057	0.829
8	0.984	0.211	0.963	0.066	0.882
10	0.000	0.001	0.000	0.003	0.000
11	0.551	0.495	0.532	0.199	0.665
12	0.554	0.492	0.536	0.197	0.669

	1	2	3	4	5

6	*				
7	0.000	*			
8	0.000	0.945	*		
10	0.000	0.000	0.000	*	
11	0.000	0.517	0.562	0.000	*
12	0.000	0.521	0.566	0.000	0.991

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance

CULT			
1	5	0.0180	0.0007
2	5	0.4680	0.0926
3	5	0.0080	0.0003
4	5	0.6840	0.2281
5	5	0.0760	0.0053
6	5	3.2160	2.0263
7	5	0.0000	0.0000
8	5	0.0240	0.0029
10	5	1.7840	1.2489
11	5	0.2280	0.0067
12	5	0.2260	0.0205

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
1	3	1	1	0.0300	0.0300	0.3233	-0.2933
1	3	2	1	0.0000	0.0000	0.1069	-0.1069
1	3	3	1	0.0000	0.0000	-0.2567	0.2567
1	3	4	1	0.0600	0.0600	0.0815	-0.0215
1	3	5	1	0.0000	0.0000	-0.1649	0.1649
1	3	1	2	0.4200	0.4200	0.7733	-0.3533
1	3	2	2	0.5500	0.5500	0.5569	-0.0069
1	3	3	2	0.8400	0.8400	0.1933	0.6467
1	3	4	2	0.5300	0.5300	0.5315	-0.0015
1	3	5	2	0.0000	0.0000	0.2851	-0.2851
1	3	1	3	0.0000	0.0000	0.3133	-0.3133
1	3	2	3	0.0400	0.0400	0.0969	-0.0569
1	3	3	3	0.0000	0.0000	-0.2667	0.2667
1	3	4	3	0.0000	0.0000	0.0715	-0.0715
1	3	5	3	0.0000	0.0000	-0.1749	0.1749
1	3	1	4	0.6900	0.6900	0.9893	-0.2993
1	3	2	4	0.9100	0.9100	0.7729	0.1371

1	3	3	4	0.0500	0.0500	0.4093	-0.3593
1	3	4	4	0.4500	0.4500	0.7475	-0.2975
1	3	5	4	1.3200	1.3200	0.5011	0.8189
1	3	1	5	0.0000	0.0000	0.3813	-0.3813
1	3	2	5	0.1200	0.1200	0.1649	-0.0449
1	3	3	5	0.1600	0.1600	-0.1987	0.3587
1	3	4	5	0.1000	0.1000	0.1395	-0.0395
1	3	5	5	0.0000	0.0000	-0.1069	0.1069
1	3	1	6	4.8900	4.8900	3.5213	1.3687
1	3	2	6	3.9900	3.9900	3.3049	0.6851
1	3	3	6	1.8100	1.8100	2.9413	-1.1313
1	3	4	6	3.7400	3.7400	3.2795	0.4605
1	3	5	6	1.6500	1.6500	3.0331	-1.3831
1	3	1	7	0.0000	0.0000	0.3053	-0.3053
1	3	2	7	0.0000	0.0000	0.0889	-0.0889
1	3	3	7	0.0000	0.0000	-0.2747	0.2747
1	3	4	7	0.0000	0.0000	0.0635	-0.0635
1	3	5	7	0.0000	0.0000	-0.1829	0.1829
1	3	1	8	0.0000	0.0000	0.3293	-0.3293
1	3	2	8	0.0000	0.0000	0.1129	-0.1129
1	3	3	8	0.0000	0.0000	-0.2507	0.2507
1	3	4	8	0.0000	0.0000	0.0875	-0.0875
1	3	5	8	0.1200	0.1200	-0.1589	0.2789
1	3	1	10	3.3900	3.3900	2.0893	1.3007
1	3	2	10	1.6200	1.6200	1.8729	-0.2529
1	3	3	10	0.5500	0.5500	1.5093	-0.9593
1	3	4	10	2.3300	2.3300	1.8475	0.4825
1	3	5	10	1.0300	1.0300	1.6011	-0.5711
1	3	1	11	0.3300	0.3300	0.5333	-0.2033
1	3	2	11	0.1600	0.1600	0.3169	-0.1569
1	3	3	11	0.2500	0.2500	-0.0467	0.2967
1	3	4	11	0.1300	0.1300	0.2915	-0.1615

1	3	5	11	0.2700	0.2700	0.0451	0.2249
1	3	1	12	0.3400	0.3400	0.5313	-0.1913
1	3	2	12	0.3200	0.3200	0.3149	0.0051
1	3	3	12	0.0500	0.0500	-0.0487	0.0987
1	3	4	12	0.0900	0.0900	0.2895	-0.1995
1	3	5	12	0.3300	0.3300	0.0431	0.2869

===== fyield for AREA 3 and YEAR 2 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	1.8173	0.4543	1.12	0.362
+ CULT	10	54.1988	5.4199	13.32	<.001
Residual	40	16.2753	0.4069		
Total	54	72.2914	1.3387		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

CULT	Prediction	se
1	0.008	0.285
2	0.576	0.285
3	0.116	0.285
4	2.382	0.285
5	0.970	0.285
6	1.948	0.285
7	0.000	0.285
8	0.510	0.285
10	3.204	0.285
11	1.222	0.285
12	0.926	0.285

*** Coefficient of variation and standard error of a single unit ***

%cv	se
59.15	0.6379

***** Pairwise differences *****

t probabilities of pairwise differences

1	*		
2	0.167	*	
3	0.790	0.261	*

4	0.000	0.000	0.000	*	
5	0.022	0.335	0.041	0.001	*
6	0.000	0.002	0.000	0.288	0.020
7	0.982	0.161	0.775	0.000	0.021
8	0.221	0.871	0.335	0.000	0.261
10	0.000	0.000	0.000	0.048	0.000
11	0.005	0.117	0.009	0.006	0.536
12	0.028	0.391	0.051	0.001	0.913

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.001	0.213	*		
10	0.003	0.000	0.000	*	
11	0.079	0.004	0.085	0.000	*
12	0.015	0.027	0.309	0.000	0.467

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	5	0.008	0.0001
2	5	0.576	0.0907
3	5	0.116	0.0093
4	5	2.382	1.6055
5	5	0.970	0.1237

6	5	1.948	0.6708
7	5	0.000	0.0000
8	5	0.510	0.5129
10	5	3.204	0.6383
11	5	1.222	0.5852
12	5	0.926	0.2866

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
2	3	1	1	0.000	0.000	0.184	-0.1842
2	3	2	1	0.000	0.000	0.253	-0.2533
2	3	3	1	0.020	0.020	-0.138	0.1576
2	3	4	1	0.020	0.020	-0.216	0.2358
2	3	5	1	0.000	0.000	-0.044	0.0440
2	3	1	2	0.790	0.790	0.752	0.0378
2	3	2	2	0.140	0.140	0.821	-0.6813
2	3	3	2	0.540	0.540	0.430	0.1096
2	3	4	2	0.490	0.490	0.352	0.1378
2	3	5	2	0.920	0.920	0.524	0.3960
2	3	1	3	0.090	0.090	0.292	-0.2022
2	3	2	3	0.080	0.080	0.361	-0.2813
2	3	3	3	0.270	0.270	-0.030	0.2996
2	3	4	3	0.010	0.010	-0.108	0.1178
2	3	5	3	0.130	0.130	0.064	0.0660
2	3	1	4	3.160	3.160	2.558	0.6018
2	3	2	4	4.240	4.240	2.627	1.6127
2	3	3	4	1.520	1.520	2.236	-0.7164
2	3	4	4	1.650	1.650	2.158	-0.5082
2	3	5	4	1.340	1.340	2.330	-0.9900
2	3	1	5	1.440	1.440	1.146	0.2938
2	3	2	5	1.230	1.230	1.215	0.0147
2	3	3	5	0.610	0.610	0.824	-0.2144

2	3	4	5	0.720	0.720	0.746	-0.0262
2	3	5	5	0.850	0.850	0.918	-0.0680
2	3	1	6	1.740	1.740	2.124	-0.3842
2	3	2	6	3.310	3.310	2.193	1.1167
2	3	3	6	1.750	1.750	1.802	-0.0524
2	3	4	6	1.850	1.850	1.724	0.1258
2	3	5	6	1.090	1.090	1.896	-0.8060
2	3	1	7	0.000	0.000	0.176	-0.1762
2	3	2	7	0.000	0.000	0.245	-0.2453
2	3	3	7	0.000	0.000	-0.146	0.1456
2	3	4	7	0.000	0.000	-0.224	0.2238
2	3	5	7	0.000	0.000	-0.052	0.0520
2	3	1	8	0.490	0.490	0.686	-0.1962
2	3	2	8	0.000	0.000	0.755	-0.7553
2	3	3	8	0.130	0.130	0.364	-0.2344
2	3	4	8	0.180	0.180	0.286	-0.1062
2	3	5	8	1.750	1.750	0.458	1.2920
2	3	1	10	3.820	3.820	3.380	0.4398
2	3	2	10	3.980	3.980	3.449	0.5307
2	3	3	10	2.490	2.490	3.058	-0.5684
2	3	4	10	3.510	3.510	2.980	0.5298
2	3	5	10	2.220	2.220	3.152	-0.9320
2	3	1	11	0.880	0.880	1.398	-0.5182
2	3	2	11	0.860	0.860	1.467	-0.6073
2	3	3	11	2.470	2.470	1.076	1.3936
2	3	4	11	0.510	0.510	0.998	-0.4882
2	3	5	11	1.390	1.390	1.170	0.2200
2	3	1	12	1.390	1.390	1.102	0.2878
2	3	2	12	0.720	0.720	1.171	-0.4513
2	3	3	12	0.460	0.460	0.780	-0.3204
2	3	4	12	0.460	0.460	0.702	-0.2422
2	3	5	12	1.600	1.600	0.874	0.7260

===== fyield for AREA 3 and YEAR 3 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	4.453	1.113	0.84	0.506
+ CULT	10	920.743	92.074	69.78	<.001
Residual	40	52.778	1.319		
Total	54	977.974	18.111		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

	Prediction	se
CULT		
1	0.010	0.514
2	0.648	0.514

3	0.332	0.514
4	9.202	0.514
5	1.104	0.514
6	11.352	0.514
7	0.026	0.514
8	0.610	0.514
10	8.138	0.514
11	0.718	0.514
12	0.860	0.514

*** Coefficient of variation and standard error of a single unit ***

%cv	se
38.29	1.149

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.385	*			
3	0.660	0.666	*		
4	0.000	0.000	0.000	*	
5	0.140	0.534	0.294	0.000	*
6	0.000	0.000	0.000	0.005	0.000
7	0.981	0.397	0.676	0.000	0.146
8	0.414	0.958	0.704	0.000	0.500
10	0.000	0.000	0.000	0.151	0.000

11	0.336	0.923	0.598	0.000	0.598
12	0.249	0.772	0.472	0.000	0.739

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.426	*		
10	0.000	0.000	0.000	*	
11	0.000	0.347	0.882	0.000	*
12	0.000	0.258	0.732	0.000	0.846

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	5	0.010	0.000
2	5	0.648	0.105
3	5	0.332	0.022
4	5	9.202	4.060
5	5	1.104	0.889
6	5	11.352	1.196
7	5	0.026	0.001
8	5	0.610	1.117
10	5	8.138	5.825
11	5	0.718	0.310
12	5	0.860	0.783

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
3	3	1	1	0.020	0.020	0.157	-0.1373
3	3	2	1	0.000	0.000	0.117	-0.1173
3	3	3	1	0.030	0.030	0.377	-0.3473
3	3	4	1	0.000	0.000	-0.448	0.4482
3	3	5	1	0.000	0.000	-0.154	0.1536
3	3	1	2	0.610	0.610	0.795	-0.1853
3	3	2	2	0.250	0.250	0.755	-0.5053
3	3	3	2	0.870	0.870	1.015	-0.1453
3	3	4	2	1.060	1.060	0.190	0.8702
3	3	5	2	0.450	0.450	0.484	-0.0344
3	3	1	3	0.290	0.290	0.479	-0.1893
3	3	2	3	0.430	0.430	0.439	-0.0093
3	3	3	3	0.430	0.430	0.699	-0.2693
3	3	4	3	0.090	0.090	-0.126	0.2162
3	3	5	3	0.420	0.420	0.168	0.2516
3	3	1	4	8.240	8.240	9.349	-1.1093
3	3	2	4	10.650	10.650	9.309	1.3407
3	3	3	4	11.760	11.760	9.569	2.1907
3	3	4	4	8.690	8.690	8.744	-0.0538
3	3	5	4	6.670	6.670	9.038	-2.3684
3	3	1	5	2.530	2.530	1.251	1.2787
3	3	2	5	0.510	0.510	1.211	-0.7013
3	3	3	5	1.580	1.580	1.471	0.1087
3	3	4	5	0.660	0.660	0.646	0.0142
3	3	5	5	0.240	0.240	0.940	-0.7004
3	3	1	6	11.550	11.550	11.499	0.0507
3	3	2	6	10.920	10.920	11.459	-0.5393
3	3	3	6	11.270	11.270	11.719	-0.4493
3	3	4	6	13.010	13.010	10.894	2.1162

3	3	5	6	10.010	10.010	11.188	-1.1784
3	3	1	7	0.000	0.000	0.173	-0.1733
3	3	2	7	0.080	0.080	0.133	-0.0533
3	3	3	7	0.000	0.000	0.393	-0.3933
3	3	4	7	0.000	0.000	-0.432	0.4322
3	3	5	7	0.050	0.050	-0.138	0.1876
3	3	1	8	0.000	0.000	0.757	-0.7573
3	3	2	8	0.460	0.460	0.717	-0.2573
3	3	3	8	0.000	0.000	0.977	-0.9773
3	3	4	8	0.120	0.120	0.152	-0.0318
3	3	5	8	2.470	2.470	0.446	2.0236
3	3	1	10	9.660	9.660	8.285	1.3747
3	3	2	10	9.830	9.830	8.245	1.5847
3	3	3	10	9.050	9.050	8.505	0.5447
3	3	4	10	3.980	3.980	7.680	-3.6998
3	3	5	10	8.170	8.170	7.974	0.1956
3	3	1	11	1.010	1.010	0.865	0.1447
3	3	2	11	0.610	0.610	0.825	-0.2153
3	3	3	11	1.520	1.520	1.085	0.4347
3	3	4	11	0.140	0.140	0.260	-0.1198
3	3	5	11	0.310	0.310	0.554	-0.2444
3	3	1	12	0.710	0.710	1.007	-0.2973
3	3	2	12	0.440	0.440	0.967	-0.5273
3	3	3	12	0.530	0.530	1.227	-0.6973
3	3	4	12	0.210	0.210	0.402	-0.1918
3	3	5	12	2.410	2.410	0.696	1.7136

===== fyield for AREA 3 and YEAR 4 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	14.129	3.532	2.64	0.048
+ CULT	10	2554.770	255.477	191.24	<.001
Residual	40	53.437	1.336		
Total	54	2622.336	48.562		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

	Prediction	se
CULT		
1	0.228	0.517
2	0.734	0.517
3	1.190	0.517
4	16.722	0.517
5	2.320	0.517
6	12.030	0.517
7	0.422	0.517
8	0.790	0.517

10	19.050	0.517
11	1.630	0.517
12	1.234	0.517

*** Coefficient of variation and standard error of a single unit ***

%cv	se
22.56	1.156

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.493	*			
3	0.196	0.536	*		
4	0.000	0.000	0.000	*	
5	0.007	0.036	0.130	0.000	*
6	0.000	0.000	0.000	0.000	0.000
7	0.792	0.672	0.300	0.000	0.013
8	0.446	0.939	0.587	0.000	0.043
10	0.000	0.000	0.000	0.003	0.000
11	0.062	0.227	0.551	0.000	0.351
12	0.176	0.498	0.952	0.000	0.145

	1	2	3	4	5
6	*				

7	0.000	*			
8	0.000	0.617	*		
10	0.000	0.000	0.000	*	
11	0.000	0.106	0.257	0.000	*
12	0.000	0.273	0.547	0.000	0.591

6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	5	0.228	0.038
2	5	0.734	0.037
3	5	1.190	0.381
4	5	16.722	3.435
5	5	2.320	0.856
6	5	12.030	4.319
7	5	0.422	0.092
8	5	0.790	0.834
10	5	19.050	5.671
11	5	1.630	0.513
12	5	1.234	0.714

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
4	3	1	1	0.540	0.540	1.063	-0.5235
4	3	2	1	0.230	0.230	0.525	-0.2953
4	3	3	1	0.180	0.180	-0.354	0.5338

4	3	4	1	0.000	0.000	-0.110	0.1102
4	3	5	1	0.190	0.190	0.015	0.1747
4	3	1	2	0.490	0.490	1.569	-1.0795
4	3	2	2	0.690	0.690	1.031	-0.3413
4	3	3	2	0.830	0.830	0.152	0.6778
4	3	4	2	1.000	1.000	0.396	0.6042
4	3	5	2	0.660	0.660	0.521	0.1387
4	3	1	3	0.880	0.880	2.025	-1.1455
4	3	2	3	1.670	1.670	1.487	0.1827
4	3	3	3	2.010	2.010	0.608	1.4018
4	3	4	3	0.560	0.560	0.852	-0.2918
4	3	5	3	0.830	0.830	0.977	-0.1473
4	3	1	4	18.700	18.700	17.557	1.1425
4	3	2	4	17.920	17.920	17.019	0.9007
4	3	3	4	15.600	15.600	16.140	-0.5402
4	3	4	4	17.280	17.280	16.384	0.8962
4	3	5	4	14.110	14.110	16.509	-2.3993
4	3	1	5	3.750	3.750	3.155	0.5945
4	3	2	5	1.940	1.940	2.617	-0.6773
4	3	3	5	1.230	1.230	1.738	-0.5082
4	3	4	5	2.190	2.190	1.982	0.2082
4	3	5	5	2.490	2.490	2.107	0.3827
4	3	1	6	13.990	13.990	12.865	1.1245
4	3	2	6	14.220	14.220	12.327	1.8927
4	3	3	6	9.730	9.730	11.448	-1.7182
4	3	4	6	12.010	12.010	11.692	0.3182
4	3	5	6	10.200	10.200	11.817	-1.6173
4	3	1	7	0.490	0.490	1.257	-0.7675
4	3	2	7	0.850	0.850	0.719	0.1307
4	3	3	7	0.510	0.510	-0.160	0.6698
4	3	4	7	0.150	0.150	0.084	0.0662
4	3	5	7	0.110	0.110	0.209	-0.0993

4	3	1	8	0.760	0.760	1.625	-0.8655
4	3	2	8	0.260	0.260	1.087	-0.8273
4	3	3	8	0.140	0.140	0.208	-0.0682
4	3	4	8	0.420	0.420	0.452	-0.0318
4	3	5	8	2.370	2.370	0.577	1.7927
4	3	1	10	23.210	23.210	19.885	3.3245
4	3	2	10	18.180	18.180	19.347	-1.1673
4	3	3	10	17.330	17.330	18.468	-1.1382
4	3	4	10	17.800	17.800	18.712	-0.9118
4	3	5	10	18.730	18.730	18.837	-0.1073
4	3	1	11	1.850	1.850	2.465	-0.6155
4	3	2	11	2.660	2.660	1.927	0.7327
4	3	3	11	1.290	1.290	1.048	0.2418
4	3	4	11	0.720	0.720	1.292	-0.5718
4	3	5	11	1.630	1.630	1.417	0.2127
4	3	1	12	0.880	0.880	2.069	-1.1895
4	3	2	12	1.000	1.000	1.531	-0.5313
4	3	3	12	1.100	1.100	0.652	0.4478
4	3	4	12	0.500	0.500	0.896	-0.3958
4	3	5	12	2.690	2.690	1.021	1.6687

===== fyield for AREA 3 and YEAR 5 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	17.645	4.411	1.72	0.164
+ CULT	10	1990.339	199.034	77.66	<.001
Residual	40	102.521	2.563		
Total	54	2110.506	39.083		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

	Prediction	se
CULT		
1	0.016	0.716
2	0.212	0.716
3	0.222	0.716
4	19.644	0.716
5	1.262	0.716
6	11.238	0.716
7	0.018	0.716
8	1.250	0.716
10	6.930	0.716
11	1.144	0.716
12	1.018	0.716

*** Coefficient of variation and standard error of a single unit ***

%cv	se
41.00	1.601

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.847	*			
3	0.840	0.989	*		
4	0.000	0.000	0.000	*	
5	0.226	0.306	0.311	0.000	*
6	0.000	0.000	0.000	0.000	0.000
7	0.992	0.849	0.841	0.000	0.226
8	0.230	0.311	0.316	0.000	0.988
10	0.000	0.000	0.000	0.000	0.000
11	0.272	0.363	0.368	0.000	0.907
12	0.328	0.431	0.436	0.000	0.811

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.231	*		
10	0.000	0.000	0.000	*	
11	0.000	0.273	0.917	0.000	*
12	0.000	0.329	0.820	0.000	0.901

6 7 8 10 11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	5	0.016	0.001
2	5	0.212	0.027
3	5	0.222	0.026
4	5	19.644	8.332
5	5	1.262	0.203
6	5	11.238	5.986
7	5	0.018	0.002
8	5	1.250	1.313
10	5	6.930	13.344
11	5	1.144	0.368
12	5	1.018	0.440

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
5	3	1	1	0.080	0.080	0.574	-0.4938
5	3	2	1	0.000	0.000	0.128	-0.1284
5	3	3	1	0.000	0.000	-0.112	0.1116
5	3	4	1	0.000	0.000	-1.003	1.0025
5	3	5	1	0.000	0.000	0.492	-0.4920
5	3	1	2	0.300	0.300	0.770	-0.4698
5	3	2	2	0.120	0.120	0.324	-0.2044
5	3	3	2	0.160	0.160	0.084	0.0756
5	3	4	2	0.030	0.030	-0.807	0.8365

5	3	5	2	0.450	0.450	0.688	-0.2380
5	3	1	3	0.060	0.060	0.780	-0.7198
5	3	2	3	0.030	0.030	0.334	-0.3044
5	3	3	3	0.320	0.320	0.094	0.2256
5	3	4	3	0.350	0.350	-0.797	1.1465
5	3	5	3	0.350	0.350	0.698	-0.3480
5	3	1	4	19.310	19.310	20.202	-0.8918
5	3	2	4	22.610	22.610	19.756	2.8536
5	3	3	4	18.770	18.770	19.516	-0.7464
5	3	4	4	15.440	15.440	18.625	-3.1855
5	3	5	4	22.090	22.090	20.120	1.9700
5	3	1	5	0.720	0.720	1.820	-1.0998
5	3	2	5	1.630	1.630	1.374	0.2556
5	3	3	5	0.830	0.830	1.134	-0.3044
5	3	4	5	1.490	1.490	0.243	1.2465
5	3	5	5	1.640	1.640	1.738	-0.0980
5	3	1	6	13.730	13.730	11.796	1.9342
5	3	2	6	9.100	9.100	11.350	-2.2504
5	3	3	6	10.660	10.660	11.110	-0.4504
5	3	4	6	8.820	8.820	10.219	-1.3995
5	3	5	6	13.880	13.880	11.714	2.1660
5	3	1	7	0.000	0.000	0.576	-0.5758
5	3	2	7	0.000	0.000	0.130	-0.1304
5	3	3	7	0.090	0.090	-0.110	0.1996
5	3	4	7	0.000	0.000	-1.001	1.0005
5	3	5	7	0.000	0.000	0.494	-0.4940
5	3	1	8	0.900	0.900	1.808	-0.9078
5	3	2	8	0.120	0.120	1.362	-1.2424
5	3	3	8	1.140	1.140	1.122	0.0176
5	3	4	8	0.910	0.910	0.231	0.6785
5	3	5	8	3.180	3.180	1.726	1.4540
5	3	1	10	12.710	12.710	7.488	5.2222 ?

5	3	2	10	7.500	7.500	7.042	0.4576
5	3	3	10	6.610	6.610	6.802	-0.1924
5	3	4	10	3.090	3.090	5.911	-2.8215
5	3	5	10	4.740	4.740	7.406	-2.6660
5	3	1	11	1.010	1.010	1.702	-0.6918
5	3	2	11	2.040	2.040	1.256	0.7836
5	3	3	11	0.990	0.990	1.016	-0.0264
5	3	4	11	0.370	0.370	0.125	0.2445
5	3	5	11	1.310	1.310	1.620	-0.3100
5	3	1	12	0.270	0.270	1.576	-1.3058
5	3	2	12	1.040	1.040	1.130	-0.0904
5	3	3	12	1.980	1.980	0.890	1.0896
5	3	4	12	1.250	1.250	-0.001	1.2505
5	3	5	12	0.550	0.550	1.494	-0.9440

===== fyield for AREA 3 and YEAR 6 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	13.187	3.297	0.85	0.501
+ CULT	10	2541.388	254.139	65.61	<.001
Residual	40	154.950	3.874		

Total	54	2709.526	50.176

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

CULT	Prediction	se
1	0.040	0.880
2	0.110	0.880
3	0.008	0.880
4	23.464	0.880
5	2.066	0.880
6	9.142	0.880
7	0.014	0.880
8	1.188	0.880
10	8.154	0.880
11	1.010	0.880
12	2.126	0.880

*** Coefficient of variation and standard error of a single unit ***

%cv	se
45.75	1.968

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.955	*			
3	0.978	0.935	*		
4	0.000	0.000	0.000	*	
5	0.111	0.124	0.106	0.000	*
6	0.000	0.000	0.000	0.000	0.000
7	0.982	0.938	0.991	0.000	0.107
8	0.362	0.392	0.349	0.000	0.485
10	0.000	0.000	0.000	0.000	0.000
11	0.440	0.474	0.426	0.000	0.401
12	0.102	0.113	0.097	0.000	0.961

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.351	*		
10	0.432	0.000	0.000	*	
11	0.000	0.428	0.887	0.000	*
12	0.000	0.098	0.455	0.000	0.375

	6	7	8	10	11

========== Summary of untransformed data =========

CULT	Nobservd	Mean	Variance
1	5	0.040	0.003
2	5	0.110	0.021
3	5	0.008	0.000
4	5	23.464	11.667
5	5	2.066	0.675
6	5	9.142	27.609
7	5	0.014	0.001
8	5	1.188	0.860
10	5	8.154	0.500
11	5	1.010	0.281
12	5	2.126	0.417

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
6	3	1	1	0.130	0.130	-0.738	0.8684
6	3	2	1	0.000	0.000	0.649	-0.6489
6	3	3	1	0.000	0.000	0.454	-0.4544
6	3	4	1	0.070	0.070	0.019	0.0511
6	3	5	1	0.000	0.000	-0.184	0.1838
6	3	1	2	0.000	0.000	-0.668	0.6684
6	3	2	2	0.170	0.170	0.719	-0.5489
6	3	3	2	0.020	0.020	0.524	-0.5044
6	3	4	2	0.340	0.340	0.089	0.2511
6	3	5	2	0.020	0.020	-0.114	0.1338
6	3	1	3	0.000	0.000	-0.770	0.7704
6	3	2	3	0.040	0.040	0.617	-0.5769
6	3	3	3	0.000	0.000	0.422	-0.4224
6	3	4	3	0.000	0.000	-0.013	0.0131
6	3	5	3	0.000	0.000	-0.216	0.2158

6	3	1	4	25.610	25.610	22.686	2.9244
6	3	2	4	26.860	26.860	24.073	2.7871
6	3	3	4	24.470	24.470	23.878	0.5916
6	3	4	4	22.200	22.200	23.443	-1.2429
6	3	5	4	18.180	18.180	23.240	-5.0602 ?
6	3	1	5	1.100	1.100	1.288	-0.1876
6	3	2	5	1.550	1.550	2.675	-1.1249
6	3	3	5	2.990	2.990	2.480	0.5096
6	3	4	5	1.850	1.850	2.045	-0.1949
6	3	5	5	2.840	2.840	1.842	0.9978
6	3	1	6	0.000	0.000	8.364	-8.3636 ?
6	3	2	6	13.100	13.100	9.751	3.3491
6	3	3	6	10.010	10.010	9.556	0.4536
6	3	4	6	12.050	12.050	9.121	2.9291
6	3	5	6	10.550	10.550	8.918	1.6318
6	3	1	7	0.000	0.000	-0.764	0.7644
6	3	2	7	0.000	0.000	0.623	-0.6229
6	3	3	7	0.070	0.070	0.428	-0.3584
6	3	4	7	0.000	0.000	-0.007	0.0071
6	3	5	7	0.000	0.000	-0.210	0.2098
6	3	1	8	0.620	0.620	0.410	0.2104
6	3	2	8	0.350	0.350	1.797	-1.4469
6	3	3	8	2.100	2.100	1.602	0.4976
6	3	4	8	0.580	0.580	1.167	-0.5869
6	3	5	8	2.290	2.290	0.964	1.3258
6	3	1	10	8.930	8.930	7.376	1.5544
6	3	2	10	8.510	8.510	8.763	-0.2529
6	3	3	10	8.300	8.300	8.568	-0.2684
6	3	4	10	7.980	7.980	8.133	-0.1529
6	3	5	10	7.050	7.050	7.930	-0.8802
6	3	1	11	0.530	0.530	0.232	0.2984
6	3	2	11	1.520	1.520	1.619	-0.0989

6	3	3	11	1.640	1.640	1.424	0.2156
6	3	4	11	0.580	0.580	0.989	-0.4089
6	3	5	11	0.780	0.780	0.786	-0.0062
6	3	1	12	1.840	1.840	1.348	0.4924
6	3	2	12	1.920	1.920	2.735	-0.8149
6	3	3	12	2.280	2.280	2.540	-0.2604
6	3	4	12	1.440	1.440	2.105	-0.6649
6	3	5	12	3.150	3.150	1.902	1.2478

===== fyield for AREA 3 and YEAR 7 =====

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	61.519	15.380	2.50	0.058
+ CULT	10	2046.900	204.690	33.26	<.001
Residual	40	246.192	6.155		
Total	54	2354.611	43.604		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

	Prediction	se
CULT		
1	0.59	1.11
2	0.16	1.11
3	0.96	1.11
4	10.88	1.11
5	0.72	1.11
6	16.66	1.11
7	0.47	1.11
8	0.52	1.11
10	14.66	1.11
11	0.65	1.11
12	1.32	1.11

*** Coefficient of variation and standard error of a single unit ***

%cv	se
57.34	2.481

***** Pairwise differences *****

t probabilities of pairwise differences

1	*

2	0.788	*			
3	0.813	0.614	*		
4	0.000	0.000	0.000	*	
5	0.933	0.725	0.878	0.000	*
6	0.000	0.000	0.000	0.001	0.000
7	0.941	0.845	0.756	0.000	0.875
8	0.963	0.823	0.778	0.000	0.897
10	0.000	0.000	0.000	0.021	0.000
11	0.968	0.758	0.843	0.000	0.964
12	0.641	0.464	0.819	0.000	0.702

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.000	0.976	*		
10	0.209	0.000	0.000	*	
11	0.000	0.910	0.932	0.000	*
12	0.000	0.590	0.609	0.000	0.670

	6	7	8	10	11

========== Summary of untransformed data =========

	Nobservd	Mean	Variance
CULT			
1	5	0.588	0.237
2	5	0.164	0.023
3	5	0.962	0.805

4	5	10.876	7.468
5	5	0.720	0.268
6	5	16.662	44.828
7	5	0.472	0.233
8	5	0.516	0.138
10	5	14.660	22.499
11	5	0.650	0.176
12	5	1.324	0.253

YEAR	AREA	REP	CULT	fyield	fyield	FITTED	RESIDUAL
7	3	1	1	1.190	1.190	2.107	-0.917
7	3	2	1	0.990	0.990	1.373	-0.383
7	3	3	1	0.490	0.490	0.575	-0.085
7	3	4	1	0.170	0.170	-0.709	0.879
7	3	5	1	0.100	0.100	-0.406	0.506
7	3	1	2	0.150	0.150	1.683	-1.533
7	3	2	2	0.390	0.390	0.949	-0.559
7	3	3	2	0.030	0.030	0.151	-0.121
7	3	4	2	0.220	0.220	-1.133	1.353
7	3	5	2	0.030	0.030	-0.830	0.860
7	3	1	3	0.390	0.390	2.481	-2.091
7	3	2	3	2.420	2.420	1.747	0.673
7	3	3	3	0.090	0.090	0.949	-0.859
7	3	4	3	0.900	0.900	-0.335	1.235
7	3	5	3	1.010	1.010	-0.032	1.042
7	3	1	4	9.590	9.590	12.395	-2.805
7	3	2	4	14.650	14.650	11.661	2.989
7	3	3	4	12.510	12.510	10.863	1.647
7	3	4	4	7.630	7.630	9.579	-1.949
7	3	5	4	10.000	10.000	9.882	0.118
7	3	1	5	1.100	1.100	2.239	-1.139

7	3	2	5	0.460	0.460	1.505	-1.045
7	3	3	5	1.430	1.430	0.707	0.723
7	3	4	5	0.380	0.380	-0.577	0.957
7	3	5	5	0.230	0.230	-0.274	0.504
7	3	1	6	28.380	28.380	18.181	10.199 ?
7	3	2	6	16.080	16.080	17.447	-1.367
7	3	3	6	13.390	13.390	16.649	-3.259
7	3	4	6	12.600	12.600	15.365	-2.765
7	3	5	6	12.860	12.860	15.668	-2.808
7	3	1	7	0.890	0.890	1.991	-1.101
7	3	2	7	0.280	0.280	1.257	-0.977
7	3	3	7	1.080	1.080	0.459	0.621
7	3	4	7	0.090	0.090	-0.825	0.915
7	3	5	7	0.020	0.020	-0.522	0.542
7	3	1	8	0.560	0.560	2.035	-1.475
7	3	2	8	0.640	0.640	1.301	-0.661
7	3	3	8	0.210	0.210	0.503	-0.293
7	3	4	8	0.120	0.120	-0.781	0.901
7	3	5	8	1.050	1.050	-0.478	1.528
7	3	1	10	19.930	19.930	16.179	3.751
7	3	2	10	17.840	17.840	15.445	2.395
7	3	3	10	16.160	16.160	14.647	1.513
7	3	4	10	10.110	10.110	13.363	-3.253
7	3	5	10	9.260	9.260	13.666	-4.406
7	3	1	11	0.630	0.630	2.169	-1.539
7	3	2	11	0.680	0.680	1.435	-0.755
7	3	3	11	1.330	1.330	0.637	0.693
7	3	4	11	0.260	0.260	-0.647	0.907
7	3	5	11	0.350	0.350	-0.344	0.694
7	3	1	12	1.490	1.490	2.843	-1.353
7	3	2	12	1.800	1.800	2.109	-0.309
7	3	3	12	0.730	0.730	1.311	-0.581

7	3	4	12	0.850	0.850	0.027	0.823
7	3	5	12	1.750	1.750	0.330	1.420

Appendix 3.7.6 ANOVA of combined performance per year in each of the three areas for number of cladodes left after pruning, number of fertile cladodes, number of fruit set, number of fruit left after thinning and fruit yield

JPfruityield.out

file is JPfruityield.gen

===== CACTUS PEAR ENVIRONMENTAL ADAPTIBILITY: Combined over cultivars

========== clleftprun ==========

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tclleftprun

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ AREA	2	24.90022	12.45011	410.15	<.001
+ YEAR	6	232.84675	38.80779	1278.47	<.001
+ AREA.YEAR	12	4.09794	0.34150	11.25	<.001
Residual	84	2.54982	0.03035		
Total	104	264.39473	2.54226		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
AREA		
1	7.3452	0.0294
2	6.2865	0.0294
3	6.3399	0.0294

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

	Prediction	se
YEAR		
1	3.9565	0.0450
2	5.2098	0.0450
3	6.1878	0.0450
4	7.2684	0.0450
5	7.6404	0.0450
6	8.2147	0.0450
7	8.1228	0.0450

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tclleftprun

YEAR	1		2	
	Prediction	se	Prediction	se
AREA				
1	4.5224	0.0779	5.9913	0.0779
2	3.6985	0.0779	4.5759	0.0779
3	3.6486	0.0779	5.0621	0.0779

YEAR	3		4	
	Prediction	se	Prediction	se
AREA				
1	7.3370	0.0779	7.9286	0.0779
2	5.3658	0.0779	6.9066	0.0779
3	5.8607	0.0779	6.9700	0.0779

YEAR	5		6	
	Prediction	se	Prediction	se
AREA				
1	8.0752	0.0779	8.7378	0.0779
2	7.4884	0.0779	8.1535	0.0779
3	7.3575	0.0779	7.7527	0.0779

YEAR 7

AREA	Prediction	se
1	8.8240	0.0779
2	7.8166	0.0779
3	7.7279	0.0779

*** Coefficient of variation and standard error of a single unit ***

%cv	se
2.62	0.1742

***** Pairwise differences *****

t probabilities of pairwise differences

1	*		
2	0.000	*	
3	0.000	0.203	*

	1	2	3

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.000	*			
3	0.000	0.000	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.000	*
6	0.000	0.000	0.000	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000

	1	2	3	4	5

6	*	
7	0.153	*

	6	7

***** Pairwise differences *****

t probabilities of pairwise differences

A1-Y1	*				
A1-Y2	0.000	*			
A1-Y3	0.000	0.000	*		
A1-Y4	0.000	0.000	0.000	*	
A1-Y5	0.000	0.000	0.000	0.187	*
A1-Y6	0.000	0.000	0.000	0.000	0.000
A1-Y7	0.000	0.000	0.000	0.000	0.000
A2-Y1	0.000	0.000	0.000	0.000	0.000
A2-Y2	0.628	0.000	0.000	0.000	0.000
A2-Y3	0.000	0.000	0.000	0.000	0.000
A2-Y4	0.000	0.000	0.000	0.000	0.000
A2-Y5	0.000	0.000	0.173	0.000	0.000

A2-Y6	0.000	0.000	0.000	0.044	0.479
A2-Y7	0.000	0.000	0.000	0.312	0.021
A3-Y1	0.000	0.000	0.000	0.000	0.000
A3-Y2	0.000	0.000	0.000	0.000	0.000
A3-Y3	0.000	0.239	0.000	0.000	0.000
A3-Y4	0.000	0.000	0.001	0.000	0.000
A3-Y5	0.000	0.000	0.852	0.000	0.000
A3-Y6	0.000	0.000	0.000	0.114	0.004
A3-Y7	0.000	0.000	0.001	0.072	0.002

	A1-Y1	A1-Y2	A1-Y3	A1-Y4	A1-Y5
A1-Y6	*				
A1-Y7	0.436	*			
A2-Y1	0.000	0.000	*		
A2-Y2	0.000	0.000	0.000	*	
A2-Y3	0.000	0.000	0.000	0.000	*
A2-Y4	0.000	0.000	0.000	0.000	0.000
A2-Y5	0.000	0.000	0.000	0.000	0.000
A2-Y6	0.000	0.000	0.000	0.000	0.000
A2-Y7	0.000	0.000	0.000	0.000	0.000
A3-Y1	0.000	0.000	0.652	0.000	0.000
A3-Y2	0.000	0.000	0.000	0.000	0.007
A3-Y3	0.000	0.000	0.000	0.000	0.000
A3-Y4	0.000	0.000	0.000	0.000	0.000
A3-Y5	0.000	0.000	0.000	0.000	0.000
A3-Y6	0.000	0.000	0.000	0.000	0.000
A3-Y7	0.000	0.000	0.000	0.000	0.000

	A1-Y6	A1-Y7	A2-Y1	A2-Y2	A2-Y3
A2-Y4	*				

A2-Y5	0.000	*			
A2-Y6	0.000	0.000	*		
A2-Y7	0.000	0.004	0.003	*	
A3-Y1	0.000	0.000	0.000	0.000	*
A3-Y2	0.000	0.000	0.000	0.000	0.000
A3-Y3	0.000	0.000	0.000	0.000	0.000
A3-Y4	0.567	0.000	0.000	0.000	0.000
A3-Y5	0.000	0.238	0.000	0.000	0.000
A3-Y6	0.000	0.019	0.000	0.564	0.000
A3-Y7	0.000	0.033	0.000	0.423	0.000

	A2-Y4	A2-Y5	A2-Y6	A2-Y7	A3-Y1
A3-Y2	*				
A3-Y3	0.000	*			
A3-Y4	0.000	0.000	*		
A3-Y5	0.000	0.000	0.001	*	
A3-Y6	0.000	0.000	0.000	0.001	*
A3-Y7	0.000	0.000	0.000	0.001	0.822

	A3-Y2	A3-Y3	A3-Y4	A3-Y5	A3-Y6

========== Summary of original data =========

AREA 1

YEAR	Nobservd	Mean	Variance
1	5	19.95	0.207
2	5	35.41	3.257

3	5	53.37	9.383
4	5	62.41	14.714
5	5	64.72	4.417
6	5	75.86	5.107
7	5	77.39	8.975

AREA 2

YEAR	Nobservd	Mean	Variance
1	5	13.18	0.226
2	5	20.44	0.112
3	5	28.30	0.953
4	5	47.23	7.404
5	5	55.59	4.662
6	5	66.04	19.389
7	5	60.63	8.215

AREA 3

YEAR	Nobservd	Mean	Variance
1	5	12.84	1.566
2	5	25.15	3.188
3	5	33.87	4.163
4	5	48.11	7.246
5	5	53.67	9.545
6	5	59.63	8.292
7	5	59.27	15.394

========== fertclad ==========

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfertclad

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ AREA	2	12.56024	6.28012	238.07	<.001
+ YEAR	6	63.96563	10.66094	404.13	<.001
+ AREA.YEAR	12	8.03776	0.66981	25.39	<.001
Residual	84	2.21590	0.02638		
Total	104	86.77954	0.83442		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

	Prediction	se
AREA		
1	3.4112	0.0275
2	3.6977	0.0275
3	2.8639	0.0275

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

	Prediction	se
YEAR		
1	2.0540	0.0419
2	2.2981	0.0419
3	3.5428	0.0419
4	3.9310	0.0419
5	3.8662	0.0419
6	4.2666	0.0419
7	3.3110	0.0419

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfertclad

YEAR	1		2	
	Prediction	se	Prediction	se
AREA				
1	2.4144	0.0726	2.5096	0.0726

2	2.0909	0.0726	2.3262	0.0726
3	1.6566	0.0726	2.0586	0.0726

YEAR	3		4	
	Prediction	se	Prediction	se
AREA				
1	3.9231	0.0726	3.9091	0.0726
2	3.8500	0.0726	4.2196	0.0726
3	2.8554	0.0726	3.6643	0.0726

YEAR	5		6	
	Prediction	se	Prediction	se
AREA				
1	3.7802	0.0726	4.0769	0.0726
2	4.4932	0.0726	5.3690	0.0726
3	3.3253	0.0726	3.3539	0.0726

YEAR	7	
	Prediction	se
AREA		
1	3.2647	0.0726
2	3.5347	0.0726
3	3.1335	0.0726

*** Coefficient of variation and standard error of a single unit ***

%cv	se
4.89	0.1624

***** Pairwise differences *****

t probabilities of pairwise differences

1	*		
2	0.000	*	
3	0.000	0.000	*

	1	2	3

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.000	*			
3	0.000	0.000	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.278	*
6	0.000	0.000	0.000	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000

	1	2	3	4	5

6	*				
7	0.000	*			

6 7

***** Pairwise differences *****

t probabilities of pairwise differences

A1-Y1	*				
A1-Y2	0.357	*			
A1-Y3	0.000	0.000	*		
A1-Y4	0.000	0.000	0.892	*	
A1-Y5	0.000	0.000	0.168	0.213	*
A1-Y6	0.000	0.000	0.138	0.106	0.005
A1-Y7	0.000	0.000	0.000	0.000	0.000
A2-Y1	0.002	0.000	0.000	0.000	0.000
A2-Y2	0.393	0.078	0.000	0.000	0.000
A2-Y3	0.000	0.000	0.479	0.566	0.498
A2-Y4	0.000	0.000	0.005	0.003	0.000
A2-Y5	0.000	0.000	0.000	0.000	0.000
A2-Y6	0.000	0.000	0.000	0.000	0.000
A2-Y7	0.000	0.000	0.000	0.000	0.019
A3-Y1	0.000	0.000	0.000	0.000	0.000
A3-Y2	0.001	0.000	0.000	0.000	0.000
A3-Y3	0.000	0.001	0.000	0.000	0.000
A3-Y4	0.000	0.000	0.014	0.019	0.263
A3-Y5	0.000	0.000	0.000	0.000	0.000
A3-Y6	0.000	0.000	0.000	0.000	0.000
A3-Y7	0.000	0.000	0.000	0.000	0.000

	A1-Y1	A1-Y2	A1-Y3	A1-Y4	A1-Y5
A1-Y6	*				

A1-Y7	0.000	*			
A2-Y1	0.000	0.000	*		
A2-Y2	0.000	0.000	0.024	*	
A2-Y3	0.030	0.000	0.000	0.000	*
A2-Y4	0.168	0.000	0.000	0.000	0.001
A2-Y5	0.000	0.000	0.000	0.000	0.000
A2-Y6	0.000	0.000	0.000	0.000	0.000
A2-Y7	0.000	0.010	0.000	0.000	0.003
A3-Y1	0.000	0.000	0.000	0.000	0.000
A3-Y2	0.000	0.000	0.754	0.011	0.000
A3-Y3	0.000	0.000	0.000	0.000	0.000
A3-Y4	0.000	0.000	0.000	0.000	0.074
A3-Y5	0.000	0.557	0.000	0.000	0.000
A3-Y6	0.000	0.388	0.000	0.000	0.000
A3-Y7	0.000	0.205	0.000	0.000	0.000

	A1-Y6	A1-Y7	A2-Y1	A2-Y2	A2-Y3
A2-Y4	*				
A2-Y5	0.009	*			
A2-Y6	0.000	0.000	*		
A2-Y7	0.000	0.000	0.000	*	
A3-Y1	0.000	0.000	0.000	0.000	*
A3-Y2	0.000	0.000	0.000	0.000	0.000
A3-Y3	0.000	0.000	0.000	0.000	0.000
A3-Y4	0.000	0.000	0.000	0.211	0.000
A3-Y5	0.000	0.000	0.000	0.045	0.000
A3-Y6	0.000	0.000	0.000	0.082	0.000
A3-Y7	0.000	0.000	0.000	0.000	0.000

	A2-Y4	A2-Y5	A2-Y6	A2-Y7	A3-Y1

A3-Y2	*				
A3-Y3	0.000	*			
A3-Y4	0.000	0.000	*		
A3-Y5	0.000	0.000	0.001	*	
A3-Y6	0.000	0.000	0.003	0.781	*
A3-Y7	0.000	0.008	0.000	0.065	0.035

	A3-Y2	A3-Y3	A3-Y4	A3-Y5	A3-Y6

========== Summary of original data =========

AREA 1

YEAR	Nobservd	Mean	Variance
1	5	5.35	0.717
2	5	5.82	0.883
3	5	14.90	0.893
4	5	14.82	3.208
5	5	13.80	0.439
6	5	16.14	1.344
7	5	10.19	2.034

AREA 2

YEAR	Nobservd	Mean	Variance
1	5	3.88	0.095
2	5	4.92	0.135
3	5	14.34	0.972

4	5	17.31	0.598
5	5	19.70	1.167
6	5	28.36	5.160
7	5	12.04	2.717

AREA 3

	Nobservd	Mean	Variance
YEAR			
1	5	2.26	0.161
2	5	3.76	0.430
3	5	7.66	0.423
4	5	12.94	0.976
5	5	10.58	1.172
6	5	10.81	3.163
7	5	9.34	1.131

========== ftotal ==========

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tftotal

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ AREA	2	172.218	86.109	34.27	<.001
+ YEAR	6	341.969	56.995	22.68	<.001

+ AREA.YEAR	12	161.512	13.459	5.36 <.001
Residual	84	211.047	2.512	
Total	104	886.745	8.526	

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

	Prediction	se
AREA		
1	6.981	0.268
2	9.165	0.268
3	6.122	0.268

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

	Prediction	se
YEAR		
1	5.747	0.409
2	4.424	0.409

3	8.416	0.409
4	9.830	0.409
5	8.108	0.409
6	9.053	0.409
7	6.379	0.409

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tftotal

YEAR	1		2	
	Prediction	se	Prediction	se
AREA				
1	6.414	0.709	5.419	0.709
2	7.305	0.709	4.509	0.709
3	3.523	0.709	3.345	0.709

YEAR	3		4	
	Prediction	se	Prediction	se
AREA				
1	7.893	0.709	9.572	0.709
2	10.208	0.709	12.313	0.709
3	7.149	0.709	7.606	0.709

YEAR	5		6	

	Prediction	se	Prediction	se
AREA				
1	7.620	0.709	6.881	0.709
2	9.788	0.709	13.702	0.709
3	6.917	0.709	6.577	0.709

YEAR 7

	Prediction	se
AREA		
1	5.072	0.709
2	6.327	0.709
3	7.737	0.709

*** Coefficient of variation and standard error of a single unit ***

%cv	se
21.35	1.585

***** Pairwise differences *****

t probabilities of pairwise differences

1	*		
2	0.000	*	
3	0.026	0.000	*
	1	2	3

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.025	*			
3	0.000	0.000	*		
4	0.000	0.000	0.017	*	
5	0.000	0.000	0.596	0.004	*
6	0.000	0.000	0.274	0.183	0.106
7	0.279	0.001	0.001	0.000	0.004

	1	2	3	4	5

6	*	
7	0.000	*

	6	7

***** Pairwise differences *****

t probabilities of pairwise differences

A1-Y1	*				
A1-Y2	0.324	*			
A1-Y3	0.144	0.016	*		
A1-Y4	0.002	0.000	0.098	*	
A1-Y5	0.232	0.031	0.786	0.055	*
A1-Y6	0.643	0.149	0.316	0.009	0.463

A1-Y7	0.184	0.730	0.006	0.000	0.013
A2-Y1	0.377	0.063	0.559	0.026	0.754
A2-Y2	0.061	0.367	0.001	0.000	0.003
A2-Y3	0.000	0.000	0.023	0.527	0.012
A2-Y4	0.000	0.000	0.000	0.008	0.000
A2-Y5	0.001	0.000	0.062	0.829	0.033
A2-Y6	0.000	0.000	0.000	0.000	0.000
A2-Y7	0.931	0.367	0.122	0.002	0.201
A3-Y1	0.005	0.062	0.000	0.000	0.000
A3-Y2	0.003	0.042	0.000	0.000	0.000
A3-Y3	0.466	0.088	0.460	0.018	0.639
A3-Y4	0.238	0.032	0.775	0.053	0.986
A3-Y5	0.617	0.139	0.333	0.010	0.485
A3-Y6	0.871	0.251	0.193	0.004	0.301
A3-Y7	0.190	0.023	0.877	0.071	0.907

	A1-Y1	A1-Y2	A1-Y3	A1-Y4	A1-Y5
A1-Y6	*				
A1-Y7	0.075	*			
A2-Y1	0.673	0.029	*		
A2-Y2	0.020	0.576	0.007	*	
A2-Y3	0.001	0.000	0.005	0.000	*
A2-Y4	0.000	0.000	0.000	0.000	0.039
A2-Y5	0.005	0.000	0.015	0.000	0.676
A2-Y6	0.000	0.000	0.000	0.000	0.001
A2-Y7	0.582	0.214	0.332	0.073	0.000
A3-Y1	0.001	0.126	0.000	0.328	0.000
A3-Y2	0.001	0.089	0.000	0.249	0.000
A3-Y3	0.790	0.041	0.876	0.010	0.003
A3-Y4	0.471	0.013	0.765	0.003	0.011
A3-Y5	0.970	0.069	0.700	0.019	0.002

A3-Y6	0.763	0.137	0.470	0.042	0.000
A3-Y7	0.395	0.009	0.668	0.002	0.016

	A1-Y6	A1-Y7	A2-Y1	A2-Y2	A2-Y3
A2-Y4	*				
A2-Y5	0.014	*			
A2-Y6	0.169	0.000	*		
A2-Y7	0.000	0.001	0.000	*	
A3-Y1	0.000	0.000	0.000	0.006	*
A3-Y2	0.000	0.000	0.000	0.004	0.859
A3-Y3	0.000	0.010	0.000	0.415	0.001
A3-Y4	0.000	0.032	0.000	0.206	0.000
A3-Y5	0.000	0.005	0.000	0.558	0.001
A3-Y6	0.000	0.002	0.000	0.804	0.003
A3-Y7	0.000	0.044	0.000	0.163	0.000

	A2-Y4	A2-Y5	A2-Y6	A2-Y7	A3-Y1
A3-Y2	*				
A3-Y3	0.000	*			
A3-Y4	0.000	0.649	*		
A3-Y5	0.001	0.818	0.494	*	
A3-Y6	0.002	0.570	0.308	0.735	*
A3-Y7	0.000	0.559	0.896	0.416	0.250

	A3-Y2	A3-Y3	A3-Y4	A3-Y5	A3-Y6

========== Summary of original data =========

AREA 1

YEAR	Nobservd	Mean	Variance
1	5	41.07	91.0
2	5	30.51	262.7
3	5	64.62	933.2
4	5	95.35	1981.9
5	5	62.37	1598.5
6	5	49.78	810.7
7	5	26.64	205.9

AREA 2

YEAR	Nobservd	Mean	Variance
1	5	53.24	106.5
2	5	21.60	211.5
3	5	105.20	783.4
4	5	154.82	2713.3
5	5	97.65	1102.3
6	5	192.08	4748.0
7	5	40.07	116.1

AREA 3

YEAR	Nobservd	Mean	Variance
1	5	12.54	39.9
2	5	10.96	13.1
3	5	51.51	223.6
4	5	59.23	523.0

5	5	48.85	353.4
6	5	45.41	502.2
7	5	60.37	289.0

========== fnoat ==========

******* Analysis of an unbalanced design using GenStat regression *******

Variate: Tfnoat

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ AREA	2	85.4902	42.7451	189.80	<.001
+ YEAR	6	156.5944	26.0991	115.89	<.001
+ AREA.YEAR	12	60.4982	5.0415	22.39	<.001
Residual	84	18.9174	0.2252		
Total	104	321.5002	3.0913		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

	Prediction	se
AREA		
1	6.0322	0.0802
2	7.2244	0.0802
3	5.0165	0.0802

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

	Prediction	se
YEAR		
1	5.005	0.123
2	4.080	0.123
3	6.226	0.123
4	7.446	0.123
5	7.032	0.123
6	7.486	0.123
7	5.361	0.123

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: Tfnoat

YEAR	1		2	
	Prediction	se	Prediction	se
AREA				
1	4.830	0.212	4.852	0.212
2	7.302	0.212	4.092	0.212
3	2.882	0.212	3.298	0.212

YEAR	3		4	
	Prediction	se	Prediction	se
AREA				
1	6.489	0.212	7.612	0.212
2	7.099	0.212	8.375	0.212
3	5.091	0.212	6.352	0.212

YEAR	5		6	
	Prediction	se	Prediction	se
AREA				
1	7.442	0.212	6.278	0.212
2	7.828	0.212	10.201	0.212
3	5.826	0.212	5.979	0.212

YEAR	7	
	Prediction	se
AREA		
1	4.723	0.212
2	5.674	0.212
3	5.688	0.212

*** Coefficient of variation and standard error of a single unit ***

%cv	se
7.79	0.4746

***** Pairwise differences *****

t probabilities of pairwise differences

1	*		
2	0.000	*	
3	0.000	0.000	*

	1	2	3

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.000	*			
3	0.000	0.000	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.019	*
6	0.000	0.000	0.000	0.819	0.010
7	0.043	0.000	0.000	0.000	0.000

	1	2	3	4	5
6	*				
7	0.000	*			

	6	7

***** Pairwise differences *****

t probabilities of pairwise differences

A1-Y1	*				
A1-Y2	0.943	*			
A1-Y3	0.000	0.000	*		
A1-Y4	0.000	0.000	0.000	*	
A1-Y5	0.000	0.000	0.002	0.573	*
A1-Y6	0.000	0.000	0.484	0.000	0.000
A1-Y7	0.722	0.669	0.000	0.000	0.000
A2-Y1	0.000	0.000	0.008	0.306	0.643
A2-Y2	0.016	0.013	0.000	0.000	0.000
A2-Y3	0.000	0.000	0.045	0.092	0.257
A2-Y4	0.000	0.000	0.000	0.013	0.003
A2-Y5	0.000	0.000	0.000	0.472	0.202
A2-Y6	0.000	0.000	0.000	0.000	0.000
A2-Y7	0.006	0.008	0.008	0.000	0.000
A3-Y1	0.000	0.000	0.000	0.000	0.000
A3-Y2	0.000	0.000	0.000	0.000	0.000
A3-Y3	0.388	0.428	0.000	0.000	0.000
A3-Y4	0.000	0.000	0.650	0.000	0.000
A3-Y5	0.001	0.002	0.030	0.000	0.000

A3-Y6	0.000	0.000	0.093	0.000	0.000
A3-Y7	0.005	0.007	0.009	0.000	0.000

	A1-Y1	A1-Y2	A1-Y3	A1-Y4	A1-Y5
A1-Y6	*				
A1-Y7	0.000	*			
A2-Y1	0.001	0.000	*		
A2-Y2	0.000	0.038	0.000	*	
A2-Y3	0.008	0.000	0.501	0.000	*
A2-Y4	0.000	0.000	0.001	0.000	0.000
A2-Y5	0.000	0.000	0.083	0.000	0.017
A2-Y6	0.000	0.000	0.000	0.000	0.000
A2-Y7	0.047	0.002	0.000	0.000	0.000
A3-Y1	0.000	0.000	0.000	0.000	0.000
A3-Y2	0.000	0.000	0.000	0.010	0.000
A3-Y3	0.000	0.224	0.000	0.001	0.000
A3-Y4	0.805	0.000	0.002	0.000	0.015
A3-Y5	0.136	0.000	0.000	0.000	0.000
A3-Y6	0.322	0.000	0.000	0.000	0.000
A3-Y7	0.053	0.002	0.000	0.000	0.000

	A1-Y6	A1-Y7	A2-Y1	A2-Y2	A2-Y3
A2-Y4	*				
A2-Y5	0.072	*			
A2-Y6	0.000	0.000	*		
A2-Y7	0.000	0.000	0.000	*	
A3-Y1	0.000	0.000	0.000	0.000	*
A3-Y2	0.000	0.000	0.000	0.000	0.170
A3-Y3	0.000	0.000	0.000	0.055	0.000
A3-Y4	0.000	0.000	0.000	0.026	0.000

A3-Y5	0.000	0.000	0.000	0.614	0.000
A3-Y6	0.000	0.000	0.000	0.313	0.000
A3-Y7	0.000	0.000	0.000	0.963	0.000

	A2-Y4	A2-Y5	A2-Y6	A2-Y7	A3-Y1
A3-Y2	*				
A3-Y3	0.000	*			
A3-Y4	0.000	0.000	*		
A3-Y5	0.000	0.016	0.083	*	
A3-Y6	0.000	0.004	0.217	0.612	*
A3-Y7	0.000	0.050	0.030	0.646	0.335

	A3-Y2	A3-Y3	A3-Y4	A3-Y5	A3-Y6

========== Summary of original data =========

AREA 1

YEAR	Nobservd	Mean	Variance
1	5	23.02	23.74
2	5	23.35	41.72
3	5	41.75	28.46
4	5	57.69	70.59
5	5	55.02	39.46
6	5	39.05	27.01
7	5	21.87	7.01

AREA 2

	Nobservd	Mean	Variance
YEAR			
1	5	53.20	104.77
2	5	16.37	11.41
3	5	50.11	53.04
4	5	69.67	13.82
5	5	60.82	11.84
6	5	103.84	150.01
7	5	31.94	40.28

AREA 3

	Nobservd	Mean	Variance
YEAR			
1	5	8.02	8.98
2	5	10.51	7.21
3	5	25.48	7.76
4	5	39.90	10.53
5	5	33.64	32.91
6	5	35.37	21.04
7	5	32.30	72.64

========== fyield ==========

******* Analysis of an unbalanced design using GenStat regression *******

Variate: fyield

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ AREA	2	499.6003	249.8002	372.96	<.001
+ YEAR	6	571.5186	95.2531	142.22	<.001
+ AREA.YEAR	12	302.1272	25.1773	37.59	<.001
Residual	84	56.2616	0.6698		
Total	104	1429.5077	13.7453		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

	Prediction	se
AREA		
1	4.371	0.138
2	8.295	0.138
3	3.192	0.138

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

	Prediction	se
YEAR		
1	3.187	0.211
2	1.655	0.211
3	5.231	0.211
4	7.296	0.211
5	6.850	0.211
6	8.798	0.211
7	3.987	0.211

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: fyield

YEAR	1		2	
	Prediction	se	Prediction	se
AREA				
1	2.390	0.366	2.066	0.366
2	6.559	0.366	1.819	0.366
3	0.612	0.366	1.079	0.366

YEAR	3		4	
	Prediction	se	Prediction	se
AREA				

1	5.067	0.366	6.783	0.366
2	7.626	0.366	9.982	0.366
3	3.000	0.366	5.123	0.366

YEAR	5		6	
	Prediction	se	Prediction	se
AREA				
1	6.301	0.366	5.411	0.366
2	10.345	0.366	16.680	0.366
3	3.905	0.366	4.302	0.366

YEAR	7	
	Prediction	se
AREA		
1	2.579	0.366
2	5.054	0.366
3	4.327	0.366

*** Coefficient of variation and standard error of a single unit ***

%cv	se
15.48	0.8184

***** Pairwise differences *****

t probabilities of pairwise differences

1	*		
2	0.000	*	
3	0.000	0.000	*

	1	2	3

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.000	*			
3	0.000	0.000	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.139	*
6	0.000	0.000	0.000	0.000	0.000
7	0.009	0.000	0.000	0.000	0.000

	1	2	3	4	5

6	*	
7	0.000	*

	6	7

***** Pairwise differences *****

t probabilities of pairwise differences

A1-Y1	*				
A1-Y2	0.534	*			
A1-Y3	0.000	0.000	*		
A1-Y4	0.000	0.000	0.001	*	
A1-Y5	0.000	0.000	0.019	0.354	*
A1-Y6	0.000	0.000	0.509	0.010	0.089
A1-Y7	0.715	0.325	0.000	0.000	0.000
A2-Y1	0.000	0.000	0.005	0.665	0.619
A2-Y2	0.274	0.634	0.000	0.000	0.000
A2-Y3	0.000	0.000	0.000	0.107	0.012
A2-Y4	0.000	0.000	0.000	0.000	0.000
A2-Y5	0.000	0.000	0.000	0.000	0.000
A2-Y6	0.000	0.000	0.000	0.000	0.000
A2-Y7	0.000	0.000	0.979	0.001	0.018
A3-Y1	0.001	0.006	0.000	0.000	0.000
A3-Y2	0.013	0.060	0.000	0.000	0.000
A3-Y3	0.242	0.075	0.000	0.000	0.000
A3-Y4	0.000	0.000	0.914	0.002	0.025
A3-Y5	0.004	0.001	0.027	0.000	0.000
A3-Y6	0.000	0.000	0.143	0.000	0.000
A3-Y7	0.000	0.000	0.156	0.000	0.000

	A1-Y1	A1-Y2	A1-Y3	A1-Y4	A1-Y5
A1-Y6	*				
A1-Y7	0.000	*			
A2-Y1	0.029	0.000	*		
A2-Y2	0.000	0.146	0.000	*	
A2-Y3	0.000	0.000	0.042	0.000	*
A2-Y4	0.000	0.000	0.000	0.000	0.000
A2-Y5	0.000	0.000	0.000	0.000	0.000
A2-Y6	0.000	0.000	0.000	0.000	0.000

A2-Y7	0.493	0.000	0.005	0.000	0.000
A3-Y1	0.000	0.000	0.000	0.022	0.000
A3-Y2	0.000	0.005	0.000	0.156	0.000
A3-Y3	0.000	0.419	0.000	0.025	0.000
A3-Y4	0.580	0.000	0.007	0.000	0.000
A3-Y5	0.005	0.012	0.000	0.000	0.000
A3-Y6	0.035	0.001	0.000	0.000	0.000
A3-Y7	0.039	0.001	0.000	0.000	0.000

	A1-Y6	A1-Y7	A2-Y1	A2-Y2	A2-Y3
A2-Y4	*				
A2-Y5	0.485	*			
A2-Y6	0.000	0.000	*		
A2-Y7	0.000	0.000	0.000	*	
A3-Y1	0.000	0.000	0.000	0.000	*
A3-Y2	0.000	0.000	0.000	0.000	0.370
A3-Y3	0.000	0.000	0.000	0.000	0.000
A3-Y4	0.000	0.000	0.000	0.895	0.000
A3-Y5	0.000	0.000	0.000	0.029	0.000
A3-Y6	0.000	0.000	0.000	0.150	0.000
A3-Y7	0.000	0.000	0.000	0.163	0.000

	A2-Y4	A2-Y5	A2-Y6	A2-Y7	A3-Y1
A3-Y2	*				
A3-Y3	0.000	*			
A3-Y4	0.000	0.000	*		
A3-Y5	0.000	0.084	0.021	*	
A3-Y6	0.000	0.014	0.117	0.445	*
A3-Y7	0.000	0.012	0.128	0.417	0.961

A3-Y2 A3-Y3 A3-Y4 A3-Y5 A3-Y6

========== Summary of original data =========

AREA 1

YEAR	Nobservd	Mean	Variance
1	5	2.390	0.1465
2	5	2.066	0.3682
3	5	5.067	0.3923
4	5	6.783	1.3585
5	5	6.301	0.3495
6	5	5.411	0.3300
7	5	2.579	0.1424

AREA 2

YEAR	Nobservd	Mean	Variance
1	5	6.559	0.8665
2	5	1.819	0.0848
3	5	7.626	0.7766
4	5	9.982	0.5295
5	5	10.345	0.3783
6	5	16.680	4.7296
7	5	5.054	0.9974

AREA 3

	Nobservd	Mean	Variance
YEAR			
1	5	0.612	0.0535
2	5	1.079	0.0413
3	5	3.000	0.1011
4	5	5.123	0.3209
5	5	3.905	0.4013
6	5	4.302	0.2995
7	5	4.327	1.3977

Appendix 3.7.7 Original (non-transformed) data of cultivar performance for all yield components used in the ANOVA

JPfyldYEAR.out

file is JPfyldYEAR.gen

========== CACTUS PEAR ENVIRONMENTAL ADAPTIBILITY

COMBINED means over 7 years

===== Area 1 for clleftprun =====

CULT	Nobservd	Mean	Variance
1	5	36.33	18.58
2	5	35.01	15.72
3	5	36.16	26.48
4	5	65.60	18.38
5	5	76.81	74.29
6	5	64.85	35.44
7	5	37.64	23.50
8	5	62.90	45.81
10	5	59.42	112.91
11	5	66.27	42.80
12	5	70.47	108.75

===== Area 1 for fertclad =====

CULT	Nobservd	Mean	Variance

1	5	1.58	0.422
2	5	4.72	0.701
3	5	1.25	0.039
4	5	8.87	3.085
5	5	22.33	18.065
6	5	9.39	1.618
7	5	0.55	0.099
8	5	15.71	0.881
10	5	18.41	0.895
11	5	21.59	7.485
12	5	22.94	31.525

===== Area 1 for ftotal =====

CULT	Nobservd	Mean	Variance
1	5	34.02	723.3
2	5	32.77	358.6
3	5	35.23	650.7
4	5	58.32	2296.5
5	5	57.19	613.9
6	5	57.06	918.6
7	5	32.89	694.8
8	5	57.80	755.9
10	5	47.11	881.0
11	5	62.19	691.4
12	5	96.50	1981.5

===== Area 1 for fnoat =====

	Nobservd	Mean	Variance
CULT			
1	5	2.99	1.7
2	5	9.45	3.8
3	5	4.07	0.9
4	5	24.43	34.4
5	5	69.98	362.6
6	5	28.54	30.2
7	5	1.32	1.0
8	5	49.58	47.2
10	5	45.71	15.3
11	5	70.49	83.0
12	5	78.60	830.7

===== Area 1 for fyield =====

	Nobservd	Mean	Variance
CULT			
1	5	0.379	0.031
2	5	1.034	0.091
3	5	0.335	0.010
4	5	3.542	0.753
5	5	9.043	5.202
6	5	3.289	0.453
7	5	0.092	0.006
8	5	6.357	0.643
10	5	5.620	0.138
11	5	8.957	1.267

12	5	9.432	9.251

===== Area 2 for clleftprun =====

CULT	Nobservd	Mean	Variance
1	5	41.88	17.63
2	5	23.40	13.45
3	5	37.57	66.93
4	5	50.25	22.10
5	5	47.07	22.28
6	5	45.77	2.65
7	5	37.36	18.59
8	5	44.98	52.98
10	5	45.70	29.50
11	5	38.16	11.84
12	5	46.23	102.08

===== Area 2 for fertclad =====

CULT	Nobservd	Mean	Variance
1	5	10.79	3.267
2	5	4.56	1.707
3	5	7.81	1.246
4	5	17.49	9.812
5	5	20.28	6.499
6	5	14.46	1.418

7	5	5.52	1.066
8	5	17.67	13.804
10	5	20.57	10.989
11	5	16.61	4.514
12	5	22.23	15.020

===== Area 2 for ftotal =====

CULT	Nobservd	Mean	Variance
1	5	55.65	1375
2	5	63.71	592
3	5	56.00	318
4	5	110.57	2518
5	5	106.22	1176
6	5	113.11	1174
7	5	55.80	785
8	5	112.83	957
10	5	99.93	879
11	5	107.08	1343
12	5	171.63	2770

===== Area 2 for fnoat =====

CULT	Nobservd	Mean	Variance
1	5	22.87	3.97
2	5	8.73	10.69

3	5	20.38	38.61
4	5	60.32	39.58
5	5	87.60	84.34
6	5	62.08	35.57
7	5	9.96	3.44
8	5	71.91	186.22
10	5	78.09	104.01
11	5	79.28	43.27
12	5	105.50	296.79

===== Area 2 for fyield =====

CULT	Nobservd	Mean	Variance
1	5	3.808	0.133
2	5	1.344	0.291
3	5	2.688	0.678
4	5	12.798	2.919
5	5	12.961	2.613
6	5	9.046	1.216
7	5	1.588	0.078
8	5	10.167	4.978
10	5	10.773	2.222
11	5	11.740	1.102
12	5	14.330	5.295

===== Area 3 for clleftprun =====

CULT	Nobservd	Mean	Variance
1	5	33.77	5.00
2	5	28.20	42.60
3	5	38.11	28.81
4	5	59.60	5.98
5	5	28.32	19.96
6	5	65.17	30.79
7	5	34.19	2.08
8	5	32.84	112.15
10	5	80.26	27.85
11	5	29.98	11.38
12	5	29.26	35.37

===== Area 3 for fertclad =====

CULT	Nobservd	Mean	Variance
1	5	0.650	0.241
2	5	2.228	0.201
3	5	2.380	0.547
4	5	20.042	4.710
5	5	6.098	0.168
6	5	19.056	0.207
7	5	0.800	0.148
8	5	3.478	5.905
10	5	25.330	6.671
11	5	4.742	3.135
12	5	5.322	1.784

===== Area 3 for ftotal =====

CULT	Nobservd	Mean	Variance
1	5	8.51	26.6
2	5	56.16	911.0
3	5	37.16	1885.2
4	5	44.66	38.1
5	5	5.61	14.7
6	5	110.61	1206.9
7	5	54.99	2500.1
8	5	33.64	1280.2
10	5	86.76	1323.9
11	5	17.55	883.4
12	5	9.81	24.6

===== Area 3 for fnoat =====

CULT	Nobservd	Mean	Variance
1	5	2.27	1.52
2	5	3.38	0.33
3	5	5.56	2.22
4	5	62.91	65.97
5	5	13.21	3.92
6	5	73.42	109.10
7	5	3.53	6.99
8	5	8.11	32.02

10	5	75.09	214.33
11	5	8.73	10.92
12	5	10.84	11.78

===== Area 3 for fyield =====

CULT	Nobservd	Mean	Variance
1	5	0.130	0.0103
2	5	0.416	0.0064
3	5	0.405	0.0293
4	5	11.853	2.0814
5	5	1.217	0.0361
6	5	9.370	0.9249
7	5	0.136	0.0101
8	5	0.698	0.4556
10	5	8.845	3.6179
11	5	0.943	0.1412
12	5	1.102	0.1653

1

Appendix 3.7.8 ANOVA for cumulative fruit yield for individual cultivars over production years

JPfyieldCUMcult.out

file is JPfyieldCUMcult.gen

========== CACTUS PEAR ENVIRONMENTAL ADAPTIBILITY

Cumulative yield over 7 years & 3 areas

******* Analysis of an unbalanced design using GenStat regression *******

Variate: TotalYld

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	1218.6	304.7	0.99	0.425
+ CULT	10	269620.7	26962.1	87.45	<.001
Residual	40	12332.4	308.3		
Total	54	283171.7	5243.9		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as

summaries of the data rather than as forecasts of new observations.

Response variate: TotalYld

Prediction se

CULT		
1	30.22	7.85
2	19.56	7.85
3	24.00	7.85
4	197.35	7.85
5	162.55	7.85
6	151.93	7.85
7	12.71	7.85
8	120.56	7.85
10	176.67	7.85
11	151.48	7.85
12	174.05	7.85

*** Coefficient of variation and standard error of a single unit ***

%cv	se
15.82	17.56

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.343	*			
3	0.578	0.691	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.003	*
6	0.000	0.000	0.000	0.000	0.345
7	0.123	0.541	0.316	0.000	0.000
8	0.000	0.000	0.000	0.000	0.001

10	0.000	0.000	0.000	0.070	0.211
11	0.000	0.000	0.000	0.000	0.325
12	0.000	0.000	0.000	0.042	0.307

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.007	0.000	*		
10	0.032	0.000	0.000	*	
11	0.967	0.000	0.008	0.029	*
12	0.053	0.000	0.000	0.814	0.049

	6	7	8	10	11

REP	CULT	TotalYld	FITTED	RESIDUAL
1	1	32.7	31.3	1.33
2	1	33.9	24.0	9.90
3	1	28.6	30.4	-1.84
4	1	26.2	27.2	-1.02
5	1	29.7	38.1	-8.38
1	2	12.3	20.7	-8.40
2	2	19.2	13.4	5.85
3	2	18.9	19.8	-0.85
4	2	24.8	16.5	8.20
5	2	22.6	27.4	-4.80
1	3	21.4	25.1	-3.73
2	3	16.8	17.8	-0.97
3	3	25.4	24.2	1.15
4	3	31.4	21.0	10.46

5	3	25.0	31.9	-6.91
1	4	209.0	198.5	10.49
2	4	204.2	191.1	13.10
3	4	217.0	197.6	19.41
4	4	161.4	194.3	-32.93
5	4	195.2	205.2	-10.07
1	5	177.2	163.7	13.49
2	5	145.9	156.3	-10.47
3	5	144.3	162.8	-18.51
4	5	189.2	159.5	29.65
5	5	156.3	170.4	-14.16
1	6	149.2	153.1	-3.85
2	6	152.3	145.7	6.57
3	6	142.5	152.1	-9.61
4	6	159.1	148.9	10.13
5	6	156.6	159.8	-3.24
1	7	13.3	13.8	-0.58
2	7	12.9	6.5	6.36
3	7	9.8	12.9	-3.11
4	7	13.3	9.7	3.60
5	7	14.3	20.6	-6.27
1	8	122.3	121.7	0.65
2	8	88.6	114.4	-25.75
3	8	110.4	120.8	-10.39
4	8	136.9	117.6	19.36
5	8	144.6	128.4	16.13
1	10	182.2	177.8	4.35
2	10	195.4	170.5	24.95
3	10	179.6	176.9	2.70
4	10	151.7	173.7	-21.94
5	10	174.5	184.5	-10.06
1	11	159.9	152.6	7.25

2	11	135.6	145.3	-9.67
3	11	171.7	151.7	19.99
4	11	141.1	148.5	-7.37
5	11	149.2	159.4	-10.19
1	12	154.2	175.2	-20.99
2	12	148.0	167.8	-19.86
3	12	175.3	174.3	1.05
4	12	152.9	171.0	-18.14
5	12	239.9	181.9	57.94

1

Appendix 3.7.9 ANOVA for cumulative fruit yield for individual cultivars per area

JPfyieldCUMarea.out

file is JPfyieldCUMarea.gen

========== CACTUS PEAR ENVIRONMENTAL ADAPTIBILITY

Cumulative yield over 7 years & 11 cultivars

******* Analysis of an unbalanced design using GenStat regression *******

Variate: TotalYld

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ AREA	2	423157.	211578.	175.32	<.001
Residual	12	14482.	1207.		
Total	14	437638.	31260.		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: TotalYld

	Prediction	se
AREA		

1	336.6	15.5
2	638.7	15.5
3	245.8	15.5

*** Coefficient of variation and standard error of a single unit ***

%cv	se
8.53	34.74

***** Pairwise differences *****

t probabilities of pairwise differences

1	*		
2	0.000	*	
3	0.001	0.000	*

	1	2	3

REP	AREA	TotalYld	FITTED	RESIDUAL
1	1	344.5	336.6	7.94
2	1	300.5	336.6	-36.02
3	1	337.7	336.6	1.17
4	1	334.1	336.6	-2.41
5	1	365.9	336.6	29.32
1	2	612.8	638.7	-25.94
2	2	581.8	638.7	-56.92
3	2	643.9	638.7	5.21
4	2	644.2	638.7	5.52

5	2	710.8	638.7	72.12
1	3	276.2	245.8	30.39
2	3	270.5	245.8	24.70
3	3	241.8	245.8	-3.97
4	3	209.6	245.8	-36.22
5	3	230.9	245.8	-14.88

1

Appendix 3.7.10 ANOVA for cumulative fruit yield for cultivars combined per area

JPfyieldCUM.out

file is JPfyieldCUM.gen

===== CACTUS PEAR ENVIRONMENTAL ADAPTIBILITY: CUMULATIVE YIELD OVER 7 YEARS

========== TOTAL YIELD for AREA 1 ==========

******* Analysis of an unbalanced design using GenStat regression *******

Variate: TotalYld

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	202.48	50.62	0.61	0.655
+ CULT	10	33689.31	3368.93	40.89	<.001
Residual	40	3295.48	82.39		
Total	54	37187.28	688.65		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: TotalYld

CULT	Prediction	se
1	2.65	4.06
2	7.24	4.06
3	2.34	4.06
4	24.80	4.06
5	63.30	4.06
6	23.02	4.06
7	0.64	4.06
8	44.50	4.06
10	39.34	4.06
11	62.70	4.06
12	66.02	4.06

*** Coefficient of variation and standard error of a single unit ***

%cv	se
29.67	9.077

***** Pairwise differences *****

t probabilities of pairwise differences

1	*		
2	0.429	*	
3	0.956	0.399	*

4	0.000	0.004	0.000	*	
5	0.000	0.000	0.000	0.000	*
6	0.001	0.009	0.001	0.759	0.000
7	0.728	0.257	0.768	0.000	0.000
8	0.000	0.000	0.000	0.001	0.002
10	0.000	0.000	0.000	0.015	0.000
11	0.000	0.000	0.000	0.000	0.917
12	0.000	0.000	0.000	0.000	0.638

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.001	0.000	*		
10	0.007	0.000	0.374	*	
11	0.000	0.000	0.003	0.000	*
12	0.000	0.000	0.001	0.000	0.566

	6	7	8	10	11

========== Summary of original data =========

	Nobservd	Mean	Variance
CULT			
1	5	2.65	1.52
2	5	7.24	4.47
3	5	2.34	0.50
4	5	24.80	36.90
5	5	63.30	254.90

6	5	23.02	22.18
7	5	0.64	0.31
8	5	44.50	31.50
10	5	39.34	6.78
11	5	62.70	62.07
12	5	66.02	453.37

AREA	REP	CULT	TotalYld	FITTED	RESIDUAL
1	1	1	1.29	3.38	-2.086
1	2	1	3.66	-0.62	4.281
1	3	1	3.99	2.76	1.230
1	4	1	1.48	2.43	-0.955
1	5	1	2.85	5.32	-2.469
1	1	2	5.32	7.96	-2.642
1	2	2	8.30	3.97	4.335
1	3	2	5.86	7.35	-1.486
1	4	2	6.28	7.02	-0.741
1	5	2	10.44	9.91	0.535
1	1	3	1.88	3.07	-1.186
1	2	3	1.35	-0.93	2.281
1	3	3	2.91	2.45	0.460
1	4	3	2.57	2.12	0.445
1	5	3	3.01	5.01	-1.999
1	1	4	28.06	25.52	2.542
1	2	4	23.08	21.52	1.559
1	3	4	27.80	24.90	2.898
1	4	4	14.95	24.58	-9.627
1	5	4	30.09	27.46	2.629
1	1	5	81.66	64.02	17.636
1	2	5	57.26	60.03	-2.767
1	3	5	53.86	63.41	-9.548

1	4	5	78.49	63.08	15.407
1	5	5	45.24	65.97	-20.727
1	1	6	21.46	23.74	-2.282
1	2	6	19.51	19.75	-0.235
1	3	6	21.59	23.13	-1.536
1	4	6	31.31	22.80	8.509
1	5	6	21.23	25.69	-4.455
1	1	7	0.28	1.36	-1.084
1	2	7	0.62	-2.63	3.253
1	3	7	0.26	0.75	-0.488
1	4	7	0.45	0.42	0.027
1	5	7	1.60	3.31	-1.707
1	1	8	39.62	45.22	-5.604
1	2	8	40.21	41.23	-1.017
1	3	8	41.96	44.61	-2.648
1	4	8	52.44	44.28	8.157
1	5	8	48.28	47.17	1.113
1	1	10	38.52	40.06	-1.540
1	2	10	43.42	36.06	7.357
1	3	10	39.48	39.44	0.036
1	4	10	36.23	39.12	-2.889
1	5	10	39.04	42.00	-2.963
1	1	11	61.88	63.42	-1.542
1	2	11	54.77	59.43	-4.655
1	3	11	75.71	62.81	12.904
1	4	11	58.78	62.48	-3.701
1	5	11	62.36	65.37	-3.005
1	1	12	64.53	66.74	-2.214
1	2	12	48.36	62.75	-14.387
1	3	12	64.31	66.13	-1.818
1	4	12	51.17	65.80	-14.633
1	5	12	101.74	68.69	33.053

========== TOTAL YIELD for AREA 2 ==========

******* Analysis of an unbalanced design using GenStat regression *******

Variate: TotalYld

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	833.79	208.45	2.46	0.061
+ CULT	10	60128.15	6012.82	71.05	<.001
Residual	40	3385.19	84.63		
Total	54	64347.13	1191.61		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: TotalYld

	Prediction	se
CULT		
1	26.66	4.11
2	9.41	4.11

3	18.82	4.11
4	89.58	4.11
5	90.73	4.11
6	63.32	4.11
7	11.12	4.11
8	71.17	4.11
10	75.41	4.11
11	82.18	4.11
12	100.31	4.11

*** Coefficient of variation and standard error of a single unit ***

%cv	se
15.84	9.199

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.005	*			
3	0.185	0.114	*		
4	0.000	0.000	0.000	*	
5	0.000	0.000	0.000	0.845	*
6	0.000	0.000	0.000	0.000	0.000
7	0.011	0.770	0.193	0.000	0.000
8	0.000	0.000	0.000	0.003	0.002
10	0.000	0.000	0.000	0.019	0.012

11	0.000	0.000	0.000	0.211	0.150
12	0.000	0.000	0.000	0.073	0.107

	1	2	3	4	5
6	*				
7	0.000	*			
8	0.185	0.000	*		
10	0.044	0.000	0.470	*	
11	0.002	0.000	0.066	0.252	*
12	0.000	0.000	0.000	0.000	0.003

	6	7	8	10	11

========== Summary of original data =========

CULT	Nobservd	Mean	Variance
1	5	26.66	6.50
2	5	9.41	14.27
3	5	18.82	33.21
4	5	89.58	143.02
5	5	90.73	128.00
6	5	63.32	59.61
7	5	11.12	3.85
8	5	71.17	243.98
10	5	75.41	108.86
11	5	82.18	54.00
12	5	100.31	259.43

AREA	REP	CULT	TotalYld	FITTED	RESIDUAL
2	1	1	29.40	24.30	5.100
2	2	1	29.04	21.48	7.556
2	3	1	23.89	27.13	-3.242
2	4	1	24.39	27.16	-2.770
2	5	1	26.57	33.21	-6.645
2	1	2	4.20	7.05	-2.848
2	2	2	8.59	4.23	4.358
2	3	2	9.78	9.88	-0.100
2	4	2	14.80	9.91	4.892
2	5	2	9.66	15.96	-6.303
2	1	3	17.80	16.46	1.342
2	2	3	10.76	13.64	-2.882
2	3	3	19.34	19.29	0.050
2	4	3	26.97	19.32	7.652
2	5	3	19.21	25.37	-6.163
2	1	4	95.61	87.22	8.386
2	2	4	83.33	84.41	-1.078
2	3	4	104.50	90.06	14.444
2	4	4	73.12	90.08	-16.964
2	5	4	91.35	96.14	-4.789
2	1	5	84.86	88.37	-3.510
2	2	5	81.17	85.55	-4.384
2	3	5	81.57	91.20	-9.632
2	4	5	103.31	91.23	12.080
2	5	5	102.73	97.28	5.445
2	1	6	53.46	60.96	-7.502
2	2	6	62.06	58.15	3.914
2	3	6	62.33	63.79	-1.464
2	4	6	63.66	63.82	-0.162

2	5	6	75.09	69.88	5.213
2	1	7	11.60	8.76	2.840
2	2	7	11.04	5.94	5.096
2	3	7	7.81	11.59	-3.782
2	4	7	12.61	11.62	0.990
2	5	7	12.53	17.67	-5.145
2	1	8	79.39	68.81	10.576
2	2	8	46.57	66.00	-19.428
2	3	8	64.71	71.65	-6.936
2	4	8	82.14	71.67	10.466
2	5	8	83.05	77.73	5.321
2	1	10	61.98	73.06	-11.076
2	2	10	84.54	70.24	14.300
2	3	10	79.62	75.89	3.732
2	4	10	66.69	75.92	-9.226
2	5	10	84.24	81.97	2.269
2	1	11	91.74	79.82	11.916
2	2	11	72.31	77.01	-4.698
2	3	11	86.49	82.66	3.834
2	4	11	79.61	82.68	-3.074
2	5	11	80.76	88.74	-7.979
2	1	12	82.73	97.95	-15.224
2	2	12	92.38	95.14	-2.758
2	3	12	103.88	100.79	3.094
2	4	12	96.93	100.81	-3.884
2	5	12	125.64	106.87	18.771

========== TOTAL YIELD for AREA 3 ==========

******* Analysis of an unbalanced design using GenStat regression *******

Variate: TotalYld

***** Regression Analysis *****

*** Accumulated analysis of variance ***

Change	d.f.	s.s.	m.s.	v.r.	F pr.
+ REP	4	280.25	70.06	2.36	0.069
+ CULT	10	48726.12	4872.61	164.41	<.001
Residual	40	1185.50	29.64		
Total	54	50191.87	929.48		

*** Predictions from regression model ***

The standard errors are appropriate for interpretation of the predictions as summaries of the data rather than as forecasts of new observations.

Response variate: TotalYld

CULT	Prediction	se
1	0.91	2.43
2	2.91	2.43
3	2.84	2.43
4	82.97	2.43
5	8.52	2.43
6	65.59	2.43
7	0.95	2.43
8	4.89	2.43

10	61.92	2.43
11	6.60	2.43
12	7.71	2.43

*** Coefficient of variation and standard error of a single unit ***

%cv	se
24.36	5.444

***** Pairwise differences *****

t probabilities of pairwise differences

1	*				
2	0.564	*			
3	0.578	0.981	*		
4	0.000	0.000	0.000	*	
5	0.033	0.111	0.107	0.000	*
6	0.000	0.000	0.000	0.000	0.000
7	0.987	0.572	0.587	0.000	0.034
8	0.255	0.569	0.555	0.000	0.298
10	0.000	0.000	0.000	0.000	0.000
11	0.106	0.290	0.281	0.000	0.581
12	0.055	0.171	0.164	0.000	0.816

	1	2	3	4	5
6	*				

7	0.000	*			
8	0.000	0.260	*		
10	0.293	0.000	0.000	*	
11	0.000	0.109	0.621	0.000	*
12	0.000	0.057	0.417	0.000	0.748

	6	7	8	10	11

========== Summary of original data =========

CULT	Nobservd	Mean	Variance
1	5	0.91	0.51
2	5	2.91	0.31
3	5	2.84	1.43
4	5	82.97	101.99
5	5	8.52	1.77
6	5	65.59	45.33
7	5	0.95	0.50
8	5	4.89	22.32
10	5	61.92	177.27
11	5	6.60	6.91
12	5	7.71	8.10

AREA	REP	CULT	TotalYld	FITTED	RESIDUAL
3	1	1	1.99	3.67	-1.680
3	2	1	1.22	3.15	-1.933
3	3	1	0.72	0.55	0.173

3	4	1	0.32	-2.39	2.705
3	5	1	0.29	-0.45	0.735
3	1	2	2.76	5.67	-2.914
3	2	2	2.31	5.16	-2.847
3	3	2	3.29	2.55	0.739
3	4	2	3.67	-0.38	4.051
3	5	2	2.53	1.56	0.971
3	1	3	1.71	5.60	-3.890
3	2	3	4.71	5.08	-0.373
3	3	3	3.12	2.48	0.643
3	4	3	1.91	-0.46	2.365
3	5	3	2.74	1.48	1.255
3	1	4	85.30	85.74	-0.436
3	2	4	97.84	85.22	12.621
3	3	4	84.68	82.61	2.067
3	4	4	73.34	79.68	-6.341
3	5	4	73.71	81.62	-7.911
3	1	5	10.64	11.28	-0.640
3	2	5	7.44	10.76	-3.323
3	3	5	8.83	8.16	0.673
3	4	5	7.39	5.22	2.165
3	5	5	8.29	7.16	1.125
3	1	6	74.28	68.35	5.930
3	2	6	70.72	67.83	2.887
3	3	6	58.62	65.23	-6.607
3	4	6	64.08	62.29	1.785
3	5	6	60.24	64.23	-3.995
3	1	7	1.38	3.71	-2.334
3	2	7	1.21	3.20	-1.987
3	3	7	1.75	0.59	1.159
3	4	7	0.24	-2.34	2.581
3	5	7	0.18	-0.40	0.581

3	1	8	3.33	7.65	-4.320
3	2	8	1.83	7.13	-5.303
3	3	8	3.72	4.53	-0.807
3	4	8	2.33	1.59	0.735
3	5	8	13.23	3.53	9.695
3	1	10	81.65	64.68	16.968
3	2	10	67.46	64.17	3.295
3	3	10	60.49	61.56	-1.069
3	4	10	48.80	58.63	-9.827
3	5	10	51.20	60.57	-9.367
3	1	11	6.24	9.36	-3.124
3	2	11	8.53	8.85	-0.317
3	3	11	9.49	6.24	3.249
3	4	11	2.71	3.31	-0.599
3	5	11	6.04	5.25	0.791
3	1	12	6.92	10.48	-3.556
3	2	12	7.24	9.96	-2.719
3	3	12	7.13	7.35	-0.223
3	4	12	4.80	4.42	0.379
3	5	12	12.48	6.36	6.119

1

Appendix 3.8.1 Correlation matrix for all cultivars combined over production years and areas

JPcorrALLyld.out

file is JPfyieldFS.gen

========== CACTUS PEAR ENVIRONMENTAL ADAPTIBILITY: FRUIT YIELD

========== Correlations on all data ==========

*** Degrees of freedom ***

Correlations: 226

*** Correlation matrix ***

fyield	1	1.000									
Tclleftprun	2	0.529	1.000								
Tfertclad	3	0.863	0.701	1.000							
Tftotal	4	0.774	0.493	0.689	1.000						
Tfnoat	5	0.935	0.568	0.927	0.769	1.000					
Tn1	6	0.152	0.417	0.226	0.239	0.194	1.000				
RC1	7	-0.170	-0.323	-0.228	-0.266	-0.220	-0.935	1.000			
IC1	8	-0.204	-0.349	-0.254	-0.294	-0.240	-0.935	0.989	1.000		
C1	9	-0.223	-0.301	-0.264	-0.319	-0.267	-0.870	0.968	0.971	1.000	
DL1	10	0.234	0.130	0.234	0.325	0.279	0.760	-0.901	-0.889	-0.947	
rain2	11	-0.047	0.230	0.052	-0.056	-0.052	-0.372	0.467	0.466	0.405	
Tx2	12	0.157	0.269	0.204	0.248	0.207	0.867	-0.982	-0.967	-0.947	
Tn2	13	0.132	0.383	0.201	0.206	0.179	0.988	-0.965	-0.961	-0.902	
HU0_2	14	0.154	0.305	0.207	0.241	0.203	0.916	-0.994	-0.982	-0.952	
HU5_2	15	0.153	0.305	0.207	0.241	0.203	0.916	-0.994	-0.982	-0.951	
HU10_2	16	0.147	0.302	0.202	0.233	0.196	0.912	-0.991	-0.976	-0.940	

HU15_2 17 0.103 0.285 0.158 0.179 0.154 0.894 -0.959 -0.937 -0.871

Rad2 18 0.309 -0.033 0.211 0.311 0.229 -0.344 0.162 0.111 -0.024

DL2 19 0.222 0.145 0.238 0.317 0.272 0.750 -0.889 -0.875 -0.941

rain3 20 -0.144 0.082 -0.093 -0.237 -0.197 -0.236 0.421 0.363 0.492

Tave3 21 0.109 0.180 0.166 0.218 0.185 0.838 -0.956 -0.913 -0.923

HU0_3 22 0.112 0.182 0.169 0.219 0.187 0.842 -0.958 -0.917 -0.928

HU5_3 23 0.112 0.181 0.169 0.219 0.187 0.841 -0.958 -0.916 -0.928

HU10_3 24 0.112 0.182 0.168 0.219 0.186 0.841 -0.957 -0.915 -0.926

HU15_3 25 0.105 0.177 0.163 0.213 0.181 0.834 -0.953 -0.908 -0.917

WS3 26 -0.178 -0.310 -0.240 -0.278 -0.241 -0.819 0.939 0.922 0.967

rad3 27 0.287 -0.100 0.206 0.309 0.211 -0.450 0.346 0.297 0.145

DL3 28 -0.214 -0.122 -0.211 -0.286 -0.251 -0.792 0.922 0.916 0.943

rain4 29 -0.147 0.137 -0.073 -0.237 -0.198 -0.320 0.519 0.464 0.567

Tx4 30 0.129 0.195 0.179 0.230 0.195 0.835 -0.968 -0.935 -0.941

Tn4 31 0.109 0.263 0.177 0.212 0.179 0.917 -0.980 -0.948 -0.928

WS4 32 -0.127 -0.206 -0.182 -0.206 -0.192 -0.731 0.895 0.884 0.927

RHx4 33 -0.121 0.280 0.080 -0.093 -0.129 -0.194 0.223 0.213 0.243

RHn4 34 -0.008 0.321 0.128 0.039 -0.042 -0.292 0.478 0.464 0.513

rad4 35 0.305 -0.105 0.211 0.321 0.225 -0.437 0.304 0.254 0.104

ETx4 36 0.061 0.181 0.125 0.152 0.143 0.832 -0.944 -0.895 -0.909

ETn4 37 0.209 0.426 0.265 0.292 0.228 0.822 -0.760 -0.764 -0.725

frost4 38 -0.190 -0.287 -0.233 -0.278 -0.235 -0.542 0.530 0.556 0.604

HU0_4 39 0.127 0.224 0.183 0.228 0.194 0.874 -0.981 -0.949 -0.946

HU5_4 40 0.127 0.224 0.183 0.228 0.194 0.873 -0.980 -0.948 -0.946

HU10_4 41 0.124 0.221 0.180 0.225 0.191 0.870 -0.978 -0.945 -0.941

HU15_4 42 0.105 0.204 0.163 0.206 0.176 0.858 -0.968 -0.929 -0.920

RC4 43 -0.173 -0.245 -0.219 -0.271 -0.230 -0.883 0.985 0.962 0.973

IC4 44 -0.201 -0.283 -0.240 -0.293 -0.245 -0.901 0.986 0.984 0.987

PC4 45 -0.219 -0.272 -0.253 -0.314 -0.263 -0.858 0.962 0.962 0.997

Eto4 46 0.135 -0.292 -0.012 0.111 0.140 0.021 -0.283 -0.282 -0.401

DL4 47 0.020 -0.078 0.007 0.072 0.012 -0.494 0.473 0.486 0.380

Alt 48 -0.073 -0.226 -0.146 -0.155 -0.146 -0.858 0.961 0.927 0.909

Lat 49 -0.210 -0.147 -0.228 -0.306 -0.263 -0.771 0.913 0.895 0.952

Long 50 -0.233 0.241 -0.098 -0.225 -0.164 0.510 -0.477 -0.432 -0.284

pH_H2O 51 0.111 0.001 0.110 0.153 0.157 0.730 -0.835 -0.830 -0.872

P 52 0.411 -0.009 0.280 0.464 0.383 0.264 -0.420 -0.465 -0.558

K 53 -0.019 0.033 0.047 -0.009 0.009 0.457 -0.491 -0.491 -0.436

Ca 54 0.109 0.113 0.118 0.149 0.153 0.713 -0.864 -0.876 -0.877

Mg 55 0.082 -0.299 -0.003 0.086 0.120 0.443 -0.642 -0.634 -0.702

Resist 56 -0.185 -0.096 -0.202 -0.256 -0.185 -0.276 0.402 0.465 0.471

APP_N 57 0.193 0.623 0.322 0.359 0.183 0.020 0.125 0.110 0.141

1 2 3 4 5 6 7 8 9

DL1 10 1.000

rain2 11 -0.468 1.000

Tx2 12 0.890 -0.515 1.000

Tn2 13 0.800 -0.428 0.919 1.000

HU0_2 14 0.881 -0.497 0.994 0.957 1.000

HU5_2 15 0.881 -0.497 0.994 0.957 1.000 1.000

HU10_2 16 0.872 -0.504 0.994 0.955 0.999 0.999 1.000

HU15_2 17 0.797 -0.538 0.974 0.940 0.979 0.980 0.986 1.000

Rad2 18 0.079 0.024 -0.107 -0.313 -0.167 -0.168 -0.184 -0.276 1.000

DL2 19 0.994 -0.409 0.872 0.789 0.865 0.865 0.855 0.773 0.056

rain3 20 -0.569 0.098 -0.438 -0.268 -0.401 -0.401 -0.395 -0.335 -0.119

Tave3 21 0.918 -0.459 0.953 0.878 0.949 0.949 0.949 0.919 -0.192

HU0_3 22 0.925 -0.462 0.953 0.881 0.950 0.950 0.950 0.917 -0.186

HU5_3 23 0.924 -0.462 0.953 0.880 0.949 0.949 0.949 0.917 -0.186

HU10_3 24 0.924 -0.461 0.953 0.880 0.949 0.949 0.949 0.917 -0.188

HU15_3 25 0.915 -0.469 0.951 0.875 0.946 0.946 0.948 0.919 -0.198

WS3 26 -0.933 0.317 -0.925 -0.858 -0.923 -0.922 -0.914 -0.849 0.030

rad3 27 -0.060 0.274 -0.342 -0.463 -0.380 -0.381 -0.399 -0.509 0.864

DL3 28 -0.973 0.575 -0.922 -0.835 -0.914 -0.914 -0.908 -0.852 -0.063

rain4 29 -0.655 0.358 -0.547 -0.365 -0.507 -0.507 -0.504 -0.458 -0.103

Tx4 30 0.924 -0.492 0.980 0.886 0.970 0.970 0.971 0.942 -0.131

Tn4 31 0.886 -0.446 0.959 0.945 0.972 0.972 0.972 0.950 -0.282

WS4 32 -0.899 0.326 -0.907 -0.785 -0.889 -0.889 -0.883 -0.823 0.018

RHx4 33 -0.307 0.515 -0.233 -0.216 -0.232 -0.231 -0.222 -0.226 -0.056

RHn4 34 -0.553 0.557 -0.544 -0.376 -0.506 -0.505 -0.499 -0.487 -0.098

rad4 35 -0.017 0.188 -0.281 -0.436 -0.328 -0.329 -0.347 -0.451 0.927

ETx4 36 0.882 -0.460 0.944 0.876 0.941 0.941 0.940 0.915 -0.198

ETn4 37 0.637 -0.313 0.696 0.792 0.735 0.735 0.729 0.700 -0.057

frost4 38 -0.537 0.096 -0.494 -0.529 -0.513 -0.512 -0.492 -0.423 -0.105

HU0_4 39 0.921 -0.480 0.979 0.916 0.978 0.978 0.978 0.949 -0.180

HU5_4 40 0.921 -0.479 0.979 0.915 0.978 0.978 0.978 0.949 -0.181

HU10_4 41 0.918 -0.481 0.978 0.913 0.976 0.976 0.977 0.950 -0.187

HU15_4 42 0.901 -0.492 0.971 0.902 0.968 0.969 0.971 0.952 -0.218

RC4 43 -0.954 0.465 -0.971 -0.921 -0.974 -0.974 -0.970 -0.925 0.114

IC4 44 -0.944 0.457 -0.968 -0.935 -0.976 -0.976 -0.969 -0.918 0.077

PC4 45 -0.959 0.408 -0.942 -0.893 -0.946 -0.945 -0.934 -0.863 -0.022

Eto4 46 0.504 -0.325 0.352 0.103 0.289 0.288 0.279 0.215 0.469

DL4 47 -0.313 0.654 -0.484 -0.523 -0.499 -0.499 -0.507 -0.554 0.064

Alt 48 -0.877 0.445 -0.965 -0.906 -0.965 -0.965 -0.968 -0.952 0.261

Lat 49 -0.995 0.437 -0.903 -0.813 -0.895 -0.895 -0.887 -0.814 -0.034

Long 50 0.127 -0.193 0.505 0.540 0.521 0.522 0.543 0.645 -0.665

pH_H2O 51 0.936 -0.547 0.811 0.767 0.814 0.814 0.805 0.735 0.009

P 52 0.686 -0.431 0.427 0.293 0.397 0.397 0.381 0.284 0.569

K 53 0.385 -0.179 0.514 0.498 0.519 0.520 0.527 0.543 -0.310

Ca 54 0.857 -0.495 0.891 0.773 0.873 0.873 0.868 0.827 -0.024

Mg 55 0.828 -0.593 0.675 0.513 0.642 0.642 0.634 0.578 0.086

Resist 56 -0.445 0.092 -0.433 -0.295 -0.404 -0.404 -0.394 -0.337 -0.148

APP_N 57 -0.270 0.508 -0.183 -0.061 -0.152 -0.152 -0.153 -0.162 -0.023

10 11 12 13 14 15 16 17 18

DL2 19 1.000

rain3 20 -0.587 1.000

Tave3 21 0.916 -0.548 1.000

HU0_3 22 0.922 -0.541 1.000 1.000

HU5_3 23 0.922 -0.543 1.000 1.000 1.000

HU10_3 24 0.921 -0.544 1.000 1.000 1.000 1.000

HU15_3 25 0.913 -0.543 0.999 0.999 0.999 0.999 1.000

WS3 26 -0.936 0.510 -0.935 -0.939 -0.938 -0.938 -0.930 1.000

rad3 27 -0.061 -0.041 -0.341 -0.334 -0.334 -0.335 -0.349 0.166 1.000

DL3 28 -0.951 0.465 -0.915 -0.921 -0.921 -0.919 -0.913 0.910 0.127

rain4 29 -0.656 0.964 -0.635 -0.630 -0.631 -0.632 -0.633 0.561 0.037

Tx4 30 0.916 -0.536 0.992 0.991 0.991 0.991 0.991 -0.939 -0.322

Tn4 31 0.882 -0.449 0.983 0.984 0.984 0.984 0.982 -0.927 -0.423

WS4 32 -0.905 0.519 -0.915 -0.916 -0.916 -0.916 -0.910 0.959 0.170

RHx4 33 -0.250 0.423 -0.224 -0.225 -0.225 -0.224 -0.216 0.163 0.065

RHn4 34 -0.514 0.537 -0.538 -0.534 -0.535 -0.534 -0.529 0.476 0.117

rad4 35 -0.027 -0.073 -0.307 -0.300 -0.300 -0.302 -0.314 0.138 0.987

ETx4 36 0.871 -0.507 0.980 0.980 0.980 0.980 0.978 -0.928 -0.365

ETn4 37 0.624 -0.128 0.665 0.671 0.670 0.669 0.664 -0.664 -0.228

frost4 38 -0.537 0.136 -0.476 -0.478 -0.477 -0.476 -0.469 0.557 -0.071

HU0_4 39 0.914 -0.502 0.993 0.994 0.994 0.994 0.992 -0.943 -0.353

HU5_4 40 0.914 -0.503 0.994 0.994 0.994 0.994 0.993 -0.943 -0.353

HU10_4 41 0.911 -0.504 0.994 0.994 0.994 0.994 0.994 -0.940 -0.360

HU15_4 42 0.894 -0.505 0.995 0.994 0.994 0.994 0.995 -0.924 -0.391

RC4 43 -0.948 0.505 -0.978 -0.981 -0.981 -0.980 -0.975 0.963 0.275

IC4 44 -0.934 0.455 -0.944 -0.948 -0.948 -0.947 -0.939 0.958 0.246

PC4 45 -0.954 0.507 -0.926 -0.931 -0.931 -0.930 -0.919 0.968 0.141

Eto4 46 0.489 -0.595 0.379 0.377 0.378 0.377 0.371 -0.407 0.311

DL4 47 -0.256 -0.251 -0.395 -0.399 -0.397 -0.396 -0.405 0.283 0.302

Alt 48 -0.877 0.437 -0.979 -0.979 -0.978 -0.979 -0.980 0.925 0.433

Lat 49 -0.995 0.568 -0.936 -0.942 -0.942 -0.941 -0.934 0.950 0.101

Long 50 0.126 0.073 0.475 0.462 0.462 0.464 0.481 -0.325 -0.805

pH_H2O 51 0.921 -0.402 0.851 0.860 0.859 0.858 0.850 -0.846 -0.107

P 52 0.653 -0.356 0.394 0.406 0.406 0.404 0.390 -0.516 0.456

K 53 0.401 -0.196 0.511 0.501 0.501 0.502 0.511 -0.409 -0.271

Ca 54 0.842 -0.354 0.855 0.856 0.855 0.855 0.849 -0.869 -0.242

Mg 55 0.810 -0.505 0.719 0.724 0.724 0.723 0.715 -0.685 -0.031

Resist 56 -0.456 0.042 -0.402 -0.399 -0.398 -0.399 -0.393 0.498 -0.180

APP_N 57 -0.246 0.191 -0.216 -0.220 -0.219 -0.217 -0.217 0.107 0.086

19 20 21 22 23 24 25 26 27

DL3 28 1.000

rain4 29 0.587 1.000

Tx4 30 -0.931 -0.633 1.000

Tn4 31 -0.895 -0.539 0.976 1.000

WS4 32 0.891 0.571 -0.925 -0.889 1.000

RHx4 33 0.308 0.536 -0.238 -0.204 0.102 1.000

RHn4 34 0.564 0.652 -0.565 -0.476 0.550 0.728 1.000

rad4 35 0.068 -0.016 -0.273 -0.397 0.135 0.010 0.049 1.000

ETx4 36 -0.892 -0.598 0.973 0.966 -0.892 -0.269 -0.567 -0.328 1.000

ETn4 37 -0.718 -0.203 0.663 0.727 -0.591 -0.040 -0.089 -0.194 0.644

frost4 38 0.556 0.151 -0.485 -0.492 0.557 0.090 0.166 -0.080 -0.454

HU0_4 39 -0.929 -0.597 0.996 0.990 -0.919 -0.227 -0.533 -0.312 0.975

HU5_4 40 -0.928 -0.598 0.996 0.990 -0.919 -0.227 -0.533 -0.312 0.975

HU10_4 41 -0.926 -0.600 0.997 0.990 -0.916 -0.224 -0.531 -0.319 0.975

HU15_4 42 -0.912 -0.603 0.995 0.988 -0.905 -0.221 -0.531 -0.350 0.975

RC4 43 0.951 0.596 -0.983 -0.978 0.922 0.246 0.522 0.236 -0.959

IC4 44 0.945 0.547 -0.959 -0.958 0.913 0.251 0.518 0.205 -0.927

PC4 45 0.946 0.583 -0.941 -0.927 0.923 0.261 0.529 0.101 -0.912

Eto4 46 -0.453 -0.643 0.402 0.272 -0.508 -0.480 -0.825 0.365 0.353

DL4 47 0.463 -0.062 -0.428 -0.439 0.283 0.218 0.300 0.238 -0.434

Alt 48 0.891 0.527 -0.981 -0.983 0.923 0.137 0.498 0.396 -0.958

Lat 49 0.967 0.646 -0.940 -0.906 0.922 0.256 0.532 0.061 -0.899

Long 50 -0.215 0.014 0.472 0.541 -0.372 0.171 -0.136 -0.797 0.496

pH_H2O 51 -0.943 -0.519 0.848 0.829 -0.826 -0.278 -0.539 -0.072 0.835

P 52 -0.650 -0.444 0.427 0.337 -0.481 -0.459 -0.443 0.516 0.352

K 53 -0.392 -0.230 0.528 0.516 -0.449 -0.020 -0.303 -0.277 0.463

Ca 54 -0.893 -0.462 0.877 0.847 -0.938 -0.163 -0.622 -0.189 0.829

Mg 55 -0.819 -0.628 0.726 0.649 -0.746 -0.460 -0.788 0.017 0.695

Resist 56 0.448 0.062 -0.414 -0.385 0.621 -0.235 0.208 -0.171 -0.319

APP_N 57 0.319 0.311 -0.228 -0.151 0.230 0.429 0.713 0.038 -0.232

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 -0.637 1.000

HU0_4 39 0.695 -0.496 1.000

HU5_4 40 0.693 -0.495 1.000 1.000

HU10_4 41 0.689 -0.486 1.000 1.000 1.000

HU15_4 42 0.677 -0.466 0.997 0.997 0.998 1.000

RC4 43 -0.707 0.516 -0.990 -0.989 -0.988 -0.978 1.000

IC4 44 -0.714 0.526 -0.969 -0.968 -0.965 -0.948 0.989 1.000

PC4 45 -0.699 0.569 -0.946 -0.946 -0.941 -0.919 0.976 0.989 1.000

Eto4 46 -0.032 -0.112 0.356 0.357 0.355 0.346 -0.374 -0.367 -0.421

DL4 47 -0.533 0.305 -0.437 -0.435 -0.436 -0.446 0.401 0.401 0.345

Alt 48 -0.675 0.465 -0.986 -0.986 -0.987 -0.989 0.966 0.941 0.908

Lat 49 -0.643 0.537 -0.938 -0.937 -0.935 -0.920 0.965 0.950 0.963

Long 50 0.332 -0.049 0.489 0.489 0.497 0.528 -0.390 -0.360 -0.260

pH_H2O 51 0.633 -0.499 0.854 0.853 0.849 0.834 -0.881 -0.877 -0.886

P 52 0.287 -0.378 0.409 0.408 0.402 0.371 -0.490 -0.517 -0.571

K 53 0.157 -0.238 0.523 0.524 0.527 0.537 -0.477 -0.473 -0.426

Ca 54 0.594 -0.498 0.874 0.873 0.870 0.859 -0.875 -0.886 -0.876

Mg 55 0.274 -0.286 0.706 0.706 0.704 0.695 -0.728 -0.715 -0.730

Resist 56 -0.228 0.365 -0.409 -0.408 -0.404 -0.389 0.415 0.453 0.461

APP_N 57 0.103 -0.162 -0.202 -0.202 -0.202 -0.212 0.192 0.171 0.169

```
            37     38     39     40     41     42     43     44     45

 Eto4  46  1.000
  DL4  47 -0.043  1.000
  Alt  48 -0.319  0.444  1.000
  Lat  49 -0.478  0.296  0.904  1.000
 Long  50 -0.174 -0.461 -0.584 -0.181  1.000
pH_H2O  51  0.431 -0.426 -0.820 -0.925  0.129  1.000
    P  52  0.607 -0.172 -0.324 -0.637 -0.466  0.604  1.000
    K  53  0.108 -0.292 -0.548 -0.402  0.497  0.357 -0.040  1.000
   Ca  54  0.531 -0.414 -0.887 -0.867  0.395  0.841  0.503  0.393  1.000
   Mg  55  0.707 -0.244 -0.679 -0.817  0.011  0.851  0.655  0.324  0.801
Resist  56 -0.373  0.069  0.447  0.465 -0.146 -0.392 -0.398 -0.369 -0.653
APP_N  57 -0.580  0.297  0.220  0.257 -0.018 -0.429 -0.214 -0.219 -0.369

            46     47     48     49     50     51     52     53     54

   Mg  55  1.000
Resist  56 -0.455  1.000
APP_N  57 -0.698  0.092  1.000

            55     56     57
```

5

Appendix 3.8.2 Correlation matrix for all cultivars combined over areas

JPcorrAREAyld.out

file is JPfyieldFS.gen

========== CACTUS PEAR ENVIRONMENTAL ADAPTIBILITY: FRUIT YIELD

===== Correlations for Area 1 =====

*** Degrees of freedom ***

Correlations: 74

*** Correlation matrix ***

fyield	1	1.000									
Tclleftprun	2	0.630	1.000								
Tfertclad	3	0.920	0.725	1.000							
Tftotal	4	0.616	0.432	0.537	1.000						
Tfnoat	5	0.965	0.641	0.964	0.629	1.000					
Tn1	6	0.097	0.415	0.126	0.111	0.085	1.000				
RC1	7	-0.155	-0.349	-0.101	-0.190	-0.121	-0.888	1.000			
IC1	8	-0.112	-0.352	-0.095	-0.028	-0.069	-0.750	0.801	1.000		
C1	9	-0.045	-0.480	-0.075	0.058	-0.029	-0.665	0.770	0.784	1.000	
DL1	10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
rain2	11	0.052	0.296	0.155	0.175	0.078	-0.072	0.372	0.453	0.421	
Tx2	12	0.174	-0.166	-0.019	0.242	0.112	-0.221	-0.236	-0.172	-0.128	
Tn2	13	0.085	0.420	0.112	0.067	0.070	0.990	-0.908	-0.821	-0.747	
HU0_2	14	0.215	0.149	0.066	0.273	0.152	0.498	-0.827	-0.699	-0.599	
HU5_2	15	0.215	0.149	0.066	0.273	0.152	0.498	-0.827	-0.699	-0.599	
HU10_2	16	0.215	0.149	0.066	0.273	0.152	0.498	-0.827	-0.699	-0.599	
HU15_2	17	0.214	0.100	0.054	0.276	0.149	0.450	-0.793	-0.663	-0.546	

Rad2 18 -0.082 -0.338 -0.108 -0.092 -0.073 -0.846 0.659 0.680 0.370

DL2 19 -0.089 0.245 0.070 -0.096 -0.040 0.138 0.280 0.207 0.249

rain3 20 0.012 0.242 0.084 -0.137 -0.014 0.166 -0.145 -0.490 -0.533

Tave3 21 0.049 -0.315 -0.034 0.263 0.061 -0.021 0.032 0.510 0.583

HU0_3 22 0.037 -0.267 -0.031 0.238 0.053 0.130 -0.098 0.418 0.451

HU5_3 23 0.039 -0.267 -0.030 0.241 0.054 0.121 -0.090 0.424 0.461

HU10_3 24 0.040 -0.266 -0.030 0.245 0.056 0.113 -0.082 0.429 0.471

HU15_3 25 0.041 -0.268 -0.030 0.246 0.056 0.101 -0.067 0.438 0.487

WS3 26 -0.185 -0.315 -0.208 -0.197 -0.134 0.397 -0.358 -0.013 -0.010

rad3 27 -0.118 -0.458 -0.099 -0.129 -0.102 -0.668 0.720 0.668 0.615

DL3 28 -0.089 0.245 0.070 -0.096 -0.040 0.138 0.280 0.207 0.249

rain4 29 0.018 0.297 0.109 -0.124 -0.006 0.165 -0.097 -0.454 -0.502

Tx4 30 0.069 -0.482 -0.104 0.245 0.055 -0.355 0.106 0.455 0.550

Tn4 31 0.106 0.265 0.107 0.219 0.104 0.885 -0.757 -0.402 -0.327

WS4 32 0.159 0.401 0.168 0.264 0.142 0.933 -0.838 -0.528 -0.507

RHx4 33 -0.081 0.239 0.088 -0.134 -0.048 -0.386 0.642 0.457 0.192

RHn4 34 0.228 0.686 0.307 0.339 0.202 0.695 -0.522 -0.375 -0.469

rad4 35 -0.100 -0.478 -0.110 -0.105 -0.090 -0.750 0.709 0.676 0.583

ETx4 36 0.137 -0.229 -0.007 0.293 0.103 -0.024 -0.267 0.154 0.029

ETn4 37 0.121 0.374 0.111 0.229 0.116 0.692 -0.760 -0.280 -0.592

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 0.129 -0.188 -0.006 0.328 0.113 0.353 -0.470 0.011 0.147

HU5_4 40 0.130 -0.188 -0.005 0.331 0.114 0.344 -0.461 0.019 0.158

HU10_4 41 0.131 -0.188 -0.005 0.333 0.115 0.335 -0.452 0.027 0.169

HU15_4 42 0.123 -0.225 -0.015 0.328 0.109 0.277 -0.390 0.083 0.236

RC4 43 -0.116 -0.341 -0.095 -0.164 -0.099 -0.944 0.964 0.684 0.692

IC4 44 -0.100 -0.338 -0.086 -0.011 -0.060 -0.754 0.790 0.998 0.762

PC4 45 -0.041 -0.478 -0.072 0.063 -0.026 -0.668 0.770 0.776 1.000

Eto4 46 -0.264 -0.565 -0.259 -0.371 -0.217 -0.891 0.846 0.701 0.603

DL4 47 0.073 -0.036 0.022 0.198 0.074 -0.320 0.322 0.358 0.535

Alt 48 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Lat 49 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Long	50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
pH_H2O	51	-0.300	-0.368	-0.233	-0.505	-0.253	0.146	-0.042	-0.121	-0.172
P	52	0.108	0.102	0.071	0.016	0.051	-0.210	0.001	-0.378	-0.338
K	53	-0.019	-0.293	-0.008	0.009	-0.019	-0.064	0.338	0.120	0.660
Ca	54	-0.157	-0.305	-0.167	-0.298	-0.145	-0.843	0.661	0.361	0.211
Mg	55	-0.229	-0.645	-0.286	-0.397	-0.213	-0.616	0.478	0.172	0.339
Resist	56	0.041	0.323	0.035	0.096	0.054	0.758	-0.791	-0.387	-0.588
APP_N	57	0.321	0.706	0.341	0.506	0.278	0.436	-0.389	-0.220	-0.304

		1	2	3	4	5	6	7	8	9
DL1	10	0.000								
rain2	11	0.000	1.000							
Tx2	12	0.000	-0.638	1.000						
Tn2	13	0.000	-0.165	-0.166	1.000					
HU0_2	14	0.000	-0.628	0.734	0.546	1.000				
HU5_2	15	0.000	-0.628	0.734	0.546	1.000	1.000			
HU10_2	16	0.000	-0.628	0.734	0.546	1.000	1.000	1.000		
HU15_2	17	0.000	-0.647	0.770	0.497	0.997	0.997	0.997	1.000	
Rad2	18	0.000	-0.186	0.319	-0.825	-0.312	-0.312	-0.312	-0.275	1.000
DL2	19	0.000	0.862	-0.892	0.071	-0.694	-0.694	-0.694	-0.726	-0.420
rain3	20	0.000	-0.452	-0.022	0.250	0.118	0.118	0.118	0.090	0.097
Tave3	21	0.000	0.284	0.009	-0.138	-0.052	-0.052	-0.052	-0.017	-0.012
HU0_3	22	0.000	0.232	-0.051	0.014	-0.002	-0.002	-0.002	0.024	-0.087
HU5_3	23	0.000	0.245	-0.050	0.005	-0.007	-0.007	-0.007	0.020	-0.090
HU10_3	24	0.000	0.258	-0.049	-0.004	-0.011	-0.011	-0.011	0.016	-0.092
HU15_3	25	0.000	0.272	-0.051	-0.017	-0.021	-0.021	-0.021	0.006	-0.093
WS3	26	0.000	-0.112	-0.150	0.356	0.128	0.128	0.128	0.134	-0.379
rad3	27	0.000	-0.069	-0.083	-0.692	-0.557	-0.557	-0.557	-0.516	0.764
DL3	28	0.000	0.862	-0.892	0.071	-0.694	-0.694	-0.694	-0.726	-0.420
rain4	29	0.000	-0.332	-0.121	0.241	0.030	0.030	0.030	-0.002	0.071
Tx4	30	0.000	-0.117	0.566	-0.411	0.223	0.223	0.223	0.282	0.298

Tn4 31 0.000 0.137 -0.253 0.818 0.368 0.368 0.368 0.337 -0.761

WS4 32 0.000 0.039 -0.186 0.886 0.464 0.464 0.464 0.425 -0.708

RHx4 33 0.000 0.565 -0.607 -0.398 -0.800 -0.800 -0.800 -0.824 0.374

RHn4 34 0.000 0.372 -0.359 0.654 0.153 0.153 0.153 0.098 -0.498

rad4 35 0.000 -0.163 0.099 -0.761 -0.451 -0.451 -0.451 -0.405 0.866

ETx4 36 0.000 -0.465 0.614 -0.051 0.492 0.492 0.492 0.525 0.380

ETn4 37 0.000 -0.060 0.039 0.662 0.494 0.494 0.494 0.458 -0.310

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 0.000 -0.077 0.296 0.274 0.470 0.470 0.470 0.494 -0.286

HU5_4 40 0.000 -0.063 0.296 0.264 0.464 0.464 0.464 0.488 -0.287

HU10_4 41 0.000 -0.050 0.295 0.255 0.457 0.457 0.457 0.482 -0.289

HU15_4 42 0.000 -0.026 0.291 0.193 0.413 0.413 0.413 0.441 -0.254

RC4 43 0.000 0.219 -0.025 -0.937 -0.671 -0.671 -0.671 -0.633 0.704

IC4 44 0.000 0.431 -0.141 -0.823 -0.676 -0.676 -0.676 -0.640 0.710

PC4 45 0.000 0.416 -0.120 -0.749 -0.594 -0.594 -0.594 -0.540 0.370

Eto4 46 0.000 -0.022 0.034 -0.871 -0.581 -0.581 -0.581 -0.537 0.719

DL4 47 0.000 0.610 0.034 -0.373 -0.194 -0.194 -0.194 -0.174 -0.129

Alt 48 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Lat 49 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Long 50 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

pH_H2O 51 0.000 -0.535 -0.268 0.184 -0.130 -0.130 -0.130 -0.130 0.071

P 52 0.000 -0.574 0.501 -0.107 0.323 0.323 0.323 0.326 0.350

K 53 0.000 0.302 -0.380 -0.127 -0.391 -0.391 -0.391 -0.364 -0.292

Ca 54 0.000 -0.249 0.322 -0.762 -0.274 -0.274 -0.274 -0.245 0.753

Mg 55 0.000 -0.525 0.321 -0.549 -0.124 -0.124 -0.124 -0.075 0.457

Resist 56 0.000 0.020 -0.043 0.738 0.481 0.481 0.481 0.443 -0.581

APP_N 57 0.000 0.519 -0.085 0.391 0.217 0.217 0.217 0.175 -0.379

10 11 12 13 14 15 16 17 18

DL2 19 1.000

rain3 20 -0.258 1.000

Tave3 21 0.065 -0.775 1.000

HU0_3 22 0.062 -0.696 0.981 1.000

HU5_3 23 0.071 -0.711 0.984 1.000 1.000

HU10_3 24 0.079 -0.726 0.987 0.999 1.000 1.000

HU15_3 25 0.091 -0.740 0.990 0.997 0.999 1.000 1.000

WS3 26 0.076 -0.545 0.564 0.643 0.641 0.637 0.633 1.000

rad3 27 -0.141 0.185 0.161 0.118 0.111 0.104 0.102 -0.254 1.000

DL3 28 1.000 -0.258 0.065 0.062 0.071 0.079 0.091 0.076 -0.141

rain4 29 -0.143 0.991 -0.782 -0.706 -0.720 -0.733 -0.746 -0.590 0.184

Tx4 30 -0.421 -0.706 0.786 0.702 0.708 0.714 0.719 0.357 0.189

Tn4 31 0.217 -0.220 0.439 0.567 0.561 0.556 0.546 0.603 -0.529

WS4 32 0.102 0.036 0.246 0.393 0.384 0.375 0.361 0.396 -0.518

RHx4 33 0.547 0.298 -0.342 -0.364 -0.363 -0.362 -0.358 -0.566 0.432

RHn4 34 0.328 0.280 -0.068 0.039 0.033 0.027 0.018 -0.177 -0.377

rad4 35 -0.293 0.162 0.141 0.084 0.077 0.071 0.069 -0.291 0.979

ETx4 36 -0.741 -0.092 0.520 0.552 0.542 0.531 0.517 0.181 0.280

ETn4 37 -0.139 -0.045 0.258 0.399 0.389 0.380 0.362 0.393 -0.441

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 -0.237 -0.605 0.844 0.874 0.873 0.872 0.868 0.655 -0.203

HU5_4 40 -0.227 -0.620 0.848 0.875 0.875 0.874 0.871 0.653 -0.209

HU10_4 41 -0.218 -0.634 0.852 0.876 0.876 0.876 0.873 0.651 -0.214

HU15_4 42 -0.204 -0.669 0.879 0.892 0.893 0.894 0.892 0.645 -0.172

RC4 43 0.105 -0.054 -0.112 -0.262 -0.253 -0.243 -0.228 -0.491 0.667

IC4 44 0.168 -0.462 0.500 0.410 0.415 0.420 0.428 -0.042 0.681

PC4 45 0.243 -0.524 0.575 0.441 0.451 0.461 0.477 -0.024 0.615

Eto4 46 -0.033 -0.223 0.018 -0.096 -0.090 -0.084 -0.073 -0.045 0.614

DL4 47 0.394 -0.801 0.377 0.232 0.254 0.276 0.299 0.040 -0.277

Alt 48 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Lat 49 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Long 50 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

pH_H2O 51 -0.141 0.416 -0.157 -0.044 -0.061 -0.078 -0.093 0.409 0.364

P 52 -0.590 0.791 -0.726 -0.747 -0.754 -0.760 -0.765 -0.741 0.183

K 53 0.433 -0.182 0.303 0.244 0.250 0.255 0.267 0.068 0.274

Ca 54 -0.296 0.154 -0.441 -0.554 -0.549 -0.544 -0.537 -0.437 0.422

Mg 55 -0.379 0.047 -0.178 -0.264 -0.262 -0.261 -0.255 0.022 0.437

Resist 56 0.062 -0.291 0.237 0.358 0.355 0.352 0.342 0.630 -0.741

APP_N 57 0.273 -0.009 0.015 0.039 0.043 0.047 0.048 -0.333 -0.491

19 20 21 22 23 24 25 26 27

DL3 28 1.000

rain4 29 -0.143 1.000

Tx4 30 -0.421 -0.767 1.000

Tn4 31 0.217 -0.214 0.007 1.000

WS4 32 0.102 0.041 -0.150 0.955 1.000

RHx4 33 0.547 0.398 -0.553 -0.436 -0.355 1.000

RHn4 34 0.328 0.347 -0.486 0.633 0.781 0.215 1.000

rad4 35 -0.293 0.144 0.286 -0.617 -0.596 0.362 -0.463 1.000

ETx4 36 -0.741 -0.173 0.666 0.182 0.228 -0.470 -0.040 0.372 1.000

ETn4 37 -0.139 -0.061 0.011 0.757 0.826 -0.291 0.640 -0.433 0.474

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 -0.237 -0.655 0.737 0.674 0.545 -0.741 0.062 -0.188 0.655

HU5_4 40 -0.227 -0.668 0.743 0.669 0.536 -0.739 0.057 -0.192 0.645

HU10_4 41 -0.218 -0.682 0.749 0.664 0.527 -0.737 0.052 -0.197 0.636

HU15_4 42 -0.204 -0.715 0.784 0.624 0.475 -0.719 0.004 -0.155 0.629

RC4 43 0.105 -0.024 0.118 -0.888 -0.933 0.558 -0.600 0.696 -0.248

IC4 44 0.168 -0.428 0.457 -0.410 -0.522 0.462 -0.357 0.695 0.193

PC4 45 0.243 -0.494 0.548 -0.334 -0.512 0.191 -0.469 0.584 0.027

Eto4 46 -0.033 -0.236 0.284 -0.791 -0.911 0.297 -0.856 0.665 -0.115

DL4 47 0.394 -0.757 0.430 -0.096 -0.288 -0.050 -0.236 -0.247 -0.299

Alt 48 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Lat 49 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Long 50 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

pH_H2O 51 -0.141 0.366 -0.251 0.036 0.033 -0.047 -0.248 0.295 0.050

P 52 -0.590 0.751 -0.304 -0.558 -0.319 0.090 -0.068 0.266 0.074

K 53 0.433 -0.144 0.096 0.063 -0.080 0.004 -0.146 0.143 -0.304

Ca 54 -0.296 0.128 0.038 -0.966 -0.941 0.313 -0.722 0.534 -0.145

Mg 55 -0.379 -0.022 0.250 -0.686 -0.766 -0.158 -0.936 0.500 -0.042

Resist 56 0.062 -0.306 0.005 0.805 0.772 -0.445 0.465 -0.740 0.159

APP_N 57 0.273 0.061 -0.221 0.441 0.557 0.168 0.858 -0.506 -0.026

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 0.000 0.000

HU0_4 39 0.523 0.000 1.000

HU5_4 40 0.513 0.000 1.000 1.000

HU10_4 41 0.504 0.000 0.999 1.000 1.000

HU15_4 42 0.452 0.000 0.995 0.996 0.998 1.000

RC4 43 -0.838 0.000 -0.536 -0.526 -0.517 -0.457 1.000

IC4 44 -0.255 0.000 0.010 0.017 0.024 0.079 0.678 1.000

PC4 45 -0.601 0.000 0.142 0.153 0.164 0.230 0.696 0.755 1.000

Eto4 46 -0.691 0.000 -0.346 -0.339 -0.332 -0.275 0.855 0.688 0.601

DL4 47 -0.320 0.000 0.185 0.206 0.227 0.268 0.324 0.328 0.535

Alt 48 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Lat 49 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Long 50 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

pH_H2O 51 -0.011 0.000 -0.119 -0.135 -0.150 -0.161 -0.111 -0.129 -0.177

P 52 -0.286 0.000 -0.532 -0.540 -0.547 -0.563 0.215 -0.343 -0.324

K 53 -0.568 0.000 0.103 0.109 0.115 0.152 0.266 0.081 0.665

Ca 54 -0.660 0.000 -0.619 -0.614 -0.610 -0.575 0.797 0.368 0.216

Mg 55 -0.730 0.000 -0.249 -0.248 -0.247 -0.209 0.586 0.157 0.343

Resist 56 0.868 0.000 0.531 0.529 0.525 0.478 -0.866 -0.387 -0.599

APP_N 57 0.520 0.000 0.109 0.113 0.117 0.085 -0.405 -0.200 -0.302

37 38 39 40 41 42 43 44 45

Eto4 46 1.000

DL4 47 0.237 1.000

Alt 48 0.000 0.000 0.000

Lat 49 0.000 0.000 0.000 0.000

Long 50 0.000 0.000 0.000 0.000 0.000

pH_H2O 51 0.194 -0.734 0.000 0.000 0.000 1.000

P 52 0.006 -0.454 0.000 0.000 0.000 0.044 1.000

K 53 0.105 0.289 0.000 0.000 0.000 0.068 -0.246 1.000

Ca 54 0.824 0.079 0.000 0.000 0.000 0.041 0.500 -0.218 1.000

Mg 55 0.776 -0.007 0.000 0.000 0.000 0.417 0.318 0.214 0.740

Resist 56 -0.618 -0.028 0.000 0.000 0.000 -0.043 -0.501 -0.451 -0.649

APP_N 57 -0.728 0.191 0.000 0.000 0.000 -0.703 -0.061 -0.223 -0.529

46 47 48 49 50 51 52 53 54

Mg 55 1.000

Resist 56 -0.604 1.000

APP_N 57 -0.908 0.405 1.000

55 56 57

===== Correlations for Area 2 =====

*** Degrees of freedom ***

Correlations: 75

*** Correlation matrix ***

fyield 1 1.000

Tclleftprun 2 0.544 1.000

Tfertclad 3 0.855 0.778 1.000

Tftotal 4 0.828 0.561 0.808 1.000

Tfnoat 5 0.937 0.496 0.842 0.845 1.000

Tn1 6 0.330 0.371 0.374 0.355 0.212 1.000

RC1 7 -0.383 -0.509 -0.473 -0.439 -0.274 -0.917 1.000

IC1 8 -0.417 -0.502 -0.493 -0.457 -0.300 -0.926 0.986 1.000

C1 9 -0.307 -0.663 -0.463 -0.286 -0.198 -0.746 0.896 0.886 1.000

DL1 10 0.169 -0.110 -0.012 0.116 0.110 0.637 -0.680 -0.642 -0.468

rain2 11 -0.037 0.553 0.201 -0.071 -0.026 -0.376 0.260 0.250 -0.137

Tx2 12 0.404 0.455 0.468 0.463 0.317 0.686 -0.905 -0.898 -0.849

Tn2 13 0.308 0.324 0.315 0.265 0.185 0.957 -0.934 -0.951 -0.826

HU0_2 14 0.390 0.433 0.436 0.412 0.285 0.824 -0.964 -0.966 -0.888

HU5_2 15 0.390 0.433 0.436 0.412 0.285 0.824 -0.964 -0.966 -0.888

HU10_2 16 0.395 0.427 0.439 0.422 0.291 0.820 -0.962 -0.965 -0.879

HU15_2 17 0.393 0.252 0.354 0.409 0.298 0.774 -0.897 -0.910 -0.748

Rad2 18 0.415 0.799 0.559 0.459 0.356 0.364 -0.611 -0.597 -0.766

DL2 19 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

rain3 20 0.158 0.237 0.268 0.215 0.063 0.831 -0.602 -0.625 -0.424

Tave3 21 -0.095 -0.183 -0.113 0.091 -0.034 -0.048 -0.034 0.106 0.197

HU0_3 22 -0.107 -0.171 -0.116 0.074 -0.051 -0.001 -0.063 0.080 0.168

HU5_3 23 -0.108 -0.171 -0.117 0.073 -0.050 -0.016 -0.053 0.090 0.174

HU10_3 24 -0.109 -0.171 -0.117 0.073 -0.050 -0.030 -0.044 0.100 0.181

HU15_3 25 -0.103 -0.200 -0.119 0.087 -0.039 -0.068 -0.017 0.122 0.215

WS3 26 0.112 -0.505 -0.047 0.220 0.122 0.083 -0.056 -0.104 0.283

rad3 27 0.400 0.907 0.646 0.493 0.345 0.298 -0.489 -0.495 -0.679

DL3 28 -0.151 0.048 -0.024 -0.064 -0.053 -0.866 0.728 0.731 0.515

rain4 29 0.136 0.548 0.380 0.174 0.048 0.615 -0.453 -0.481 -0.500

Tx4 30 0.161 0.152 0.188 0.298 0.160 0.241 -0.534 -0.431 -0.420

Tn4 31 0.177 0.047 0.156 0.340 0.144 0.659 -0.602 -0.520 -0.255

WS4 32 0.192 -0.241 0.092 0.375 0.188 0.384 -0.426 -0.387 -0.033

RHx4 33 0.014 0.569 0.359 0.126 -0.012 0.092 -0.049 -0.056 -0.219

RHn4 34 0.081 0.584 0.426 0.241 0.049 0.213 -0.159 -0.162 -0.249

rad4 35 0.422 0.875 0.632 0.499 0.364 0.320 -0.549 -0.552 -0.729

ETx4 36 -0.368 -0.261 -0.394 -0.396 -0.321 -0.139 0.059 0.209 0.053

ETn4 37 0.297 0.495 0.364 0.337 0.212 0.757 -0.568 -0.574 -0.457

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 0.193 0.146 0.206 0.339 0.167 0.513 -0.691 -0.589 -0.476

HU5_4 40 0.192 0.146 0.206 0.339 0.167 0.502 -0.683 -0.581 -0.471

HU10_4 41 0.190 0.136 0.202 0.343 0.169 0.478 -0.664 -0.560 -0.448

HU15_4 42 0.111 -0.057 0.067 0.275 0.123 0.284 -0.448 -0.336 -0.188

RC4 43 -0.353 -0.417 -0.424 -0.419 -0.251 -0.897 0.990 0.968 0.853

IC4 44 -0.386 -0.495 -0.461 -0.401 -0.268 -0.916 0.986 0.996 0.915

PC4 45 -0.290 -0.653 -0.443 -0.258 -0.182 -0.735 0.885 0.873 0.999

Eto4 46 0.094 -0.291 -0.208 -0.024 0.128 -0.281 0.203 0.182 0.235

DL4 47 -0.169 0.110 0.012 -0.116 -0.110 -0.637 0.680 0.642 0.468

Alt 48 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Lat 49 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Long 50 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

pH_H2O 51 -0.294 -0.396 -0.414 -0.438 -0.327 0.400 -0.207 -0.148 -0.090

P 52 0.381 -0.041 0.144 0.382 0.353 0.321 -0.395 -0.422 -0.181

K 53 0.151 0.161 0.190 0.067 0.091 0.207 -0.445 -0.493 -0.588

Ca 54 0.090 -0.311 -0.151 -0.091 0.015 0.527 -0.262 -0.352 -0.090

Mg 55 -0.275 -0.897 -0.600 -0.418 -0.238 -0.221 0.386 0.357 0.578

Resist 56 -0.333 -0.293 -0.415 -0.451 -0.301 -0.167 0.002 0.121 -0.085

APP_N 57 0.300 0.752 0.626 0.575 0.288 0.192 -0.354 -0.312 -0.380

1 2 3 4 5 6 7 8 9

DL1 10 1.000

rain2 11 -0.716 1.000

Tx2 12 0.667 -0.218 1.000

Tn2 13 0.726 -0.359 0.783 1.000

HU0_2 14 0.722 -0.277 0.972 0.907 1.000

HU5_2 15 0.722 -0.277 0.972 0.907 1.000 1.000

HU10_2 16 0.725 -0.289 0.975 0.901 1.000 1.000 1.000

HU15_2 17 0.816 -0.467 0.945 0.869 0.967 0.967 0.970 1.000

Rad2 18 0.222 0.413 0.691 0.421 0.630 0.630 0.627 0.513 1.000

DL2 19 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

rain3 20 0.220 -0.277 0.257 0.692 0.432 0.432 0.427 0.355 -0.041

Tave3 21 0.334 -0.444 0.029 -0.153 -0.046 -0.046 -0.034 0.006 -0.117

HU0_3 22 0.346 -0.446 0.027 -0.114 -0.032 -0.032 -0.021 0.009 -0.126

HU5_3 23 0.337 -0.438 0.024 -0.127 -0.040 -0.040 -0.029 0.002 -0.124

HU10_3 24 0.329 -0.429 0.020 -0.140 -0.047 -0.047 -0.036 -0.005 -0.121

HU15_3 25 0.319 -0.447 0.021 -0.172 -0.058 -0.058 -0.046 -0.003 -0.138

WS3 26 0.314 -0.776 0.190 0.087 0.157 0.157 0.175 0.356 -0.430

rad3 27 -0.123 0.626 0.510 0.286 0.457 0.457 0.453 0.288 0.917

DL3 28 -0.837 0.653 -0.520 -0.887 -0.684 -0.684 -0.680 -0.723 -0.063

rain4 29 -0.185 0.289 0.132 0.486 0.273 0.273 0.262 0.089 0.191

Tx4 30 0.627 -0.340 0.706 0.300 0.587 0.587 0.597 0.608 0.431

Tn4 31 0.672 -0.674 0.409 0.522 0.466 0.466 0.474 0.501 0.070

WS4 32 0.651 -0.855 0.472 0.336 0.439 0.439 0.457 0.583 -0.104

RHx4 33 -0.656 0.651 -0.129 -0.046 -0.103 -0.103 -0.112 -0.319 0.142

RHn4 34 -0.562 0.518 -0.042 0.043 -0.012 -0.012 -0.018 -0.214 0.152

rad4 35 0.008 0.548 0.612 0.344 0.549 0.549 0.545 0.401 0.967

ETx4 36 0.316 -0.188 -0.086 -0.119 -0.108 -0.108 -0.110 -0.125 -0.169

ETn4 37 0.241 -0.034 0.222 0.601 0.376 0.376 0.370 0.286 0.365

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 0.763 -0.525 0.719 0.511 0.673 0.673 0.682 0.694 0.353

HU5_4 40 0.757 -0.520 0.716 0.500 0.668 0.668 0.677 0.688 0.355

HU10_4 41 0.746 -0.520 0.705 0.474 0.650 0.650 0.660 0.675 0.348

HU15_4 42 0.692 -0.607 0.514 0.264 0.441 0.441 0.454 0.513 0.164

RC4 43 -0.737 0.362 -0.917 -0.920 -0.966 -0.966 -0.966 -0.921 -0.537

IC4 44 -0.657 0.224 -0.903 -0.960 -0.973 -0.973 -0.970 -0.909 -0.605

PC4 45 -0.467 -0.148 -0.836 -0.822 -0.878 -0.878 -0.868 -0.736 -0.759

Eto4 46 0.353 -0.221 0.011 -0.151 -0.048 -0.048 -0.041 0.125 0.143

DL4	47	-1.000	0.716	-0.667	-0.726	-0.722	-0.722	-0.725	-0.816	-0.222
Alt	48	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Lat	49	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Long	50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
pH_H2O	51	0.530	-0.523	-0.045	0.404	0.118	0.118	0.109	0.132	-0.418
P	52	0.708	-0.534	0.524	0.393	0.503	0.503	0.513	0.665	0.364
K	53	0.282	0.041	0.693	0.434	0.636	0.636	0.634	0.621	0.372
Ca	54	0.490	-0.549	0.091	0.567	0.276	0.276	0.271	0.386	-0.237
Mg	55	0.291	-0.691	-0.340	-0.146	-0.288	-0.288	-0.283	-0.075	-0.766
Resist	56	0.438	-0.167	0.103	-0.023	0.059	0.059	0.055	0.067	-0.044
APP_N	57	-0.279	0.421	0.334	0.048	0.243	0.243	0.248	0.087	0.569

		10	11	12	13	14	15	16	17	18
DL2	19	0.000								
rain3	20	0.000	1.000							
Tave3	21	0.000	-0.120	1.000						
HU0_3	22	0.000	-0.058	0.997	1.000					
HU5_3	23	0.000	-0.074	0.998	1.000	1.000				
HU10_3	24	0.000	-0.090	0.999	0.999	1.000	1.000			
HU15_3	25	0.000	-0.131	0.999	0.995	0.996	0.997	1.000		
WS3	26	0.000	0.079	0.181	0.151	0.149	0.148	0.205	1.000	
rad3	27	0.000	0.088	-0.259	-0.262	-0.259	-0.256	-0.275	-0.507	1.000
DL3	28	0.000	-0.665	-0.035	-0.080	-0.064	-0.049	-0.016	-0.219	0.133
rain4	29	0.000	0.840	-0.370	-0.310	-0.321	-0.331	-0.383	-0.359	0.441
Tx4	30	0.000	-0.155	0.665	0.647	0.650	0.652	0.665	0.229	0.180
Tn4	31	0.000	0.531	0.693	0.722	0.712	0.702	0.678	0.278	-0.066
WS4	32	0.000	0.213	0.630	0.617	0.613	0.608	0.636	0.781	-0.282
RHx4	33	0.000	0.433	-0.282	-0.248	-0.249	-0.250	-0.280	-0.461	0.499
RHn4	34	0.000	0.541	-0.187	-0.152	-0.155	-0.158	-0.187	-0.346	0.501
rad4	35	0.000	0.024	-0.228	-0.236	-0.233	-0.230	-0.245	-0.448	0.986
ETx4	36	0.000	-0.210	0.734	0.754	0.754	0.754	0.730	-0.221	-0.353

ETn4 37 0.000 0.739 -0.071 -0.021 -0.034 -0.046 -0.103 -0.318 0.421

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 0.000 0.170 0.704 0.709 0.705 0.701 0.697 0.264 0.114

HU5_4 40 0.000 0.157 0.709 0.712 0.709 0.705 0.702 0.264 0.116

HU10_4 41 0.000 0.135 0.724 0.725 0.722 0.718 0.717 0.275 0.109

HU15_4 42 0.000 -0.013 0.854 0.846 0.845 0.843 0.852 0.369 -0.087

RC4 43 0.000 -0.576 -0.121 -0.147 -0.138 -0.128 -0.107 -0.159 -0.390

IC4 44 0.000 -0.601 0.122 0.094 0.104 0.114 0.139 -0.057 -0.489

PC4 45 0.000 -0.414 0.205 0.175 0.181 0.187 0.223 0.304 -0.669

Eto4 46 0.000 -0.645 0.044 -0.005 0.002 0.008 0.036 0.138 -0.143

DL4 47 0.000 -0.220 -0.334 -0.346 -0.337 -0.329 -0.319 -0.314 0.123

Alt 48 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Lat 49 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Long 50 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

pH_H2O 51 0.000 0.446 0.267 0.325 0.312 0.300 0.256 -0.007 -0.560

P 52 0.000 -0.132 0.127 0.093 0.092 0.091 0.114 0.417 0.069

K 53 0.000 -0.078 -0.410 -0.428 -0.426 -0.424 -0.398 0.216 0.259

Ca 54 0.000 0.480 -0.394 -0.368 -0.380 -0.393 -0.406 0.308 -0.347

Mg 55 0.000 -0.164 0.093 0.083 0.080 0.078 0.106 0.593 -0.931

Resist 56 0.000 -0.392 0.506 0.511 0.513 0.515 0.505 -0.158 -0.316

APP_N 57 0.000 0.206 0.192 0.192 0.195 0.198 0.190 -0.228 0.758

	19	20	21	22	23	24	25	26	27
DL3 28	1.000								
rain4 29	-0.293	1.000							
Tx4 30	-0.213	-0.346	1.000						
Tn4 31	-0.649	0.148	0.556	1.000					
WS4 32	-0.454	-0.271	0.668	0.771	1.000				
RHx4 33	0.314	0.800	-0.351	-0.186	-0.467	1.000			
RHn4 34	0.218	0.832	-0.266	-0.017	-0.299	0.981	1.000		
rad4 35	0.070	0.333	0.292	-0.037	-0.203	0.359	0.364	1.000	

ETx4 36 -0.088 -0.315 0.489 0.357 0.171 -0.252 -0.272 -0.314 1.000

ETn4 37 -0.558 0.717 -0.144 0.528 0.002 0.309 0.398 0.370 -0.212

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 -0.490 -0.127 0.930 0.810 0.779 -0.312 -0.183 0.209 0.480

HU5_4 40 -0.478 -0.137 0.935 0.805 0.778 -0.314 -0.186 0.211 0.483

HU10_4 41 -0.455 -0.160 0.941 0.800 0.786 -0.321 -0.193 0.204 0.486

HU15_4 42 -0.343 -0.356 0.911 0.790 0.839 -0.451 -0.324 0.008 0.564

RC4 43 0.746 -0.369 -0.610 -0.650 -0.530 0.028 -0.090 -0.460 -0.012

IC4 44 0.740 -0.472 -0.438 -0.487 -0.344 -0.046 -0.138 -0.551 0.161

PC4 45 0.515 -0.495 -0.411 -0.239 -0.011 -0.215 -0.239 -0.719 0.034

Eto4 46 0.000 -0.768 0.141 -0.114 0.096 -0.841 -0.867 -0.029 -0.008

DL4 47 0.837 0.185 -0.627 -0.672 -0.651 0.656 0.562 -0.008 -0.316

Alt 48 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Lat 49 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Long 50 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

pH_H2O 51 -0.700 0.149 0.038 0.473 0.197 -0.231 -0.213 -0.543 0.600

P 52 -0.441 -0.435 0.428 0.372 0.546 -0.750 -0.661 0.197 -0.183

K 53 -0.161 -0.055 0.350 -0.274 0.070 -0.104 -0.135 0.355 -0.213

Ca 54 -0.761 0.168 -0.347 0.181 0.146 -0.386 -0.347 -0.313 -0.317

Mg 55 -0.247 -0.554 -0.154 0.008 0.313 -0.716 -0.718 -0.874 0.173

Resist 56 -0.122 -0.484 0.552 0.137 0.119 -0.449 -0.506 -0.225 0.900

APP_N 57 0.292 0.443 0.313 0.217 0.057 0.669 0.738 0.697 -0.155

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 0.000 0.000

HU0_4 39 0.151 0.000 1.000

HU5_4 40 0.141 0.000 1.000 1.000

HU10_4 41 0.122 0.000 0.999 0.999 1.000

HU15_4 42 -0.013 0.000 0.951 0.954 0.961 1.000

RC4 43 -0.484 0.000 -0.762 -0.755 -0.737 -0.541 1.000

IC4 44 -0.547 0.000 -0.585 -0.577 -0.555 -0.324 0.967 1.000

PC4 45 -0.447 0.000 -0.464 -0.459 -0.436 -0.176 0.841 0.905 1.000

Eto4 46 -0.219 0.000 0.022 0.027 0.038 0.154 0.191 0.179 0.232

DL4 47 -0.241 0.000 -0.763 -0.757 -0.746 -0.692 0.737 0.657 0.467

Alt 48 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Lat 49 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Long 50 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

pH_H2O 51 0.229 0.000 0.270 0.261 0.244 0.243 -0.255 -0.187 -0.108

P 52 0.160 0.000 0.454 0.454 0.456 0.468 -0.415 -0.397 -0.167

K 53 -0.351 0.000 0.192 0.193 0.184 0.025 -0.467 -0.531 -0.590

Ca 54 0.398 0.000 -0.113 -0.125 -0.143 -0.180 -0.255 -0.350 -0.093

Mg 55 -0.409 0.000 -0.111 -0.113 -0.107 0.067 0.295 0.350 0.569

Resist 56 -0.413 0.000 0.453 0.456 0.457 0.501 -0.074 0.051 -0.109

APP_N 57 0.304 0.000 0.291 0.294 0.298 0.188 -0.310 -0.274 -0.358

37 38 39 40 41 42 43 44 45

Eto4 46 1.000

DL4 47 -0.353 1.000

Alt 48 0.000 0.000 0.000

Lat 49 0.000 0.000 0.000 0.000

Long 50 0.000 0.000 0.000 0.000 0.000

pH_H2O 51 -0.172 -0.530 0.000 0.000 0.000 1.000

P 52 0.759 -0.708 0.000 0.000 0.000 -0.103 1.000

K 53 0.008 -0.282 0.000 0.000 0.000 -0.164 0.184 1.000

Ca 54 0.229 -0.490 0.000 0.000 0.000 0.491 0.420 0.055 1.000

Mg 55 0.413 -0.291 0.000 0.000 0.000 0.467 0.232 -0.077 0.542

Resist 56 0.203 -0.438 0.000 0.000 0.000 0.518 -0.014 0.163 -0.218

APP_N 57 -0.493 0.279 0.000 0.000 0.000 -0.516 -0.188 -0.022 -0.639

46 47 48 49 50 51 52 53 54

Mg 55 1.000

Resist 56 0.261 1.000

APP_N 57 -0.885 -0.335 1.000

55 56 57

===== Correlations for Area 3 =====

*** Degrees of freedom ***

Correlations: 73

*** Correlation matrix ***

fyield 1 1.000

Tcllefprun 2 0.750 1.000

Tfertclad 3 0.902 0.756 1.000

Tftotal 4 0.679 0.745 0.640 1.000

Tfnoat 5 0.942 0.773 0.974 0.693 1.000

Tn1 6 0.155 0.547 0.174 0.252 0.173 1.000

RC1 7 -0.177 -0.570 -0.181 -0.267 -0.180 -0.866 1.000

IC1 8 -0.157 -0.538 -0.156 -0.230 -0.152 -0.855 0.928 1.000

C1 9 -0.181 -0.570 -0.190 -0.263 -0.183 -0.864 0.980 0.971 1.000

DL1 10 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

rain2 11 0.094 0.241 0.133 0.203 0.134 0.528 -0.120 -0.102 -0.101

Tx2 12 0.103 0.398 0.083 0.130 0.082 0.489 -0.816 -0.757 -0.798

Tn2 13 0.132 0.533 0.137 0.212 0.139 0.960 -0.905 -0.872 -0.883

HU0_2 14 0.127 0.498 0.116 0.182 0.117 0.754 -0.936 -0.889 -0.917

HU5_2 15 0.127 0.498 0.115 0.182 0.116 0.752 -0.935 -0.887 -0.915

HU10_2 16 0.124 0.485 0.109 0.181 0.111 0.675 -0.905 -0.831 -0.870

HU15_2 17 0.049 0.292 0.019 0.064 0.026 0.334 -0.644 -0.520 -0.574

Rad2 18 0.028 0.059 0.032 -0.024 0.010 -0.185 -0.193 -0.222 -0.264

DL2 19 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

rain3 20 -0.081 0.000 -0.075 -0.127 -0.081 0.249 0.051 -0.152 -0.024

Tave3 21 0.071 0.027 0.100 0.104 0.103 0.053 -0.145 0.163 -0.041

HU0_3 22 0.060 0.001 0.085 0.083 0.089 0.049 -0.138 0.164 -0.034

HU5_3 23 0.060 0.000 0.085 0.085 0.089 0.038 -0.133 0.172 -0.027

HU10_3 24 0.065 0.005 0.090 0.097 0.094 0.015 -0.106 0.200 0.001

HU15_3 25 0.050 -0.081 0.082 0.072 0.079 -0.261 0.125 0.420 0.216

WS3 26 -0.250 -0.664 -0.268 -0.429 -0.264 -0.712 0.829 0.694 0.775

rad3 27 0.232 0.450 0.306 0.368 0.269 0.135 -0.237 -0.138 -0.273

DL3 28 0.046 0.124 0.022 0.163 0.049 0.151 -0.022 0.107 0.110

rain4 29 -0.044 0.076 -0.026 -0.050 -0.031 0.390 0.019 -0.161 -0.044

Tx4 30 0.065 0.116 0.066 0.058 0.062 -0.028 -0.400 -0.137 -0.322

Tn4 31 0.148 0.452 0.164 0.257 0.174 0.852 -0.754 -0.583 -0.670

WS4 32 -0.254 -0.565 -0.298 -0.406 -0.273 -0.500 0.554 0.622 0.636

RHx4 33 -0.001 -0.070 0.024 0.041 0.005 -0.397 0.621 0.396 0.520

RHn4 34 0.081 0.165 0.121 0.190 0.099 -0.132 0.384 0.229 0.313

rad4 35 0.149 0.259 0.201 0.198 0.163 -0.132 -0.130 -0.092 -0.200

ETx4 36 0.070 0.149 0.078 0.089 0.088 0.354 -0.516 -0.199 -0.393

ETn4 37 0.097 0.329 0.149 0.106 0.117 0.527 -0.423 -0.561 -0.552

frost4 38 -0.150 -0.450 -0.219 -0.226 -0.186 -0.582 0.399 0.453 0.483

HU0_4 39 0.147 0.401 0.156 0.216 0.159 0.561 -0.793 -0.516 -0.691

HU5_4 40 0.146 0.395 0.155 0.216 0.159 0.541 -0.778 -0.495 -0.672

HU10_4 41 0.134 0.319 0.144 0.203 0.148 0.359 -0.626 -0.301 -0.502

HU15_4 42 0.064 0.023 0.083 0.086 0.081 -0.189 -0.100 0.241 0.016

RC4 43 -0.143 -0.434 -0.138 -0.226 -0.149 -0.660 0.849 0.602 0.736

IC4 44 -0.116 -0.467 -0.090 -0.186 -0.104 -0.834 0.930 0.888 0.885

PC4 45 -0.138 -0.508 -0.125 -0.208 -0.132 -0.869 0.976 0.943 0.955

Eto4 46 -0.036 -0.214 -0.078 -0.094 -0.062 -0.368 -0.043 0.104 0.021

DL4 47 0.046 0.124 0.022 0.163 0.049 0.151 -0.022 0.107 0.110

Alt 48 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Lat 49 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Long	50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
pH_H2O	51	-0.178	-0.328	-0.209	-0.303	-0.205	-0.155	0.348	0.028	0.233
P	52	0.113	0.166	0.120	0.153	0.096	-0.226	-0.059	-0.222	-0.179
K	53	-0.155	-0.316	-0.139	-0.272	-0.149	-0.328	0.443	0.437	0.426
Ca	54	0.030	0.176	0.016	0.027	0.010	0.410	-0.323	-0.649	-0.467
Mg	55	-0.249	-0.648	-0.306	-0.434	-0.279	-0.501	0.478	0.415	0.483
Resist	56	-0.110	-0.277	-0.126	-0.188	-0.111	-0.337	0.162	0.461	0.306
APP_N	57	0.252	0.657	0.300	0.460	0.283	0.583	-0.486	-0.430	-0.473

		1	2	3	4	5	6	7	8	9
DL1	10	0.000								
rain2	11	0.000	1.000							
Tx2	12	0.000	-0.452	1.000						
Tn2	13	0.000	0.324	0.664	1.000					
HU0_2	14	0.000	-0.136	0.939	0.881	1.000				
HU5_2	15	0.000	-0.137	0.940	0.880	1.000	1.000			
HU10_2	16	0.000	-0.218	0.965	0.827	0.991	0.991	1.000		
HU15_2	17	0.000	-0.505	0.924	0.570	0.841	0.843	0.900	1.000	
Rad2	18	0.000	-0.836	0.629	-0.035	0.381	0.380	0.428	0.548	1.000
DL2	19	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
rain3	20	0.000	0.095	0.005	0.307	0.140	0.139	0.083	0.072	-0.003
Tave3	21	0.000	0.267	-0.101	-0.039	-0.087	-0.090	-0.070	-0.109	-0.215
HU0_3	22	0.000	0.264	-0.110	-0.044	-0.094	-0.097	-0.080	-0.120	-0.232
HU5_3	23	0.000	0.256	-0.110	-0.052	-0.098	-0.100	-0.082	-0.116	-0.228
HU10_3	24	0.000	0.268	-0.136	-0.078	-0.127	-0.129	-0.107	-0.136	-0.246
HU15_3	25	0.000	0.096	-0.239	-0.341	-0.314	-0.317	-0.270	-0.204	-0.095
WS3	26	0.000	-0.324	-0.561	-0.692	-0.676	-0.677	-0.677	-0.432	0.028
rad3	27	0.000	0.102	0.143	0.060	0.115	0.112	0.130	0.017	0.339
DL3	28	0.000	0.579	-0.273	0.092	-0.130	-0.125	-0.110	-0.152	-0.799
rain4	29	0.000	0.415	-0.153	0.377	0.073	0.071	-0.006	-0.107	-0.280
Tx4	30	0.000	-0.546	0.631	0.105	0.441	0.440	0.518	0.648	0.617

Tn4 31 0.000 0.644 0.301 0.784 0.550 0.549 0.502 0.222 -0.430

WS4 32 0.000 -0.297 -0.269 -0.363 -0.348 -0.346 -0.304 0.044 -0.131

RHx4 33 0.000 0.148 -0.590 -0.487 -0.595 -0.594 -0.604 -0.579 -0.132

RHn4 34 0.000 0.348 -0.464 -0.227 -0.398 -0.397 -0.408 -0.446 -0.211

rad4 35 0.000 -0.421 0.338 -0.105 0.163 0.160 0.202 0.228 0.775

ETx4 36 0.000 0.127 0.336 0.360 0.372 0.370 0.387 0.335 -0.055

ETn4 37 0.000 0.057 0.357 0.507 0.460 0.454 0.383 0.170 0.423

frost4 38 0.000 -0.315 -0.226 -0.536 -0.386 -0.381 -0.321 -0.111 -0.197

HU0_4 39 0.000 0.027 0.670 0.618 0.704 0.703 0.725 0.628 0.175

HU5_4 40 0.000 0.024 0.658 0.599 0.687 0.686 0.711 0.622 0.169

HU10_4 41 0.000 -0.020 0.545 0.415 0.530 0.529 0.575 0.552 0.152

HU15_4 42 0.000 -0.199 0.162 -0.152 0.024 0.023 0.102 0.244 0.212

RC4 43 0.000 -0.120 -0.682 -0.720 -0.760 -0.760 -0.773 -0.646 -0.029

IC4 44 0.000 -0.130 -0.764 -0.901 -0.903 -0.904 -0.875 -0.653 -0.010

PC4 45 0.000 -0.111 -0.806 -0.923 -0.939 -0.939 -0.903 -0.650 -0.120

Eto4 46 0.000 -0.531 0.235 -0.310 0.011 0.012 0.078 0.204 0.293

DL4 47 0.000 0.579 -0.273 0.092 -0.130 -0.125 -0.110 -0.152 -0.799

Alt 48 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Lat 49 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Long 50 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

pH_H2O 51 0.000 -0.180 -0.184 -0.125 -0.168 -0.168 -0.222 -0.195 0.036

P 52 0.000 -0.474 0.261 -0.237 0.068 0.068 0.090 0.032 0.639

K 53 0.000 -0.299 -0.144 -0.214 -0.204 -0.206 -0.190 0.071 0.266

Ca 54 0.000 0.044 0.235 0.362 0.331 0.330 0.244 -0.030 0.112

Mg 55 0.000 -0.318 -0.313 -0.477 -0.414 -0.413 -0.415 -0.252 -0.111

Resist 56 0.000 -0.359 0.091 -0.183 -0.043 -0.041 0.043 0.372 0.128

APP_N 57 0.000 0.543 0.185 0.512 0.352 0.352 0.340 0.114 -0.175

10 11 12 13 14 15 16 17 18

DL2 19 0.000

rain3 20 0.000 1.000

Tave3 21 0.000 -0.740 1.000

HU0_3 22 0.000 -0.741 0.998 1.000

HU5_3 23 0.000 -0.749 0.998 1.000 1.000

HU10_3 24 0.000 -0.763 0.998 0.997 0.998 1.000

HU15_3 25 0.000 -0.785 0.938 0.928 0.933 0.944 1.000

WS3 26 0.000 0.326 -0.316 -0.290 -0.291 -0.297 -0.135 1.000

rad3 27 0.000 -0.267 0.314 0.263 0.266 0.287 0.401 -0.510 1.000

DL3 28 0.000 -0.333 0.292 0.296 0.300 0.331 0.203 -0.388 -0.184

rain4 29 0.000 0.945 -0.592 -0.594 -0.604 -0.612 -0.685 0.198 -0.209

Tx4 30 0.000 -0.540 0.535 0.522 0.528 0.513 0.543 -0.335 0.351

Tn4 31 0.000 -0.159 0.507 0.506 0.499 0.486 0.203 -0.762 0.130

WS4 32 0.000 0.252 -0.090 -0.065 -0.063 -0.070 -0.014 0.717 -0.689

RHx4 33 0.000 0.349 -0.547 -0.568 -0.565 -0.526 -0.327 0.354 0.182

RHn4 34 0.000 0.349 -0.434 -0.469 -0.466 -0.422 -0.272 0.038 0.387

rad4 35 0.000 -0.168 0.068 0.024 0.029 0.037 0.232 -0.210 0.843

ETx4 36 0.000 -0.561 0.865 0.869 0.867 0.847 0.689 -0.483 0.152

ETn4 37 0.000 0.592 -0.319 -0.339 -0.349 -0.375 -0.406 -0.143 0.404

frost4 38 0.000 -0.547 0.171 0.207 0.215 0.223 0.249 0.314 -0.586

HU0_4 39 0.000 -0.425 0.635 0.624 0.623 0.604 0.440 -0.743 0.331

HU5_4 40 0.000 -0.446 0.649 0.638 0.638 0.620 0.461 -0.741 0.334

HU10_4 41 0.000 -0.581 0.751 0.738 0.740 0.731 0.622 -0.675 0.370

HU15_4 42 0.000 -0.728 0.841 0.824 0.831 0.836 0.894 -0.269 0.428

RC4 43 0.000 0.367 -0.535 -0.530 -0.529 -0.511 -0.296 0.803 -0.184

IC4 44 0.000 -0.017 -0.009 -0.017 -0.012 0.014 0.288 0.734 0.098

PC4 45 0.000 -0.032 -0.027 -0.030 -0.024 0.006 0.265 0.753 -0.032

Eto4 46 0.000 -0.820 0.488 0.509 0.516 0.507 0.526 -0.034 -0.123

DL4 47 0.000 -0.333 0.292 0.296 0.300 0.331 0.203 -0.388 -0.184

Alt 48 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Lat 49 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Long 50 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

pH_H2O 51 0.000 0.731 -0.827 -0.799 -0.806 -0.823 -0.802 0.668 -0.610

P 52 0.000 -0.262 -0.282 -0.299 -0.294 -0.283 -0.127 -0.141 0.461

K 53 0.000 0.633 -0.295 -0.304 -0.305 -0.314 -0.167 0.656 -0.120

Ca 54 0.000 0.428 -0.659 -0.642 -0.651 -0.672 -0.781 -0.071 -0.190

Mg 55 0.000 -0.092 -0.015 0.037 0.035 0.013 0.011 0.724 -0.804

Resist 56 0.000 -0.235 0.478 0.479 0.485 0.479 0.534 0.203 -0.139

APP_N 57 0.000 0.018 0.068 0.024 0.025 0.052 -0.008 -0.798 0.678

19 20 21 22 23 24 25 26 27

DL3 28 1.000

rain4 29 -0.111 1.000

Tx4 30 -0.246 -0.678 1.000

Tn4 31 0.482 0.057 0.146 1.000

WS4 32 0.001 0.136 -0.032 -0.371 1.000

RHx4 33 -0.028 0.379 -0.691 -0.583 -0.109 1.000

RHn4 34 0.128 0.443 -0.623 -0.295 -0.280 0.927 1.000

rad4 35 -0.593 -0.290 0.529 -0.263 -0.469 0.140 0.200 1.000

ETx4 36 0.214 -0.480 0.701 0.699 -0.042 -0.871 -0.710 -0.004 1.000

ETn4 37 -0.674 0.555 -0.043 0.108 -0.420 0.080 0.173 0.468 -0.157

frost4 38 0.396 -0.601 0.087 -0.270 0.465 -0.179 -0.391 -0.465 0.085

HU0_4 39 0.123 -0.389 0.768 0.742 -0.284 -0.833 -0.592 0.209 0.895

HU5_4 40 0.139 -0.409 0.775 0.735 -0.276 -0.830 -0.590 0.210 0.900

HU10_4 41 0.196 -0.545 0.831 0.643 -0.201 -0.787 -0.566 0.245 0.922

HU15_4 42 0.077 -0.732 0.839 0.207 0.035 -0.526 -0.429 0.392 0.775

RC4 43 -0.290 0.306 -0.631 -0.826 0.280 0.826 0.572 -0.017 -0.841

IC4 44 -0.217 -0.047 -0.238 -0.738 0.354 0.632 0.437 0.195 -0.431

PC4 45 -0.073 -0.053 -0.291 -0.731 0.451 0.627 0.425 0.048 -0.441

Eto4 46 0.030 -0.926 0.661 -0.076 0.087 -0.557 -0.695 0.069 0.494

DL4 47 1.000 -0.111 -0.246 0.482 0.001 -0.028 0.128 -0.593 0.214

Alt 48 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Lat 49 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Long 50 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

pH_H2O 51 -0.386 0.611 -0.642 -0.528 0.346 0.412 0.174 -0.339 -0.755

P 52 -0.409 -0.393 0.160 -0.440 -0.606 0.330 0.239 0.670 -0.376

K 53 -0.539 0.484 -0.029 -0.479 0.653 0.193 0.108 0.138 -0.266

Ca 54 -0.265 0.401 -0.477 -0.019 -0.444 0.210 0.137 -0.105 -0.502

Mg 55 -0.088 -0.188 -0.106 -0.384 0.665 -0.194 -0.516 -0.544 -0.040

Resist 56 0.017 -0.333 0.628 -0.023 0.690 -0.517 -0.516 -0.005 0.555

APP_N 57 0.362 0.195 -0.066 0.536 -0.701 0.198 0.535 0.293 0.063

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 -0.908 1.000

HU0_4 39 0.084 -0.154 1.000

HU5_4 40 0.058 -0.134 1.000 1.000

HU10_4 41 -0.102 -0.011 0.967 0.974 1.000

HU15_4 42 -0.320 0.196 0.665 0.684 0.823 1.000

RC4 43 -0.012 0.091 -0.967 -0.966 -0.909 -0.516 1.000

IC4 44 -0.209 0.165 -0.673 -0.659 -0.501 0.068 0.808 1.000

PC4 45 -0.360 0.298 -0.707 -0.690 -0.521 0.042 0.806 0.982 1.000

Eto4 46 -0.569 0.730 0.366 0.381 0.480 0.609 -0.314 -0.064 -0.036

DL4 47 -0.674 0.396 0.123 0.139 0.196 0.077 -0.290 -0.217 -0.073

Alt 48 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Lat 49 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Long 50 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

pH_H2O 51 0.251 -0.004 -0.752 -0.768 -0.865 -0.856 0.677 0.180 0.197

P 52 0.203 -0.045 -0.149 -0.150 -0.147 -0.067 0.214 0.089 0.005

K 53 0.308 -0.283 -0.321 -0.326 -0.308 -0.068 0.430 0.483 0.448

Ca 54 0.497 -0.259 -0.292 -0.315 -0.496 -0.810 0.180 -0.384 -0.420

Mg 55 -0.474 0.734 -0.357 -0.354 -0.310 -0.100 0.339 0.271 0.344

Resist 56 -0.392 0.328 0.382 0.397 0.517 0.716 -0.286 0.152 0.194

APP_N 57 0.308 -0.607 0.331 0.329 0.282 0.016 -0.376 -0.351 -0.385

37 38 39 40 41 42 43 44 45

Eto4	46	1.000							
DL4	47	0.030	1.000						
Alt	48	0.000	0.000	0.000					
Lat	49	0.000	0.000	0.000	0.000				
Long	50	0.000	0.000	0.000	0.000	0.000			
pH_H2O	51	-0.384	-0.386	0.000	0.000	0.000	1.000		
P	52	0.256	-0.409	0.000	0.000	0.000	0.027	1.000	
K	53	-0.397	-0.539	0.000	0.000	0.000	0.408	-0.327	1.000
Ca	54	-0.287	-0.265	0.000	0.000	0.000	0.631	0.419	-0.276	1.000
Mg	55	0.473	-0.088	0.000	0.000	0.000	0.464	-0.220	0.141	-0.008
Resist	56	0.409	0.017	0.000	0.000	0.000	-0.376	-0.498	0.451	-0.845
APP_N	57	-0.475	0.362	0.000	0.000	0.000	-0.481	0.113	-0.355	0.058

	46	47	48	49	50	51	52	53	54
Mg	55	1.000							
Resist	56	0.270	1.000						
APP_N	57	-0.946	-0.380	1.000					

	55	56	57

1

Appendix 3.8.3 Correlation matrix for all cultivars combined over production years

JPcorrYEARyld.out

file is JPfyieldFS.gen

========== CACTUS PEAR ENVIRONMENTAL ADAPTIBILITY: FRUIT YIELD

===== Correlations for Year 1 =====

*** Degrees of freedom ***

Correlations: 30

*** Correlation matrix ***

fyield	1	1.000									
Tclleftprun	2	0.370	1.000								
Tfertclad	3	0.583	0.730	1.000							
Tftotal	4	0.901	0.643	0.804	1.000						
Tfnoat	5	0.969	0.501	0.721	0.973	1.000					
Tn1	6	0.346	0.436	0.280	0.402	0.377	1.000				
RC1	7	-0.209	-0.547	-0.278	-0.328	-0.261	-0.964	1.000			
IC1	8	-0.199	-0.553	-0.277	-0.322	-0.252	-0.959	1.000	1.000		
C1	9	-0.283	-0.494	-0.282	-0.370	-0.324	-0.992	0.990	0.988	1.000	
DL1	10	0.417	0.353	0.271	0.433	0.434	0.987	-0.909	-0.902	-0.958	
rain2	11	-0.310	0.606	0.133	-0.063	-0.220	0.369	-0.602	-0.616	-0.485	
Tx2	12	0.121	0.594	0.268	0.273	0.184	0.911	-0.988	-0.990	-0.957	
Tn2	13	0.308	0.472	0.281	0.383	0.345	0.997	-0.982	-0.979	-0.999	
HU0_2	14	0.169	0.570	0.274	0.303	0.226	0.943	-0.997	-0.999	-0.978	
HU5_2	15	0.168	0.571	0.274	0.303	0.225	0.942	-0.997	-0.998	-0.977	
HU10_2	16	0.145	0.583	0.271	0.288	0.205	0.928	-0.993	-0.995	-0.968	
HU15_2	17	0.087	0.609	0.262	0.250	0.153	0.885	-0.977	-0.980	-0.937	

Rad2 18 -0.015 0.638 0.241 0.179 0.061 0.790 -0.924 -0.931 -0.863

DL2 19 0.417 0.353 0.271 0.433 0.434 0.987 -0.909 -0.902 -0.958

rain3 20 -0.545 -0.109 -0.219 -0.461 -0.525 -0.843 0.670 0.656 0.766

Tave3 21 0.214 0.544 0.279 0.330 0.265 0.967 -1.000 -1.000 -0.992

HU0_3 22 0.223 0.538 0.279 0.336 0.273 0.971 -1.000 -0.999 -0.994

HU5_3 23 0.223 0.538 0.279 0.336 0.273 0.971 -1.000 -0.999 -0.994

HU10_3 24 0.223 0.538 0.279 0.336 0.273 0.971 -1.000 -0.999 -0.994

HU15_3 25 0.211 0.546 0.278 0.329 0.262 0.965 -1.000 -1.000 -0.991

WS3 26 -0.288 -0.489 -0.282 -0.373 -0.328 -0.993 0.989 0.986 1.000

rad3 27 0.506 0.208 0.244 0.460 0.500 0.917 -0.778 -0.766 -0.857

DL3 28 -0.330 -0.452 -0.281 -0.394 -0.363 -0.999 0.973 0.969 0.996

rain4 29 -0.557 -0.073 -0.208 -0.459 -0.532 -0.811 0.627 0.613 0.729

Tx4 30 0.175 0.567 0.275 0.307 0.231 0.946 -0.998 -0.999 -0.980

Tn4 31 0.234 0.530 0.280 0.342 0.283 0.976 -0.999 -0.998 -0.996

WS4 32 -0.174 -0.568 -0.275 -0.306 -0.230 -0.946 0.998 0.999 0.980

RHx4 33 -0.561 0.301 -0.066 -0.351 -0.492 -0.342 0.080 0.062 0.218

RHn4 34 -0.415 -0.356 -0.271 -0.433 -0.432 -0.988 0.911 0.904 0.959

rad4 35 0.506 0.208 0.244 0.460 0.500 0.917 -0.778 -0.766 -0.857

ETx4 36 0.207 0.548 0.278 0.326 0.259 0.963 -1.000 -1.000 -0.990

ETn4 37 0.375 0.405 0.277 0.416 0.400 0.998 -0.946 -0.940 -0.982

frost4 38 -0.417 -0.353 -0.271 -0.433 -0.434 -0.987 0.909 0.902 0.958

HU0_4 39 0.206 0.549 0.278 0.326 0.258 0.963 -1.000 -1.000 -0.990

HU5_4 40 0.206 0.549 0.278 0.326 0.258 0.963 -1.000 -1.000 -0.990

HU10_4 41 0.199 0.553 0.277 0.321 0.252 0.959 -1.000 -1.000 -0.988

HU15_4 42 0.185 0.562 0.276 0.313 0.240 0.952 -0.999 -1.000 -0.983

RC4 43 -0.275 -0.500 -0.281 -0.365 -0.317 -0.990 0.992 0.990 1.000

IC4 44 -0.259 -0.512 -0.281 -0.356 -0.303 -0.985 0.996 0.994 0.999

PC4 45 -0.301 -0.478 -0.282 -0.379 -0.339 -0.996 0.985 0.981 0.999

Eto4 46 0.417 0.353 0.271 0.433 0.434 0.987 -0.909 -0.902 -0.958

DL4 47 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Alt 48 -0.146 -0.582 -0.272 -0.289 -0.206 -0.928 0.994 0.996 0.968

Lat 49 -0.378 -0.402 -0.277 -0.417 -0.402 -0.998 0.944 0.938 0.980

Long	50	-0.369	0.573	0.101	-0.119	-0.279	0.251	-0.499	-0.514	-0.374
pH_H2O	51	0.384	0.394	0.276	0.420	0.408	0.997	-0.939	-0.932	-0.977
P	52	0.585	-0.122	0.142	0.423	0.535	0.600	-0.366	-0.349	-0.491
K	53	-0.143	0.647	0.202	0.080	-0.059	0.636	-0.818	-0.828	-0.730
Ca	54	0.158	0.577	0.273	0.296	0.216	0.936	-0.996	-0.997	-0.973
Mg	55	0.367	0.414	0.278	0.412	0.393	0.999	-0.952	-0.946	-0.985
Resist	56	-0.014	-0.631	-0.247	-0.199	-0.087	-0.819	0.942	0.948	0.887
APP_N	57	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

		1	2	3	4	5	6	7	8	9
DL1	10	1.000								
rain2	11	0.215	1.000							
Tx2	12	0.833	0.719	1.000						
Tn2	13	0.971	0.441	0.941	1.000					
HU0_2	14	0.877	0.658	0.996	0.966	1.000				
HU5_2	15	0.876	0.659	0.997	0.966	1.000	1.000			
HU10_2	16	0.856	0.689	0.999	0.954	0.999	0.999	1.000		
HU15_2	17	0.798	0.760	0.998	0.919	0.990	0.990	0.995	1.000	
Rad2	18	0.682	0.861	0.973	0.836	0.950	0.950	0.962	0.985	1.000
DL2	19	1.000	0.215	0.833	0.971	0.877	0.876	0.856	0.798	0.682
rain3	20	-0.918	0.190	-0.546	-0.797	-0.615	-0.613	-0.581	-0.494	-0.336
Tave3	21	0.913	0.595	0.986	0.984	0.997	0.997	0.992	0.975	0.921
HU0_3	22	0.920	0.581	0.983	0.987	0.995	0.995	0.990	0.971	0.914
HU5_3	23	0.920	0.581	0.983	0.987	0.995	0.995	0.990	0.971	0.914
HU10_3	24	0.919	0.581	0.983	0.987	0.995	0.995	0.990	0.971	0.914
HU15_3	25	0.911	0.599	0.987	0.983	0.997	0.997	0.993	0.976	0.923
WS3	26	-0.961	-0.476	-0.953	-0.999	-0.975	-0.975	-0.965	-0.934	-0.857
rad3	27	0.969	-0.034	0.670	0.882	0.730	0.729	0.701	0.624	0.479
DL3	28	-0.981	-0.401	-0.925	-0.999	-0.954	-0.953	-0.940	-0.900	-0.811
rain4	29	-0.894	0.245	-0.497	-0.762	-0.569	-0.567	-0.534	-0.444	-0.282
Tx4	30	0.882	0.649	0.995	0.969	1.000	1.000	0.999	0.988	0.946

Tn4 31 0.928 0.564 0.979 0.990 0.993 0.993 0.987 0.965 0.906

WS4 32 -0.881 -0.651 -0.996 -0.968 -1.000 -1.000 -0.999 -0.988 -0.947

RHx4 33 -0.488 0.748 0.077 -0.266 -0.008 -0.006 0.034 0.136 0.306

RHn4 34 -1.000 -0.219 -0.836 -0.972 -0.879 -0.878 -0.858 -0.801 -0.685

rad4 35 0.969 -0.034 0.670 0.882 0.730 0.729 0.701 0.624 0.479

ETx4 36 0.908 0.605 0.988 0.982 0.998 0.998 0.994 0.977 0.926

ETn4 37 0.995 0.310 0.884 0.990 0.920 0.919 0.903 0.854 0.751

frost4 38 -1.000 -0.215 -0.833 -0.971 -0.877 -0.876 -0.856 -0.798 -0.682

HU0_4 39 0.907 0.606 0.989 0.981 0.998 0.998 0.994 0.978 0.926

HU5_4 40 0.907 0.607 0.989 0.981 0.998 0.998 0.994 0.978 0.927

HU10_4 41 0.901 0.617 0.990 0.979 0.999 0.998 0.995 0.980 0.931

HU15_4 42 0.890 0.637 0.994 0.973 1.000 1.000 0.998 0.985 0.940

RC4 43 -0.954 -0.499 -0.961 -0.998 -0.981 -0.981 -0.972 -0.943 -0.870

IC4 44 -0.944 -0.525 -0.969 -0.995 -0.986 -0.986 -0.979 -0.952 -0.885

PC4 45 -0.968 -0.453 -0.945 -1.000 -0.970 -0.969 -0.958 -0.924 -0.844

Eto4 46 1.000 0.215 0.833 0.971 0.877 0.876 0.856 0.798 0.682

DL4 47 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Alt 48 -0.857 -0.688 -0.999 -0.955 -0.999 -0.999 -1.000 -0.995 -0.961

Lat 49 -0.996 -0.304 -0.881 -0.989 -0.917 -0.917 -0.900 -0.851 -0.746

Long 50 0.093 0.992 0.628 0.328 0.560 0.562 0.595 0.674 0.792

pH_H2O 51 0.997 0.290 0.873 0.987 0.911 0.911 0.893 0.843 0.736

P 52 0.720 -0.523 0.216 0.534 0.298 0.296 0.257 0.157 -0.017

K 53 0.504 0.952 0.898 0.695 0.857 0.858 0.878 0.923 0.976

Ca 54 0.867 0.673 0.998 0.961 1.000 1.000 1.000 0.992 0.956

Mg 55 0.993 0.328 0.892 0.992 0.927 0.926 0.910 0.863 0.763

Resist 56 -0.717 -0.835 -0.983 -0.862 -0.964 -0.964 -0.974 -0.992 -0.999

APP_N 57 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

10 11 12 13 14 15 16 17 18

DL2 19 1.000

rain3 20 -0.918 1.000

Tave3 21 0.913 -0.676 1.000

HU0_3 22 0.920 -0.689 1.000 1.000

HU5_3 23 0.920 -0.689 1.000 1.000 1.000

HU10_3 24 0.919 -0.689 1.000 1.000 1.000 1.000

HU15_3 25 0.911 -0.673 1.000 1.000 1.000 1.000 1.000

WS3 26 -0.961 0.773 -0.990 -0.992 -0.992 -0.992 -0.989 1.000

rad3 27 0.969 -0.988 0.783 0.794 0.794 0.794 0.780 -0.863 1.000

DL3 28 -0.981 0.823 -0.975 -0.979 -0.979 -0.978 -0.974 0.997 -0.902

rain4 29 -0.894 0.998 -0.634 -0.647 -0.647 -0.646 -0.630 0.736 -0.977

Tx4 30 0.882 -0.623 0.998 0.996 0.996 0.996 0.998 -0.978 0.738

Tn4 31 0.928 -0.704 0.999 1.000 1.000 1.000 0.999 -0.995 0.806

WS4 32 -0.881 0.622 -0.997 -0.996 -0.996 -0.996 -0.998 0.977 -0.737

RHx4 33 -0.488 0.794 -0.089 -0.106 -0.106 -0.106 -0.084 0.228 -0.689

RHn4 34 -1.000 0.916 -0.915 -0.922 -0.922 -0.921 -0.913 0.963 -0.968

rad4 35 0.969 -0.988 0.783 0.794 0.794 0.794 0.780 -0.863 1.000

ETx4 36 0.908 -0.667 1.000 1.000 1.000 1.000 1.000 -0.988 0.776

ETn4 37 0.995 -0.875 0.949 0.954 0.954 0.954 0.947 -0.984 0.940

frost4 38 -1.000 0.918 -0.913 -0.920 -0.920 -0.919 -0.911 0.961 -0.969

HU0_4 39 0.907 -0.666 1.000 1.000 1.000 1.000 1.000 -0.988 0.775

HU5_4 40 0.907 -0.666 1.000 0.999 0.999 1.000 1.000 -0.988 0.774

HU10_4 41 0.901 -0.656 1.000 0.999 0.999 0.999 1.000 -0.986 0.766

HU15_4 42 0.890 -0.636 0.999 0.998 0.998 0.998 0.999 -0.981 0.749

RC4 43 -0.954 0.756 -0.993 -0.995 -0.995 -0.995 -0.993 1.000 -0.849

IC4 44 -0.944 0.736 -0.996 -0.998 -0.998 -0.998 -0.996 0.998 -0.833

PC4 45 -0.968 0.789 -0.986 -0.989 -0.989 -0.989 -0.985 1.000 -0.875

Eto4 46 1.000 -0.918 0.913 0.920 0.920 0.919 0.911 -0.961 0.969

DL4 47 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Alt 48 -0.857 0.582 -0.993 -0.990 -0.990 -0.990 -0.993 0.966 -0.702

Lat 49 -0.996 0.878 -0.947 -0.952 -0.952 -0.952 -0.945 0.983 -0.942

Long 50 0.093 0.309 0.491 0.476 0.476 0.477 0.496 -0.364 -0.157

pH_H2O 51 0.997 -0.885 0.942 0.948 0.948 0.947 0.940 -0.980 0.947

P 52 0.720 -0.936 0.374 0.390 0.390 0.390 0.369 -0.501 0.870

K	53	0.504	-0.121	0.813	0.802	0.802	0.803	0.816	-0.723	0.274
Ca	54	0.867	-0.599	0.995	0.993	0.993	0.993	0.995	-0.971	0.717
Mg	55	0.993	-0.865	0.954	0.959	0.959	0.959	0.953	-0.987	0.933
Resist	56	-0.717	0.382	-0.939	-0.933	-0.933	-0.933	-0.941	0.881	-0.522
APP_N	57	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

	19	20	21	22	23	24	25	26	27
DL3	28	1.000							
rain4	29	0.790	1.000						
Tx4	30	-0.957	-0.578	1.000					
Tn4	31	-0.983	-0.662	0.994	1.000				
WS4	32	0.956	0.576	-1.000	-0.994	1.000			
RHx4	33	0.308	0.827	-0.019	-0.127	0.017	1.000		
RHn4	34	0.982	0.892	-0.884	-0.929	0.883	0.484	1.000	
rad4	35	-0.902	-0.977	0.738	0.806	-0.737	-0.689	-0.968	1.000
ETx4	36	-0.972	-0.624	0.998	0.999	-0.998	-0.077	-0.910	0.776	1.000
ETn4	37	-0.995	-0.846	0.924	0.960	-0.924	-0.399	-0.996	0.940	0.945
frost4	38	0.981	0.894	-0.882	-0.928	0.881	0.488	1.000	-0.969	-0.908
HU0_4	39	-0.972	-0.623	0.998	0.999	-0.998	-0.075	-0.909	0.775	1.000
HU5_4	40	-0.972	-0.622	0.998	0.999	-0.998	-0.074	-0.909	0.774	1.000
HU10_4	41	-0.968	-0.612	0.999	0.998	-0.999	-0.061	-0.903	0.766	1.000
HU15_4	42	-0.962	-0.592	1.000	0.996	-1.000	-0.036	-0.892	0.749	0.999
RC4	43	0.994	0.718	-0.983	-0.997	0.983	0.202	0.955	-0.849	-0.992
IC4	44	0.990	0.696	-0.988	-0.999	0.988	0.172	0.946	-0.833	-0.995
PC4	45	0.998	0.753	-0.972	-0.992	0.972	0.253	0.969	-0.875	-0.984
Eto4	46	-0.981	-0.894	0.882	0.928	-0.881	-0.488	-1.000	0.969	0.908
DL4	47	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Alt	48	0.941	0.535	-0.999	-0.987	0.999	-0.032	0.859	-0.702	-0.994
Lat	49	0.995	0.849	-0.922	-0.958	0.921	0.405	0.996	-0.942	-0.943
Long	50	-0.285	0.363	0.551	0.458	-0.553	0.824	-0.098	-0.157	0.502
pH_H2O	51	-0.993	-0.857	0.916	0.954	-0.915	-0.419	-0.997	0.947	0.938

P 52 -0.571 -0.955 0.309 0.409 -0.307 -0.957 -0.717 0.870 0.363

K 53 -0.663 -0.064 0.851 0.790 -0.853 0.508 -0.508 0.274 0.820

Ca 54 -0.947 -0.552 1.000 0.990 -1.000 0.012 -0.869 0.717 0.996

Mg 55 -0.997 -0.836 0.931 0.965 -0.930 -0.382 -0.994 0.933 0.951

Resist 56 0.839 0.329 -0.961 -0.925 0.961 -0.259 0.720 -0.522 -0.943

APP_N 57 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 -0.995 1.000

HU0_4 39 0.944 -0.907 1.000

HU5_4 40 0.944 -0.907 1.000 1.000

HU10_4 41 0.940 -0.901 1.000 1.000 1.000

HU15_4 42 0.931 -0.890 0.999 0.999 1.000 1.000

RC4 43 -0.979 0.954 -0.992 -0.992 -0.990 -0.986 1.000

IC4 44 -0.972 0.944 -0.995 -0.995 -0.994 -0.991 1.000 1.000

PC4 45 -0.988 0.968 -0.984 -0.984 -0.981 -0.976 0.999 0.997 1.000

Eto4 46 0.995 -1.000 0.907 0.907 0.901 0.890 -0.954 -0.944 -0.968

DL4 47 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Alt 48 -0.903 0.857 -0.994 -0.994 -0.996 -0.998 0.972 0.979 0.959

Lat 49 -1.000 0.996 -0.942 -0.942 -0.937 -0.928 0.977 0.970 0.987

Long 50 0.191 -0.093 0.503 0.504 0.515 0.537 -0.389 -0.416 -0.340

pH_H2O 51 1.000 -0.997 0.937 0.937 0.932 0.923 -0.974 -0.967 -0.984

P 52 0.648 -0.720 0.361 0.361 0.348 0.324 -0.478 -0.451 -0.523

K 53 0.587 -0.504 0.821 0.821 0.829 0.843 -0.741 -0.761 -0.705

Ca 54 0.912 -0.867 0.996 0.996 0.997 0.999 -0.977 -0.983 -0.964

Mg 55 1.000 -0.993 0.950 0.950 0.946 0.937 -0.982 -0.976 -0.991

Resist 56 -0.782 0.717 -0.944 -0.944 -0.948 -0.956 0.894 0.907 0.869

APP_N 57 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

37 38 39 40 41 42 43 44 45

Eto4 46 1.000

DL4 47 0.000 0.000

Alt 48 -0.857 0.000 1.000

Lat 49 -0.996 0.000 0.901 1.000

Long 50 0.093 0.000 -0.593 -0.184 1.000

pH_H2O 51 0.997 0.000 -0.894 -1.000 0.170 1.000

P 52 0.720 0.000 -0.259 -0.653 -0.624 0.664 1.000

K 53 0.504 0.000 -0.877 -0.582 0.907 0.569 -0.236 1.000

Ca 54 0.867 0.000 -1.000 -0.909 0.577 0.903 0.279 0.867 1.000

Mg 55 0.993 0.000 -0.911 -1.000 0.209 0.999 0.634 0.602 0.919

Resist 56 -0.717 0.000 0.974 0.778 -0.761 -0.769 -0.033 -0.963 -0.969

APP_N 57 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

46 47 48 49 50 51 52 53 54

Mg 55 1.000

Resist 56 -0.794 1.000

APP_N 57 0.000 0.000 0.000

55 56 57

===== Correlations for Year 2 =====

*** Degrees of freedom ***

Correlations: 29

*** Correlation matrix ***

fyield 1 1.000

Tclleftprun 2 0.633 1.000

Tfertclad 3 0.934 0.618 1.000

Tftotal 4 0.754 0.547 0.649 1.000

Tfnoat 5 0.975 0.628 0.969 0.698 1.000

Tn1 6 0.262 0.506 0.156 0.551 0.225 1.000

RC1 7 -0.267 -0.405 -0.156 -0.567 -0.231 -0.982 1.000

IC1 8 -0.266 -0.371 -0.155 -0.568 -0.232 -0.969 0.998 1.000

C1 9 -0.259 -0.257 -0.148 -0.559 -0.228 -0.909 0.971 0.984 1.000

DL1 10 0.241 0.125 0.135 0.528 0.215 0.810 -0.906 -0.929 -0.981

rain2 11 -0.241 -0.125 -0.135 -0.528 -0.215 -0.810 0.906 0.929 0.981

Tx2 12 0.267 0.422 0.157 0.566 0.231 0.987 -1.000 -0.996 -0.964

Tn2 13 0.263 0.492 0.157 0.554 0.226 1.000 -0.987 -0.975 -0.920

HU0_2 14 0.266 0.438 0.157 0.564 0.230 0.991 -0.998 -0.993 -0.955

HU5_2 15 0.266 0.439 0.157 0.564 0.230 0.991 -0.998 -0.993 -0.955

HU10_2 16 0.266 0.450 0.157 0.563 0.230 0.994 -0.997 -0.990 -0.949

HU15_2 17 0.260 0.525 0.156 0.544 0.222 0.999 -0.974 -0.958 -0.891

Rad2 18 -0.134 -0.697 -0.092 -0.254 -0.104 -0.655 0.500 0.448 0.279

DL2 19 0.241 0.125 0.135 0.528 0.215 0.810 -0.906 -0.929 -0.981

rain3 20 -0.250 -0.178 -0.141 -0.543 -0.221 -0.853 0.936 0.955 0.993

Tave3 21 0.267 0.393 0.156 0.568 0.232 0.978 -1.000 -0.999 -0.976

HU0_3 22 0.267 0.385 0.156 0.568 0.232 0.975 -0.999 -1.000 -0.979

HU5_3 23 0.267 0.385 0.156 0.568 0.232 0.975 -0.999 -1.000 -0.979

HU10_3 24 0.267 0.385 0.156 0.568 0.232 0.975 -0.999 -1.000 -0.979

HU15_3 25 0.267 0.397 0.156 0.568 0.232 0.979 -1.000 -0.999 -0.974

WS3 26 -0.253 -0.205 -0.143 -0.549 -0.224 -0.873 0.949 0.966 0.997

rad3 27 -0.132 -0.697 -0.091 -0.249 -0.102 -0.647 0.491 0.439 0.269

DL3 28 -0.241 -0.125 -0.135 -0.528 -0.215 -0.810 0.906 0.929 0.981

rain4 29 -0.248 -0.164 -0.139 -0.539 -0.220 -0.842 0.928 0.949 0.990

Tx4 30 0.267 0.398 0.156 0.568 0.232 0.979 -1.000 -0.999 -0.974

Tn4 31 0.266 0.449 0.157 0.563 0.230 0.994 -0.997 -0.991 -0.950

WS4 32 -0.253 -0.205 -0.143 -0.549 -0.224 -0.873 0.949 0.966 0.997

RHx4 33 -0.267 -0.395 -0.156 -0.568 -0.232 -0.978 1.000 0.999 0.975

RHn4 34 -0.266 -0.351 -0.154 -0.568 -0.232 -0.961 0.996 0.999 0.989

rad4 35 -0.128 -0.696 -0.089 -0.242 -0.100 -0.636 0.479 0.426 0.256

ETx4 36 0.265 0.345 0.154 0.568 0.232 0.958 -0.995 -0.999 -0.990

ETn4 37 0.251 0.577 0.152 0.521 0.213 0.987 -0.939 -0.917 -0.831

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 0.267 0.405 0.156 0.567 0.231 0.982 -1.000 -0.998 -0.971

HU5_4 40 0.267 0.406 0.156 0.567 0.231 0.982 -1.000 -0.998 -0.971

HU10_4 41 0.267 0.410 0.156 0.567 0.231 0.983 -1.000 -0.998 -0.969

HU15_4 42 0.267 0.432 0.157 0.565 0.231 0.990 -0.999 -0.994 -0.959

RC4 43 -0.265 -0.338 -0.153 -0.567 -0.231 -0.954 0.994 0.999 0.992

IC4 44 -0.263 -0.306 -0.151 -0.565 -0.230 -0.938 0.986 0.994 0.997

PC4 45 -0.257 -0.240 -0.146 -0.556 -0.227 -0.897 0.964 0.978 1.000

Eto4 46 0.241 0.125 0.135 0.528 0.215 0.810 -0.906 -0.929 -0.981

DL4 47 -0.215 -0.666 -0.135 -0.436 -0.178 -0.902 0.804 0.767 0.639

Alt 48 -0.265 -0.463 -0.157 -0.561 -0.229 -0.996 0.995 0.987 0.941

Lat 49 -0.251 -0.187 -0.141 -0.545 -0.222 -0.860 0.941 0.959 0.994

Long 50 0.130 0.696 0.090 0.245 0.101 0.640 -0.484 -0.431 -0.261

pH_H2O 51 0.219 0.008 0.119 0.486 0.198 0.700 -0.822 -0.855 -0.934

P 52 0.152 -0.236 0.076 0.353 0.143 0.408 -0.573 -0.621 -0.752

K 53 0.123 0.694 0.086 0.230 0.095 0.618 -0.459 -0.405 -0.233

Ca 54 0.237 0.097 0.131 0.519 0.211 0.785 -0.888 -0.913 -0.972

Mg 55 0.198 -0.081 0.105 0.444 0.181 0.604 -0.743 -0.782 -0.881

Resist 56 -0.026 0.528 0.001 -0.090 -0.036 0.090 0.100 0.159 0.334

APP_N 57 -0.241 -0.125 -0.135 -0.528 -0.215 -0.810 0.906 0.929 0.981

1 2 3 4 5 6 7 8 9

DL1 10 1.000

rain2 11 -1.000 1.000

Tx2 12 0.893 -0.893 1.000

Tn2 13 0.825 -0.825 0.991 1.000

HU0_2 14 0.879 -0.879 1.000 0.995 1.000

HU5_2 15 0.879 -0.879 1.000 0.995 1.000 1.000

HU10_2 16 0.869 -0.869 0.999 0.997 1.000 1.000 1.000

HU15_2 17 0.785 -0.785 0.980 0.998 0.985 0.985 0.989 1.000

Rad2 18 -0.086 0.086 -0.526 -0.634 -0.550 -0.551 -0.569 -0.685 1.000

DL2 19 1.000 -1.000 0.893 0.825 0.879 0.879 0.869 0.785 -0.086

rain3 20 -0.997 0.997 -0.925 -0.867 -0.914 -0.914 -0.905 -0.831 0.164

Tave3 21 0.915 -0.915 0.999 0.983 0.997 0.997 0.995 0.968 -0.481

HU0_3 22 0.920 -0.920 0.998 0.980 0.996 0.995 0.993 0.965 -0.469

HU5_3 23 0.920 -0.920 0.998 0.980 0.996 0.995 0.993 0.965 -0.469

HU10_3 24 0.920 -0.920 0.998 0.981 0.996 0.996 0.993 0.965 -0.470

HU15_3 25 0.912 -0.912 0.999 0.984 0.997 0.997 0.995 0.970 -0.488

WS3 26 -0.993 0.993 -0.939 -0.886 -0.929 -0.929 -0.921 -0.852 0.202

rad3 27 -0.076 0.076 -0.517 -0.626 -0.542 -0.542 -0.560 -0.677 1.000

DL3 28 -1.000 1.000 -0.893 -0.825 -0.879 -0.879 -0.869 -0.785 0.086

rain4 29 -0.998 0.998 -0.917 -0.856 -0.905 -0.905 -0.895 -0.819 0.143

Tx4 30 0.911 -0.911 0.999 0.985 0.997 0.997 0.996 0.970 -0.489

Tn4 31 0.870 -0.870 0.999 0.996 1.000 1.000 1.000 0.988 -0.566

WS4 32 -0.993 0.993 -0.939 -0.886 -0.929 -0.929 -0.921 -0.852 0.202

RHx4 33 -0.914 0.914 -0.999 -0.984 -0.997 -0.997 -0.995 -0.969 0.484

RHn4 34 -0.941 0.941 -0.993 -0.968 -0.989 -0.989 -0.985 -0.949 0.419

rad4 35 -0.063 0.063 -0.505 -0.615 -0.530 -0.531 -0.549 -0.667 1.000

ETx4 36 0.944 -0.944 0.991 0.965 0.987 0.987 0.983 0.945 -0.409

ETn4 37 0.706 -0.706 0.949 0.983 0.958 0.958 0.964 0.993 -0.767

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 0.906 -0.906 1.000 0.987 0.998 0.998 0.997 0.974 -0.500

HU5_4 40 0.906 -0.906 1.000 0.987 0.998 0.998 0.997 0.974 -0.500

HU10_4 41 0.903 -0.903 1.000 0.988 0.999 0.999 0.997 0.975 -0.507

HU15_4 42 0.885 -0.885 1.000 0.993 1.000 1.000 0.999 0.983 -0.541

RC4 43 -0.948 0.948 -0.990 -0.962 -0.985 -0.985 -0.981 -0.942 0.399

IC4 44 -0.963 0.963 -0.981 -0.947 -0.975 -0.975 -0.970 -0.923 0.351

PC4 45 -0.986 0.986 -0.956 -0.909 -0.947 -0.947 -0.940 -0.879 0.253

Eto4 46 1.000 -1.000 0.893 0.825 0.879 0.879 0.869 0.785 -0.086

DL4	47	-0.476	0.476	-0.821	-0.889	-0.837	-0.838	-0.849	-0.918	0.917
Alt	48	-0.857	0.857	-0.997	-0.998	-0.999	-0.999	-1.000	-0.992	0.588
Lat	49	-0.996	0.996	-0.930	-0.873	-0.919	-0.919	-0.910	-0.838	0.177
Long	50	0.068	-0.068	0.509	0.619	0.535	0.535	0.553	0.671	-1.000
pH_H2O	51	0.986	-0.986	0.805	0.720	0.787	0.787	0.774	0.671	0.081
P	52	0.866	-0.866	0.548	0.433	0.524	0.523	0.505	0.371	0.423
K	53	0.039	-0.039	0.485	0.596	0.510	0.511	0.529	0.649	-0.999
Ca	54	0.999	-0.999	0.874	0.802	0.859	0.859	0.848	0.759	-0.045
Mg	55	0.957	-0.957	0.723	0.625	0.703	0.702	0.687	0.571	0.207
Resist	56	-0.512	0.512	-0.070	0.063	-0.041	-0.040	-0.019	0.130	-0.812
APP_N	57	-1.000	1.000	-0.893	-0.825	-0.879	-0.879	-0.869	-0.785	0.086

	10	11	12	13	14	15	16	17	18
DL2	19	1.000							
rain3	20	-0.997	1.000						
Tave3	21	0.915	-0.944	1.000					
HU0_3	22	0.920	-0.948	1.000	1.000				
HU5_3	23	0.920	-0.948	1.000	1.000	1.000			
HU10_3	24	0.920	-0.948	1.000	1.000	1.000	1.000		
HU15_3	25	0.912	-0.941	1.000	1.000	1.000	1.000	1.000	
WS3	26	-0.993	0.999	-0.956	-0.960	-0.960	-0.959	-0.954	1.000
rad3	27	-0.076	0.153	-0.472	-0.460	-0.460	-0.461	-0.479	0.192	1.000
DL3	28	-1.000	0.997	-0.915	-0.920	-0.920	-0.920	-0.912	0.993	0.076
rain4	29	-0.998	1.000	-0.936	-0.941	-0.941	-0.941	-0.934	0.998	0.133
Tx4	30	0.911	-0.941	1.000	1.000	1.000	1.000	1.000	-0.953	-0.480
Tn4	31	0.870	-0.906	0.995	0.994	0.994	0.994	0.996	-0.922	-0.557
WS4	32	-0.993	0.999	-0.956	-0.960	-0.960	-0.959	-0.954	1.000	0.192
RHx4	33	-0.914	0.943	-1.000	-1.000	-1.000	-1.000	-1.000	0.955	0.475
RHn4	34	-0.941	0.964	-0.998	-0.998	-0.998	-0.998	-0.997	0.974	0.410
rad4	35	-0.063	0.140	-0.460	-0.448	-0.448	-0.449	-0.467	0.179	1.000
ETx4	36	0.944	-0.967	0.997	0.998	0.998	0.998	0.996	-0.976	-0.400

ETn4 37 0.706 -0.759 0.932 0.927 0.927 0.927 0.934 -0.784 -0.760

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 0.906 -0.936 1.000 0.999 0.999 0.999 1.000 -0.949 -0.491

HU5_4 40 0.906 -0.936 1.000 0.999 0.999 0.999 1.000 -0.949 -0.492

HU10_4 41 0.903 -0.933 1.000 0.999 0.999 0.999 1.000 -0.947 -0.498

HU15_4 42 0.885 -0.918 0.998 0.997 0.997 0.997 0.998 -0.933 -0.532

RC4 43 -0.948 0.970 -0.996 -0.997 -0.997 -0.997 -0.995 0.979 0.390

IC4 44 -0.963 0.981 -0.990 -0.992 -0.992 -0.991 -0.989 0.988 0.341

PC4 45 -0.986 0.996 -0.970 -0.973 -0.973 -0.973 -0.968 0.999 0.243

Eto4 46 1.000 -0.997 0.915 0.920 0.920 0.920 0.912 -0.993 -0.076

DL4 47 -0.476 0.543 -0.791 -0.782 -0.782 -0.783 -0.795 0.576 0.913

Alt 48 -0.857 0.894 -0.992 -0.990 -0.990 -0.990 -0.993 0.911 0.579

Lat 49 -0.996 1.000 -0.948 -0.952 -0.952 -0.952 -0.945 1.000 0.167

Long 50 0.068 -0.145 0.464 0.452 0.452 0.453 0.471 -0.184 -1.000

pH_H2O 51 0.986 -0.970 0.835 0.842 0.842 0.841 0.831 -0.960 0.092

P 52 0.866 -0.825 0.591 0.602 0.602 0.601 0.585 -0.802 0.432

K 53 0.039 -0.117 0.439 0.427 0.427 0.428 0.446 -0.155 -0.999

Ca 54 0.999 -0.993 0.898 0.904 0.904 0.903 0.894 -0.988 -0.035

Mg 55 0.957 -0.931 0.758 0.767 0.767 0.766 0.753 -0.916 0.217

Resist 56 -0.512 0.443 -0.121 -0.135 -0.135 -0.134 -0.114 0.408 -0.818

APP_N 57 -1.000 0.997 -0.915 -0.920 -0.920 -0.920 -0.912 0.993 0.076

	19	20	21	22	23	24	25	26	27
DL3	28	1.000							
rain4	29	0.998	1.000						
Tx4	30	-0.911	-0.933	1.000					
Tn4	31	-0.870	-0.897	0.996	1.000				
WS4	32	0.993	0.998	-0.953	-0.922	1.000			
RHx4	33	0.914	0.935	-1.000	-0.995	0.955	1.000		
RHn4	34	0.941	0.959	-0.997	-0.986	0.974	0.997	1.000	
rad4	35	0.063	0.119	-0.468	-0.546	0.179	0.463	0.397	1.000

ETx4 36 -0.944 -0.962 0.996 0.984 -0.976 -0.996 -1.000 -0.387 1.000

ETn4 37 -0.706 -0.745 0.935 0.963 -0.784 -0.933 -0.904 -0.751 0.899

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 -0.906 -0.928 1.000 0.997 -0.949 -1.000 -0.996 -0.480 0.995

HU5_4 40 -0.906 -0.928 1.000 0.997 -0.949 -1.000 -0.996 -0.480 0.995

HU10_4 41 -0.903 -0.926 1.000 0.998 -0.947 -1.000 -0.995 -0.486 0.994

HU15_4 42 -0.885 -0.910 0.998 1.000 -0.933 -0.998 -0.990 -0.521 0.989

RC4 43 0.948 0.964 -0.995 -0.982 0.979 0.996 1.000 0.377 -1.000

IC4 44 0.963 0.977 -0.988 -0.971 0.988 0.989 0.997 0.328 -0.998

PC4 45 0.986 0.994 -0.968 -0.941 0.999 0.969 0.985 0.230 -0.986

Eto4 46 -1.000 -0.998 0.911 0.870 -0.993 -0.914 -0.941 -0.063 0.944

DL4 47 0.476 0.525 -0.796 -0.848 0.576 0.793 0.746 0.907 -0.739

Alt 48 0.857 0.885 -0.993 -1.000 0.911 0.992 0.981 0.568 -0.979

Lat 49 0.996 0.999 -0.945 -0.911 1.000 0.947 0.968 0.153 -0.970

Long 50 -0.068 -0.124 0.472 0.550 -0.184 -0.467 -0.402 -1.000 0.392

pH_H2O 51 -0.986 -0.975 0.830 0.776 -0.960 -0.833 -0.871 0.105 0.876

P 52 -0.866 -0.836 0.584 0.507 -0.802 -0.588 -0.645 0.445 0.654

K 53 -0.039 -0.096 0.447 0.526 -0.155 -0.442 -0.375 -1.000 0.365

Ca 54 -0.999 -0.995 0.894 0.849 -0.988 -0.896 -0.926 -0.022 0.930

Mg 55 -0.957 -0.939 0.752 0.689 -0.916 -0.756 -0.801 0.231 0.808

Resist 56 0.512 0.462 -0.113 -0.022 0.408 0.118 0.190 -0.825 -0.201

APP_N 57 1.000 0.998 -0.911 -0.870 0.993 0.914 0.941 0.063 -0.944

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 0.000 0.000

HU0_4 39 0.939 0.000 1.000

HU5_4 40 0.940 0.000 1.000 1.000

HU10_4 41 0.942 0.000 1.000 1.000 1.000

HU15_4 42 0.955 0.000 0.999 0.999 0.999 1.000

RC4 43 -0.895 0.000 -0.994 -0.994 -0.993 -0.987 1.000

IC4 44 -0.870 0.000 -0.986 -0.986 -0.985 -0.977 0.999 1.000

PC4 45 -0.815 0.000 -0.964 -0.964 -0.962 -0.951 0.988 0.995 1.000

Eto4 46 0.706 0.000 0.906 0.906 0.903 0.885 -0.948 -0.963 -0.986

DL4 47 -0.959 0.000 -0.804 -0.804 -0.808 -0.831 0.732 0.695 0.618

Alt 48 -0.970 0.000 -0.995 -0.995 -0.995 -0.998 0.976 0.964 0.932

Lat 49 -0.767 0.000 -0.941 -0.941 -0.938 -0.923 0.973 0.984 0.997

Long 50 0.754 0.000 0.484 0.484 0.490 0.525 -0.382 -0.333 -0.235

pH_H2O 51 0.578 0.000 0.822 0.822 0.818 0.794 -0.881 -0.905 -0.944

P 52 0.257 0.000 0.573 0.573 0.567 0.533 -0.662 -0.700 -0.769

K 53 0.735 0.000 0.459 0.459 0.465 0.500 -0.355 -0.306 -0.207

Ca 54 0.676 0.000 0.888 0.888 0.884 0.865 -0.934 -0.951 -0.978

Mg 55 0.469 0.000 0.743 0.743 0.738 0.711 -0.814 -0.843 -0.894

Resist 56 0.247 0.000 -0.100 -0.099 -0.092 -0.052 0.211 0.262 0.359

APP_N 57 -0.706 0.000 -0.906 -0.906 -0.903 -0.885 0.948 0.963 0.986

37 38 39 40 41 42 43 44 45

Eto4 46 1.000

DL4 47 -0.476 1.000

Alt 48 -0.857 0.861 1.000

Lat 49 -0.996 0.554 0.900 1.000

Long 50 0.068 -0.909 -0.572 -0.158 1.000

pH_H2O 51 0.986 -0.323 -0.759 -0.967 -0.100 1.000

P 52 0.866 0.027 -0.484 -0.817 -0.440 0.937 1.000

K 53 0.039 -0.897 -0.549 -0.130 1.000 -0.128 -0.466 1.000

Ca 54 0.999 -0.440 -0.835 -0.991 0.026 0.992 0.886 -0.002 1.000

Mg 55 0.957 -0.200 -0.670 -0.926 -0.226 0.992 0.974 -0.254 0.968

Resist 56 -0.512 -0.512 -0.005 0.431 0.823 -0.648 -0.873 0.839 -0.547

APP_N 57 -1.000 0.476 0.857 0.996 -0.068 -0.986 -0.866 -0.039 -0.999

46 47 48 49 50 51 52 53 54

Mg 55 1.000

Resist 56 -0.740 1.000

APP_N 57 -0.957 0.512 1.000

55 56 57

===== Correlations for Year 3 =====

*** Degrees of freedom ***

Correlations: 31

*** Correlation matrix ***

fyield 1 1.000

Tcllefprun 2 0.469 1.000

Tfertclad 3 0.919 0.652 1.000

Tftotal 4 0.824 0.298 0.758 1.000

Tfnoat 5 0.965 0.554 0.975 0.822 1.000

Tn1 6 0.137 0.532 0.278 0.191 0.203 1.000

RC1 7 -0.209 -0.452 -0.325 -0.294 -0.268 -0.982 1.000

IC1 8 -0.217 -0.441 -0.329 -0.306 -0.275 -0.978 1.000 1.000

C1 9 -0.273 -0.356 -0.359 -0.386 -0.323 -0.929 0.982 0.986 1.000

DL1 10 0.315 0.276 0.377 0.445 0.357 0.868 -0.947 -0.953 -0.990

rain2 11 -0.385 -0.079 -0.389 -0.546 -0.407 -0.670 0.799 0.812 0.897

Tx2 12 0.227 0.428 0.335 0.320 0.284 0.971 -0.999 -1.000 -0.990

Tn2 13 0.142 0.527 0.281 0.198 0.208 1.000 -0.984 -0.980 -0.934

HU0_2 14 0.202 0.461 0.320 0.283 0.262 0.986 -1.000 -0.999 -0.978

HU5_2 15 0.201 0.463 0.319 0.282 0.261 0.986 -1.000 -0.999 -0.978

HU10_2 16 0.186 0.481 0.310 0.260 0.247 0.992 -0.998 -0.996 -0.968

HU15_2 17 0.130 0.539 0.273 0.181 0.196 1.000 -0.978 -0.974 -0.922

Rad2 18 0.287 -0.577 0.116 0.413 0.230 -0.459 0.283 0.262 0.099

DL2 19 0.320 0.266 0.379 0.452 0.361 0.860 -0.941 -0.948 -0.988

rain3 20 -0.328 -0.246 -0.381 -0.465 -0.367 -0.842 0.929 0.937 0.982

Tave3 21 0.206 0.456 0.323 0.290 0.266 0.984 -1.000 -1.000 -0.981

HU0_3 22 0.212 0.448 0.326 0.298 0.271 0.981 -1.000 -1.000 -0.984

HU5_3 23 0.212 0.448 0.326 0.298 0.271 0.981 -1.000 -1.000 -0.984

HU10_3 24 0.210 0.451 0.325 0.295 0.269 0.982 -1.000 -1.000 -0.983

HU15_3 25 0.202 0.461 0.320 0.284 0.262 0.985 -1.000 -0.999 -0.979

WS3 26 -0.238 -0.412 -0.341 -0.335 -0.293 -0.964 0.997 0.998 0.994

rad3 27 0.239 -0.616 0.058 0.344 0.176 -0.588 0.424 0.404 0.247

DL3 28 -0.298 -0.310 -0.371 -0.422 -0.344 -0.896 0.964 0.969 0.997

rain4 29 -0.341 -0.215 -0.385 -0.483 -0.377 -0.814 0.909 0.918 0.971

Tx4 30 0.219 0.439 0.330 0.308 0.277 0.977 -1.000 -1.000 -0.987

Tn4 31 0.174 0.494 0.303 0.244 0.237 0.995 -0.996 -0.993 -0.960

WS4 32 -0.283 -0.339 -0.364 -0.399 -0.331 -0.918 0.976 0.981 1.000

RHx4 33 -0.304 -0.299 -0.373 -0.430 -0.348 -0.887 0.958 0.964 0.995

RHn4 34 -0.273 -0.356 -0.359 -0.386 -0.323 -0.929 0.982 0.986 1.000

rad4 35 0.254 -0.606 0.076 0.366 0.193 -0.550 0.382 0.361 0.202

ETx4 36 0.188 0.478 0.311 0.264 0.249 0.991 -0.998 -0.997 -0.970

ETn4 37 0.186 0.480 0.310 0.261 0.248 0.992 -0.998 -0.996 -0.969

frost4 38 -0.348 -0.196 -0.387 -0.494 -0.382 -0.795 0.896 0.905 0.963

HU0_4 39 0.205 0.457 0.322 0.288 0.265 0.984 -1.000 -0.999 -0.980

HU5_4 40 0.205 0.457 0.322 0.288 0.264 0.984 -1.000 -0.999 -0.980

HU10_4 41 0.199 0.464 0.318 0.280 0.260 0.987 -1.000 -0.999 -0.977

HU15_4 42 0.185 0.482 0.309 0.259 0.246 0.992 -0.998 -0.996 -0.968

RC4 43 -0.250 -0.394 -0.347 -0.352 -0.304 -0.953 0.993 0.996 0.997

IC4 44 -0.247 -0.398 -0.346 -0.348 -0.301 -0.956 0.994 0.996 0.997

PC4 45 -0.282 -0.340 -0.363 -0.399 -0.331 -0.918 0.977 0.981 1.000

Eto4 46 0.393 0.041 0.387 0.559 0.411 0.626 -0.763 -0.777 -0.870

DL4 47 0.026 -0.636 -0.151 0.041 -0.047 -0.923 0.833 0.821 0.715

Alt 48 -0.185 -0.482 -0.309 -0.259 -0.246 -0.992 0.998 0.996 0.968

Lat 49 -0.326 -0.251 -0.381 -0.462 -0.366 -0.846 0.932 0.940 0.983

Long 50 -0.196 0.636 -0.012 -0.284 -0.129 0.680 -0.528 -0.510 -0.360

pH_H2O 51 0.254 0.389 0.349 0.358 0.307 0.950 -0.992 -0.994 -0.998

P 52 0.408 -0.311 0.304 0.582 0.385 0.115 -0.301 -0.321 -0.474

K 53 -0.011 0.630 0.164 -0.020 0.062 0.936 -0.852 -0.841 -0.739

Ca 54 0.315 0.276 0.377 0.446 0.357 0.868 -0.946 -0.953 -0.990

Mg 55 0.406 -0.025 0.381 0.577 0.416 0.544 -0.693 -0.709 -0.816

Resist 56 -0.348 -0.196 -0.387 -0.494 -0.382 -0.795 0.896 0.905 0.963

APP_N 57 -0.348 -0.196 -0.387 -0.494 -0.382 -0.795 0.896 0.905 0.963

1 2 3 4 5 6 7 8 9

DL1 10 1.000

rain2 11 -0.950 1.000

Tx2 12 0.961 -0.828 1.000

Tn2 13 0.875 -0.680 0.974 1.000

HU0_2 14 0.940 -0.786 0.998 0.988 1.000

HU5_2 15 0.939 -0.784 0.997 0.988 1.000 1.000

HU10_2 16 0.924 -0.758 0.993 0.994 0.999 0.999 1.000

HU15_2 17 0.859 -0.657 0.967 1.000 0.982 0.983 0.990 1.000

Rad2 18 0.041 -0.351 -0.235 -0.448 -0.303 -0.305 -0.344 -0.475 1.000

DL2 19 1.000 -0.955 0.956 0.866 0.934 0.933 0.917 0.850 0.059

rain3 20 -0.999 0.965 -0.946 -0.849 -0.921 -0.920 -0.903 -0.832 -0.092

Tave3 21 0.944 -0.793 0.998 0.986 1.000 1.000 0.998 0.980 -0.292

HU0_3 22 0.949 -0.803 0.999 0.983 1.000 1.000 0.997 0.977 -0.276

HU5_3 23 0.949 -0.803 0.999 0.983 1.000 1.000 0.997 0.977 -0.276

HU10_3 24 0.947 -0.800 0.999 0.984 1.000 1.000 0.998 0.978 -0.281

HU15_3 25 0.940 -0.787 0.998 0.987 1.000 1.000 0.999 0.982 -0.301

WS3 26 -0.969 0.844 -1.000 -0.967 -0.995 -0.995 -0.989 -0.958 0.205

rad3 27 -0.109 -0.207 -0.378 -0.577 -0.443 -0.445 -0.482 -0.602 0.989

DL3 28 -0.998 0.930 -0.976 -0.901 -0.958 -0.957 -0.944 -0.887 0.016

rain4 29 -0.995 0.977 -0.929 -0.821 -0.900 -0.899 -0.880 -0.803 -0.142

Tx4 30 0.955 -0.814 1.000 0.979 0.999 0.999 0.996 0.972 -0.257

Tn4 31 0.912 -0.738 0.990 0.997 0.997 0.997 1.000 0.993 -0.372

WS4 32 -0.994 0.910 -0.986 -0.923 -0.972 -0.971 -0.960 -0.910 0.069

RHx4 33 -0.999 0.937 -0.971 -0.893 -0.952 -0.951 -0.938 -0.879 -0.002

RHn4 34 -0.990 0.897 -0.990 -0.934 -0.978 -0.978 -0.968 -0.922 0.098

rad4 35 -0.063 -0.251 -0.335 -0.539 -0.401 -0.403 -0.441 -0.565 0.995

ETx4 36 0.926 -0.762 0.994 0.993 0.999 0.999 1.000 0.989 -0.338

ETn4 37 0.924 -0.759 0.994 0.993 0.999 0.999 1.000 0.989 -0.343

frost4 38 -0.991 0.983 -0.917 -0.803 -0.886 -0.885 -0.865 -0.784 -0.173

HU0_4 39 0.943 -0.792 0.998 0.986 1.000 1.000 0.999 0.981 -0.294

HU5_4 40 0.942 -0.791 0.998 0.986 1.000 1.000 0.999 0.981 -0.295

HU10_4 41 0.937 -0.782 0.997 0.989 1.000 1.000 0.999 0.984 -0.309

HU15_4 42 0.923 -0.756 0.993 0.994 0.999 0.999 1.000 0.990 -0.347

RC4 43 -0.978 0.863 -0.998 -0.957 -0.991 -0.990 -0.984 -0.948 0.170

IC4 44 -0.976 0.859 -0.998 -0.959 -0.992 -0.991 -0.985 -0.950 0.178

PC4 45 -0.994 0.909 -0.986 -0.923 -0.972 -0.971 -0.961 -0.911 0.070

Eto4 46 0.931 -0.998 0.794 0.636 0.749 0.747 0.719 0.612 0.405

DL4 47 -0.610 0.332 -0.804 -0.918 -0.844 -0.846 -0.867 -0.929 0.766

Alt 48 -0.923 0.756 -0.993 -0.994 -0.999 -0.999 -1.000 -0.990 0.347

Lat 49 -0.999 0.963 -0.949 -0.853 -0.924 -0.923 -0.907 -0.837 -0.084

Long 50 0.226 0.089 0.486 0.670 0.546 0.548 0.582 0.693 -0.964

pH_H2O 51 0.980 -0.869 0.997 0.954 0.989 0.989 0.982 0.944 -0.159

P 52 0.592 -0.814 0.348 0.127 0.281 0.278 0.238 0.097 0.830

K 53 0.638 -0.366 0.825 0.931 0.863 0.864 0.884 0.942 -0.743

Ca 54 1.000 -0.950 0.961 0.874 0.939 0.939 0.924 0.859 0.042

Mg 55 0.888 -0.987 0.728 0.555 0.678 0.676 0.645 0.529 0.495

Resist 56 -0.991 0.983 -0.917 -0.803 -0.886 -0.885 -0.865 -0.784 -0.173

APP_N 57 -0.991 0.983 -0.917 -0.803 -0.886 -0.885 -0.865 -0.784 -0.173

10 11 12 13 14 15 16 17 18

DL2 19 1.000

rain3 20 -0.999 1.000

Tave3 21 0.938 -0.926 1.000

HU0_3 22 0.943 -0.932 1.000 1.000

HU5_3 23 0.943 -0.932 1.000 1.000 1.000

HU10_3 24 0.941 -0.930 1.000 1.000 1.000 1.000

HU15_3 25 0.934 -0.922 1.000 1.000 1.000 1.000 1.000

WS3 26 -0.965 0.956 -0.996 -0.997 -0.997 -0.997 -0.995 1.000

rad3 27 -0.092 0.059 -0.432 -0.417 -0.417 -0.422 -0.441 0.350 1.000

DL3 28 -0.997 0.994 -0.961 -0.965 -0.965 -0.964 -0.958 0.982 0.166

rain4 29 -0.996 0.999 -0.905 -0.912 -0.912 -0.910 -0.901 0.940 0.008

Tx4 30 0.950 -0.939 0.999 1.000 1.000 1.000 0.999 -0.999 -0.399

Tn4 31 0.905 -0.890 0.996 0.995 0.995 0.995 0.997 -0.985 -0.507

WS4 32 -0.992 0.987 -0.974 -0.978 -0.978 -0.977 -0.972 0.991 0.218

RHx4 33 -0.998 0.996 -0.956 -0.960 -0.960 -0.959 -0.953 0.978 0.148

RHn4 34 -0.988 0.982 -0.981 -0.984 -0.984 -0.983 -0.979 0.994 0.247

rad4 35 -0.046 0.013 -0.390 -0.375 -0.375 -0.380 -0.399 0.306 0.999

ETx4 36 0.920 -0.906 0.999 0.998 0.998 0.998 0.999 -0.990 -0.476

ETn4 37 0.918 -0.904 0.999 0.998 0.998 0.998 0.999 -0.990 -0.480

frost4 38 -0.993 0.997 -0.892 -0.899 -0.899 -0.896 -0.887 0.929 -0.023

HU0_4 39 0.937 -0.925 1.000 1.000 1.000 1.000 1.000 -0.996 -0.434

HU5_4 40 0.937 -0.924 1.000 1.000 1.000 1.000 1.000 -0.996 -0.435

HU10_4 41 0.931 -0.919 1.000 0.999 0.999 1.000 1.000 -0.994 -0.449

HU15_4 42 0.916 -0.902 0.998 0.997 0.997 0.998 0.999 -0.989 -0.484

RC4 43 -0.974 0.966 -0.992 -0.994 -0.994 -0.993 -0.991 0.999 0.316

IC4 44 -0.972 0.964 -0.993 -0.995 -0.995 -0.994 -0.992 1.000 0.324

PC4 45 -0.992 0.987 -0.975 -0.978 -0.978 -0.977 -0.972 0.991 0.219

Eto4 46 0.937 -0.948 0.757 0.767 0.767 0.764 0.750 -0.812 0.263

DL4 47 -0.596 0.569 -0.838 -0.829 -0.829 -0.832 -0.843 0.786 0.854

Alt 48 -0.916 0.902 -0.998 -0.997 -0.997 -0.998 -0.999 0.989 0.484

Lat 49 -1.000 1.000 -0.929 -0.934 -0.934 -0.932 -0.925 0.958 0.067

Long 50 0.209 -0.177 0.536 0.522 0.522 0.527 0.545 -0.458 -0.993

pH_H2O 51 0.976 -0.969 0.991 0.993 0.993 0.992 0.989 -0.999 -0.305

P 52 0.606 -0.632 0.292 0.307 0.307 0.302 0.282 -0.376 0.736

K 53 0.625 -0.598 0.857 0.849 0.849 0.852 0.862 -0.808 -0.835

Ca 54 1.000 -0.999 0.943 0.949 0.949 0.947 0.940 -0.969 -0.109

Mg 55 0.896 -0.910 0.686 0.698 0.698 0.694 0.679 -0.749 0.359

Resist 56 -0.993 0.997 -0.892 -0.899 -0.899 -0.896 -0.887 0.929 -0.023

APP_N 57 -0.993 0.997 -0.892 -0.899 -0.899 -0.896 -0.887 0.929 -0.023

19 20 21 22 23 24 25 26 27

DL3 28 1.000

rain4 29 0.987 1.000

Tx4 30 -0.970 -0.920 1.000

Tn4 31 -0.934 -0.866 0.993 1.000

WS4 32 0.999 0.978 -0.982 -0.952 1.000

RHx4 33 1.000 0.990 -0.966 -0.927 0.997 1.000

RHn4 34 0.997 0.971 -0.987 -0.960 1.000 0.995 1.000

rad4 35 0.121 -0.038 -0.357 -0.467 0.173 0.102 0.202 1.000

ETx4 36 -0.946 -0.883 0.996 0.999 -0.962 -0.940 -0.970 -0.435 1.000

ETn4 37 -0.945 -0.881 0.996 1.000 -0.961 -0.939 -0.969 -0.439 1.000

frost4 38 0.982 1.000 -0.907 -0.850 0.971 0.985 0.963 -0.069 -0.868

HU0_4 39 -0.960 -0.904 0.999 0.997 -0.974 -0.955 -0.980 -0.392 0.999

HU5_4 40 -0.960 -0.904 0.999 0.997 -0.974 -0.955 -0.980 -0.393 0.999

HU10_4 41 -0.956 -0.897 0.999 0.998 -0.970 -0.950 -0.977 -0.407 1.000

HU15_4 42 -0.943 -0.879 0.996 1.000 -0.959 -0.937 -0.967 -0.443 1.000

RC4 43 0.988 0.951 -0.996 -0.978 0.995 0.985 0.997 0.272 -0.985

IC4 44 0.987 0.949 -0.997 -0.980 0.994 0.984 0.997 0.280 -0.986

PC4 45 0.999 0.977 -0.982 -0.952 1.000 0.997 1.000 0.174 -0.962

Eto4 46 -0.908 -0.963 0.780 0.698 -0.885 -0.915 -0.870 0.307 0.724

DL4 47 0.655 0.527 -0.818 -0.881 0.693 0.640 0.715 0.829 -0.864

Alt 48 0.943 0.879 -0.996 -1.000 0.960 0.937 0.967 0.443 -1.000

Lat 49 0.995 0.998 -0.941 -0.894 0.988 0.997 0.983 0.020 -0.909

Long 50 -0.282 -0.127 0.505 0.606 -0.332 -0.264 -0.360 -0.986 0.577

pH_H2O 51 -0.990 -0.955 0.995 0.976 -0.996 -0.987 -0.998 -0.261 0.983

P 52 -0.545 -0.671 0.326 0.210 -0.500 -0.560 -0.474 0.767 0.245

K 53 -0.681 -0.557 0.838 0.898 -0.719 -0.668 -0.739 -0.809 0.881

Ca 54 -0.998 -0.995 0.955 0.912 -0.994 -0.999 -0.990 -0.063 0.926

Mg 55 -0.861 -0.930 0.712 0.622 -0.833 -0.870 -0.816 0.402 0.650

Resist 56 0.982 1.000 -0.907 -0.850 0.971 0.985 0.963 -0.069 -0.868

APP_N 57 0.982 1.000 -0.907 -0.850 0.971 0.985 0.963 -0.069 -0.868

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 -0.866 1.000

HU0_4 39 0.999 -0.891 1.000

HU5_4 40 0.999 -0.890 1.000 1.000

HU10_4 41 0.999 -0.883 1.000 1.000 1.000

HU15_4 42 1.000 -0.864 0.998 0.998 0.999 1.000

RC4 43 -0.984 0.941 -0.992 -0.992 -0.990 -0.983 1.000

IC4 44 -0.985 0.938 -0.993 -0.993 -0.991 -0.985 1.000 1.000

PC4 45 -0.961 0.970 -0.974 -0.974 -0.970 -0.960 0.995 0.994 1.000

Eto4 46 0.721 -0.971 0.755 0.755 0.745 0.717 -0.833 -0.828 -0.884

DL4 47 -0.866 0.500 -0.839 -0.840 -0.848 -0.868 0.763 0.768 0.694

Alt 48 -1.000 0.864 -0.998 -0.998 -0.999 -1.000 0.983 0.985 0.960

Lat 49 -0.907 0.996 -0.928 -0.927 -0.922 -0.905 0.968 0.966 0.988

Long 50 0.581 -0.096 0.538 0.539 0.552 0.584 -0.426 -0.434 -0.333

pH_H2O 51 0.982 -0.945 0.990 0.990 0.988 0.981 -1.000 -1.000 -0.996

P 52 0.240 -0.693 0.290 0.289 0.274 0.236 -0.409 -0.402 -0.499

K 53 0.883 -0.531 0.858 0.859 0.866 0.886 -0.786 -0.791 -0.720

Ca 54 0.924 -0.991 0.943 0.942 0.937 0.922 -0.977 -0.976 -0.994

Mg 55 0.646 -0.941 0.685 0.684 0.673 0.643 -0.772 -0.767 -0.832

Resist 56 -0.866 1.000 -0.891 -0.890 -0.883 -0.864 0.941 0.938 0.970

APP_N 57 -0.866 1.000 -0.891 -0.890 -0.883 -0.864 0.941 0.938 0.970

37 38 39 40 41 42 43 44 45

Eto4 46 1.000

DL4 47 -0.277 1.000

Alt 48 -0.717 0.868 1.000

Lat 49 -0.945 0.576 0.905 1.000

Long 50 -0.146 -0.910 -0.584 -0.185 1.000

pH_H2O 51 0.839 -0.756 -0.981 -0.970 0.416 1.000

P 52 0.846 0.277 -0.236 -0.626 -0.651 0.419 1.000

K 53 0.312 -0.999 -0.886 -0.605 0.894 0.779 -0.243 1.000

Ca 54 0.931 -0.610 -0.923 -0.999 0.226 0.980 0.593 0.638 1.000

Mg 55 0.995 -0.178 -0.643 -0.907 -0.246 0.779 0.896 0.214 0.889

Resist 56 -0.971 0.500 0.864 0.996 -0.096 -0.945 -0.693 -0.531 -0.991

APP_N 57 -0.971 0.500 0.864 0.996 -0.096 -0.945 -0.693 -0.531 -0.991

46 47 48 49 50 51 52 53 54

Mg 55 1.000

Resist 56 -0.941 1.000

APP_N 57 -0.941 1.000 1.000

55 56 57

===== Correlations for Year 4 =====

*** Degrees of freedom ***

Correlations: 31

*** Correlation matrix ***

fyield 1 1.000

Tclleftprun 2 0.748 1.000

Tfertclad 3 0.918 0.787 1.000

Tftotal 4 0.740 0.503 0.638 1.000

Tfnoat 5 0.966 0.792 0.962 0.733 1.000

Tn1 6 0.133 0.343 0.094 0.391 0.177 1.000

RC1 7 -0.151 -0.328 -0.107 -0.425 -0.191 -0.998 1.000

IC1 8 -0.175 -0.305 -0.124 -0.470 -0.210 -0.989 0.996 1.000

C1 9 -0.192 -0.285 -0.137 -0.501 -0.223 -0.977 0.988 0.998 1.000

DL1 10 0.243 0.213 0.174 0.589 0.259 0.907 -0.931 -0.959 -0.976

rain2 11 -0.297 -0.085 -0.214 -0.667 -0.290 -0.720 0.762 0.815 0.851

Tx2 12 0.132 0.344 0.093 0.390 0.176 1.000 -0.998 -0.988 -0.976

Tn2 13 0.123 0.351 0.086 0.371 0.168 0.999 -0.995 -0.983 -0.969

HU0_2 14 0.129 0.346 0.091 0.383 0.173 1.000 -0.997 -0.987 -0.974

HU5_2 15 0.129 0.346 0.091 0.383 0.173 1.000 -0.997 -0.987 -0.974

HU10_2 16 0.123 0.351 0.086 0.371 0.168 0.999 -0.995 -0.983 -0.969

HU15_2 17 0.084 0.377 0.058 0.294 0.136 0.986 -0.974 -0.951 -0.929

Rad2 18 0.277 -0.261 0.202 0.521 0.219 -0.083 0.020 -0.066 -0.132

DL2 19 0.243 0.213 0.174 0.589 0.259 0.907 -0.931 -0.959 -0.976

rain3 20 -0.084 -0.377 -0.058 -0.294 -0.136 -0.986 0.974 0.951 0.928

Tave3 21 0.168 0.312 0.119 0.456 0.204 0.992 -0.998 -1.000 -0.996

HU0_3 22 0.174 0.305 0.124 0.468 0.209 0.989 -0.997 -1.000 -0.998

HU5_3 23 0.174 0.305 0.124 0.468 0.209 0.989 -0.997 -1.000 -0.998

HU10_3 24 0.174 0.306 0.124 0.468 0.209 0.989 -0.997 -1.000 -0.998

HU15_3 25 0.169 0.311 0.120 0.459 0.205 0.992 -0.998 -1.000 -0.996

WS3 26 -0.176 -0.303 -0.125 -0.472 -0.211 -0.988 0.996 1.000 0.998

rad3 27 0.125 -0.403 0.093 0.150 0.056 -0.670 0.623 0.552 0.497

DL3 28 -0.199 -0.276 -0.142 -0.514 -0.228 -0.970 0.983 0.995 1.000

rain4 29 -0.147 -0.331 -0.104 -0.417 -0.188 -0.999 1.000 0.995 0.986

Tx4 30 0.157 0.322 0.112 0.437 0.196 0.996 -1.000 -0.998 -0.992

Tn4 31 0.150 0.329 0.106 0.423 0.190 0.998 -1.000 -0.996 -0.988

WS4 32 -0.107 -0.362 -0.075 -0.341 -0.155 -0.996 0.989 0.972 0.954

RHx4 33 -0.310 -0.027 -0.224 -0.679 -0.294 -0.614 0.662 0.725 0.769

RHn4 34 -0.271 -0.156 -0.195 -0.634 -0.277 -0.831 0.865 0.905 0.931

rad4 35 0.160 -0.388 0.118 0.229 0.090 -0.577 0.524 0.449 0.389

ETx4 36 0.148 0.330 0.105 0.420 0.189 0.999 -1.000 -0.995 -0.987

ETn4 37 0.085 0.376 0.059 0.297 0.137 0.987 -0.975 -0.952 -0.930

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 0.158 0.321 0.112 0.439 0.197 0.996 -1.000 -0.998 -0.992

HU5_4 40 0.158 0.321 0.112 0.438 0.197 0.996 -1.000 -0.998 -0.992

HU10_4 41 0.156 0.323 0.111 0.435 0.195 0.997 -1.000 -0.998 -0.991

HU15_4 42 0.148 0.331 0.105 0.419 0.189 0.999 -1.000 -0.995 -0.987

RC4 43 -0.175 -0.304 -0.125 -0.470 -0.210 -0.989 0.996 1.000 0.998

IC4 44 -0.193 -0.284 -0.138 -0.504 -0.224 -0.976 0.987 0.997 1.000

PC4 45 -0.203 -0.271 -0.145 -0.522 -0.232 -0.966 0.980 0.994 0.999

Eto4 46 0.315 -0.130 0.228 0.642 0.274 0.275 -0.335 -0.415 -0.474

DL4 47 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Alt 48 -0.106 -0.363 -0.074 -0.338 -0.154 -0.996 0.988 0.971 0.953

Lat 49 -0.223 -0.244 -0.160 -0.556 -0.246 -0.941 0.960 0.981 0.992

Long 50 -0.182 0.375 -0.134 -0.281 -0.113 0.506 -0.452 -0.372 -0.311

pH_H2O 51 0.268 0.164 0.192 0.629 0.275 0.843 -0.875 -0.914 -0.939

P 52 0.310 -0.159 0.225 0.623 0.266 0.202 -0.263 -0.346 -0.406

K 53 -0.239 0.322 -0.174 -0.420 -0.174 0.288 -0.227 -0.142 -0.077

Ca 54 0.135 0.341 0.096 0.396 0.179 1.000 -0.999 -0.990 -0.979

Mg 55 0.294 0.094 0.212 0.664 0.289 0.736 -0.777 -0.828 -0.863

Resist 56 -0.300 0.202 -0.218 -0.588 -0.250 -0.088 0.150 0.236 0.299

APP_N 57 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

1 2 3 4 5 6 7 8 9

DL1 10 1.000

rain2 11 -0.945 1.000

Tx2 12 0.906 -0.718 1.000

Tn2 13 0.891 -0.694 0.999 1.000

HU0_2 14 0.901 -0.710 1.000 1.000 1.000

HU5_2 15 0.901 -0.710 1.000 1.000 1.000 1.000

HU10_2 16 0.891 -0.694 0.999 1.000 1.000 1.000 1.000

HU15_2 17 0.825 -0.596 0.987 0.992 0.989 0.989 0.992 1.000

Rad2 18 0.345 -0.632 -0.086 -0.119 -0.097 -0.097 -0.119 -0.246 1.000

DL2 19 1.000 -0.945 0.906 0.891 0.901 0.901 0.891 0.825 0.345

rain3 20 -0.825 0.595 -0.987 -0.992 -0.989 -0.989 -0.992 -1.000 0.246

Tave3 21 0.952 -0.799 0.992 0.987 0.991 0.991 0.987 0.959 0.040

HU0_3 22 0.958 -0.813 0.989 0.983 0.987 0.987 0.983 0.952 0.063

HU5_3 23 0.958 -0.813 0.989 0.983 0.987 0.987 0.983 0.952 0.063

HU10_3 24 0.958 -0.813 0.989 0.984 0.987 0.987 0.984 0.952 0.062

HU15_3 25 0.953 -0.802 0.992 0.987 0.990 0.990 0.987 0.958 0.044

WS3 26 -0.961 0.818 -0.988 -0.982 -0.986 -0.986 -0.982 -0.949 -0.071

rad3 27 -0.295 -0.032 -0.673 -0.697 -0.681 -0.681 -0.697 -0.783 0.795

DL3 28 -0.982 0.867 -0.969 -0.961 -0.967 -0.967 -0.961 -0.917 -0.161

rain4 29 -0.926 0.752 -0.999 -0.996 -0.998 -0.998 -0.996 -0.977 0.035

Tx4 30 0.939 -0.776 0.996 0.993 0.995 0.995 0.993 0.969 0.002

Tn4 31 0.930 -0.759 0.998 0.996 0.997 0.997 0.996 0.975 -0.025

WS4 32 -0.866 0.656 -0.996 -0.999 -0.997 -0.997 -0.999 -0.997 0.171

RHx4 33 -0.890 0.990 -0.612 -0.585 -0.603 -0.603 -0.586 -0.476 -0.735

RHn4 34 -0.988 0.984 -0.830 -0.811 -0.823 -0.823 -0.811 -0.729 -0.485

rad4 35 -0.179 -0.152 -0.579 -0.606 -0.588 -0.588 -0.606 -0.703 0.862

ETx4 36 0.928 -0.755 0.998 0.996 0.998 0.998 0.996 0.976 -0.031

ETn4 37 0.828 -0.600 0.988 0.992 0.989 0.989 0.992 1.000 -0.241

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 0.940 -0.778 0.996 0.992 0.995 0.995 0.992 0.968 0.005

HU5_4 40 0.940 -0.778 0.996 0.992 0.995 0.995 0.992 0.968 0.005

HU10_4 41 0.938 -0.774 0.996 0.993 0.995 0.995 0.993 0.970 -0.001

HU15_4 42 0.927 -0.755 0.999 0.996 0.998 0.998 0.996 0.977 -0.032

RC4 43 -0.960 0.816 -0.988 -0.983 -0.986 -0.986 -0.983 -0.950 -0.068

IC4 44 -0.977 0.855 -0.975 -0.967 -0.972 -0.972 -0.967 -0.926 -0.138

PC4 45 -0.985 0.875 -0.965 -0.956 -0.962 -0.962 -0.956 -0.910 -0.178

Eto4 46 0.655 -0.865 0.272 0.240 0.261 0.261 0.240 0.113 0.935

DL4 47 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Alt 48 -0.864 0.652 -0.996 -0.998 -0.997 -0.997 -0.998 -0.997 0.175

Lat 49 -0.996 0.912 -0.940 -0.928 -0.936 -0.936 -0.928 -0.872 -0.259

Long 50 0.096 0.234 0.509 0.537 0.519 0.519 0.537 0.641 -0.901

pH_H2O 51 0.991 -0.980 0.842 0.823 0.836 0.835 0.823 0.743 0.466

P 52 0.596 -0.825 0.199 0.167 0.188 0.188 0.167 0.038 0.959

K 53 -0.143 0.458 0.290 0.322 0.301 0.301 0.322 0.441 -0.978

Ca 54 0.910 -0.725 1.000 0.999 1.000 1.000 0.999 0.985 -0.075

Mg 55 0.953 -1.000 0.734 0.711 0.726 0.726 0.711 0.614 0.614

Resist 56 -0.500 0.755 -0.085 -0.052 -0.074 -0.074 -0.052 0.077 -0.985

APP_N 57 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

10 11 12 13 14 15 16 17 18

DL2 19 1.000

rain3 20 -0.825 1.000

Tave3 21 0.952 -0.959 1.000

HU0_3 22 0.958 -0.952 1.000 1.000

HU5_3 23 0.958 -0.952 1.000 1.000 1.000

HU10_3 24 0.958 -0.952 1.000 1.000 1.000 1.000

HU15_3 25 0.953 -0.957 1.000 1.000 1.000 1.000 1.000

WS3 26 -0.961 0.949 -1.000 -1.000 -1.000 -1.000 -1.000 1.000

rad3 27 -0.295 0.784 -0.574 -0.555 -0.555 -0.556 -0.571 0.548 1.000

DL3 28 -0.982 0.917 -0.993 -0.995 -0.995 -0.995 -0.993 0.996 0.470

rain4 29 -0.926 0.977 -0.997 -0.995 -0.995 -0.995 -0.997 0.994 0.634

Tx4 30 0.939 -0.969 0.999 0.998 0.998 0.998 0.999 -0.998 -0.605

Tn4 31 0.930 -0.975 0.998 0.996 0.996 0.996 0.998 -0.995 -0.626

WS4 32 -0.866 0.997 -0.978 -0.973 -0.973 -0.973 -0.977 0.971 0.733

RHx4 33 -0.890 0.476 -0.706 -0.723 -0.723 -0.722 -0.709 0.728 -0.174

RHn4 34 -0.988 0.728 -0.893 -0.903 -0.903 -0.903 -0.895 0.907 0.145

rad4 35 -0.179 0.704 -0.472 -0.452 -0.452 -0.452 -0.468 0.444 0.993

ETx4 36 0.928 -0.976 0.998 0.996 0.996 0.996 0.997 -0.995 -0.631

ETn4 37 0.828 -1.000 0.960 0.953 0.953 0.954 0.959 -0.951 -0.780

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 0.940 -0.968 0.999 0.998 0.998 0.998 0.999 -0.998 -0.602

HU5_4 40 0.940 -0.968 0.999 0.998 0.998 0.998 0.999 -0.998 -0.603

HU10_4 41 0.938 -0.970 0.999 0.998 0.998 0.998 0.999 -0.997 -0.607

HU15_4 42 0.927 -0.977 0.997 0.996 0.996 0.996 0.997 -0.995 -0.631

RC4 43 -0.960 0.950 -1.000 -1.000 -1.000 -1.000 -1.000 1.000 0.551

IC4 44 -0.977 0.926 -0.995 -0.997 -0.997 -0.997 -0.996 0.998 0.491

PC4 45 -0.985 0.910 -0.990 -0.993 -0.993 -0.993 -0.991 0.994 0.455

Eto4 46 0.655 -0.113 0.391 0.412 0.412 0.411 0.395 -0.419 0.529

DL4 47 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Alt 48 -0.864 0.997 -0.977 -0.972 -0.972 -0.972 -0.976 0.970 0.736

Lat 49 -0.996 0.872 -0.975 -0.980 -0.980 -0.980 -0.976 0.982 0.379

Long 50 0.096 -0.642 0.397 0.376 0.376 0.376 0.393 -0.368 -0.979

pH_H2O 51 0.991 -0.743 0.903 0.912 0.912 0.912 0.905 -0.916 -0.166

P 52 0.596 -0.038 0.320 0.342 0.342 0.342 0.325 -0.350 0.591

K 53 -0.143 -0.442 0.168 0.145 0.145 0.146 0.164 -0.137 -0.904

Ca 54 0.910 -0.985 0.993 0.990 0.990 0.991 0.993 -0.989 -0.664

Mg 55 0.953 -0.614 0.813 0.826 0.826 0.826 0.816 -0.831 0.009

Resist 56 -0.500 -0.077 -0.210 -0.232 -0.232 -0.232 -0.214 0.240 -0.680

APP_N 57 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

19 20 21 22 23 24 25 26 27

DL3 28 1.000

rain4 29 0.981 1.000

Tx4 30 -0.987 -0.999 1.000

Tn4 31 -0.983 -1.000 1.000 1.000

WS4 32 0.945 0.991 -0.985 -0.989 1.000

RHx4 33 0.787 0.651 -0.679 -0.659 0.542 1.000

RHn4 34 0.941 0.857 -0.876 -0.862 0.779 0.949 1.000

rad4 35 0.361 0.537 -0.505 -0.529 0.647 -0.290 0.025 1.000

ETx4 36 -0.982 -1.000 0.999 1.000 -0.990 -0.655 -0.859 -0.533 1.000

ETn4 37 -0.919 -0.978 0.970 0.976 -0.997 -0.480 -0.732 -0.700 0.977

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 -0.988 -0.999 1.000 1.000 -0.984 -0.681 -0.877 -0.503 0.999

HU5_4 40 -0.988 -0.999 1.000 1.000 -0.984 -0.681 -0.877 -0.503 0.999

HU10_4 41 -0.987 -0.999 1.000 1.000 -0.986 -0.677 -0.874 -0.508 1.000

HU15_4 42 -0.981 -1.000 0.999 1.000 -0.990 -0.654 -0.859 -0.534 1.000

RC4 43 0.996 0.995 -0.998 -0.996 0.972 0.726 0.905 0.447 -0.995

IC4 44 1.000 0.985 -0.991 -0.987 0.952 0.772 0.933 0.384 -0.986

PC4 45 1.000 0.977 -0.984 -0.979 0.939 0.798 0.947 0.346 -0.978

Eto4 46 -0.500 -0.321 0.356 0.330 -0.189 -0.928 -0.763 0.627 0.325

DL4 47 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Alt 48 0.943 0.990 -0.984 -0.989 1.000 0.538 0.776 0.650 -0.989

Lat 49 0.995 0.956 -0.966 -0.959 0.907 0.845 0.970 0.266 -0.957

Long 50 -0.282 -0.465 0.431 0.456 -0.581 0.369 0.058 -0.997 0.461

pH_H2O 51 -0.948 -0.868 0.886 0.873 -0.792 -0.942 -1.000 -0.047 0.870

P 52 -0.434 -0.249 0.284 0.258 -0.115 -0.897 -0.712 0.684 0.253

K 53 -0.047 -0.241 0.205 0.232 -0.371 0.579 0.293 -0.948 0.237

Ca 54 -0.972 -0.999 0.997 0.999 -0.995 -0.621 -0.836 -0.570 0.999

Mg 55 -0.878 -0.767 0.791 0.774 -0.673 -0.986 -0.988 0.129 0.770

Resist 56 0.327 0.136 -0.173 -0.146 0.000 0.840 0.627 -0.763 -0.140

APP_N 57 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 0.000 0.000

HU0_4 39 0.969 0.000 1.000

HU5_4 40 0.969 0.000 1.000 1.000

HU10_4 41 0.971 0.000 1.000 1.000 1.000

HU15_4 42 0.978 0.000 0.999 0.999 1.000 1.000

RC4 43 -0.952 0.000 -0.998 -0.998 -0.998 -0.995 1.000

IC4 44 -0.928 0.000 -0.991 -0.991 -0.990 -0.986 0.998 1.000

PC4 45 -0.912 0.000 -0.985 -0.985 -0.984 -0.978 0.994 0.999 1.000

Eto4 46 0.118 0.000 0.359 0.358 0.353 0.324 -0.416 -0.479 -0.514

DL4 47 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Alt 48 -0.998 0.000 -0.984 -0.984 -0.985 -0.990 0.970 0.951 0.938

Lat 49 -0.875 0.000 -0.967 -0.967 -0.965 -0.957 0.981 0.992 0.997

Long 50 0.638 0.000 0.429 0.429 0.434 0.462 -0.371 -0.305 -0.266

pH_H2O 51 0.746 0.000 0.887 0.887 0.884 0.870 -0.914 -0.941 -0.954

P 52 0.043 0.000 0.287 0.287 0.281 0.252 -0.347 -0.412 -0.449

K 53 0.437 0.000 0.202 0.202 0.208 0.238 -0.141 -0.071 -0.030

Ca 54 0.986 0.000 0.997 0.997 0.997 0.999 -0.990 -0.977 -0.968

Mg 55 0.618 0.000 0.792 0.792 0.789 0.770 -0.829 -0.866 -0.886

Resist 56 0.072 0.000 -0.176 -0.176 -0.169 -0.139 0.237 0.305 0.343

APP_N 57 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

37 38 39 40 41 42 43 44 45

Eto4 46 1.000

DL4 47 0.000 0.000

Alt 48 -0.185 0.000 1.000

Lat 49 -0.584 0.000 0.905 1.000

Long 50 -0.690 0.000 -0.584 -0.185 1.000

pH_H2O 51 0.749 0.000 -0.790 -0.975 -0.037 1.000

P 52 0.997 0.000 -0.110 -0.522 -0.742 0.697 1.000

K 53 -0.842 0.000 -0.375 0.054 0.972 -0.272 -0.880 1.000

Ca 54 0.283 0.000 -0.995 -0.944 0.500 0.847 0.210 0.280 1.000

Mg 55 0.853 0.000 -0.670 -0.922 -0.211 0.984 0.812 -0.437 0.741

Resist 56 -0.982 0.000 -0.004 0.420 0.814 -0.610 -0.993 0.929 -0.096

APP_N 57 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

46 47 48 49 50 51 52 53 54

Mg 55 1.000

Resist 56 -0.740 1.000

APP_N 57 0.000 0.000 0.000

55 56 57

===== Correlations for Year 5 =====

*** Degrees of freedom ***

Correlations: 31

*** Correlation matrix ***

fyield 1 1.000

Tcllefprun 2 0.688 1.000

Tfertclad 3 0.924 0.765 1.000

Tftotal 4 0.617 0.445 0.515 1.000

Tfnoat 5 0.955 0.770 0.977 0.541 1.000

Tn1 6 0.116 0.275 0.113 0.237 0.179 1.000

RC1 7 -0.202 -0.257 -0.191 -0.352 -0.245 -0.973 1.000

IC1 8 -0.228 -0.248 -0.216 -0.387 -0.264 -0.952 0.997 1.000

C1 9 -0.302 -0.210 -0.283 -0.480 -0.314 -0.848 0.947 0.970 1.000

DL1 10 0.314 0.201 0.294 0.494 0.322 0.822 -0.931 -0.957 -0.999

rain2 11 0.291 -0.163 0.266 0.365 0.194 -0.446 0.228 0.150 -0.095

Tx2 12 0.211 0.254 0.200 0.364 0.252 0.966 -1.000 -0.999 -0.956

Tn2 13 0.130 0.273 0.125 0.256 0.190 0.999 -0.981 -0.962 -0.867

HU0_2 14 0.189 0.261 0.180 0.336 0.236 0.981 -0.999 -0.993 -0.936

HU5_2 15 0.189 0.261 0.180 0.335 0.236 0.981 -0.999 -0.993 -0.936

HU10_2 16 0.182 0.263 0.173 0.326 0.230 0.985 -0.998 -0.991 -0.928

HU15_2 17 0.111 0.276 0.108 0.230 0.175 1.000 -0.970 -0.947 -0.841

Rad2 18 0.179 -0.231 0.160 0.189 0.080 -0.727 0.550 0.482 0.254

DL2 19 0.314 0.201 0.294 0.494 0.322 0.822 -0.931 -0.957 -0.999

rain3 20 -0.373 -0.136 -0.347 -0.559 -0.351 -0.621 0.785 0.832 0.942

Tave3 21 0.190 0.261 0.181 0.337 0.237 0.980 -0.999 -0.994 -0.937

HU0_3 22 0.195 0.259 0.185 0.343 0.240 0.977 -1.000 -0.995 -0.941

HU5_3 23 0.195 0.259 0.185 0.343 0.240 0.977 -1.000 -0.995 -0.941

HU10_3 24 0.194 0.260 0.184 0.342 0.239 0.978 -1.000 -0.995 -0.940

HU15_3 25 0.186 0.262 0.177 0.331 0.233 0.983 -0.999 -0.992 -0.932

WS3 26 -0.233 -0.246 -0.220 -0.392 -0.267 -0.948 0.996 1.000 0.973

rad3 27 0.173 -0.233 0.155 0.181 0.075 -0.737 0.562 0.494 0.267

DL3 28 -0.261 -0.234 -0.246 -0.429 -0.288 -0.915 0.983 0.995 0.990

rain4 29 -0.343 -0.175 -0.320 -0.528 -0.338 -0.744 0.878 0.913 0.985

Tx4 30 0.222 0.251 0.210 0.378 0.259 0.958 -0.998 -1.000 -0.965

Tn4 31 0.143 0.271 0.138 0.274 0.201 0.997 -0.987 -0.971 -0.884

WS4 32 -0.245 -0.241 -0.231 -0.408 -0.276 -0.935 0.991 0.999 0.981

RHx4 33 -0.205 -0.256 -0.195 -0.357 -0.248 -0.970 1.000 0.998 0.951

RHn4 34 -0.318 -0.197 -0.298 -0.500 -0.324 -0.811 0.924 0.952 0.998

rad4 35 0.183 -0.229 0.165 0.196 0.084 -0.718 0.539 0.470 0.241

ETx4 36 0.184 0.262 0.175 0.328 0.232 0.984 -0.999 -0.992 -0.930

ETn4 37 -0.108 0.256 -0.094 -0.083 -0.013 0.843 -0.697 -0.638 -0.431

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 0.197 0.259 0.187 0.346 0.242 0.976 -1.000 -0.996 -0.944

HU5_4 40 0.197 0.259 0.187 0.346 0.242 0.976 -1.000 -0.996 -0.944

HU10_4 41 0.194 0.259 0.185 0.342 0.240 0.978 -1.000 -0.995 -0.941

HU15_4 42 0.172 0.265 0.164 0.312 0.222 0.989 -0.996 -0.987 -0.917

RC4 43 -0.233 -0.246 -0.220 -0.392 -0.268 -0.948 0.996 1.000 0.973

IC4 44 -0.252 -0.238 -0.237 -0.417 -0.281 -0.927 0.989 0.997 0.985

PC4 45 -0.302 -0.209 -0.283 -0.480 -0.314 -0.848 0.947 0.970 1.000

Eto4 46 0.350 -0.102 0.321 0.463 0.261 -0.213 -0.018 -0.097 -0.336

DL4 47 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Alt 48 -0.146 -0.271 -0.140 -0.277 -0.202 -0.997 0.988 0.973 0.887

Lat 49 -0.290 -0.217 -0.273 -0.466 -0.307 -0.870 0.960 0.979 0.999

Long	50	-0.218	0.212	-0.197	-0.249	-0.118	0.646	-0.452	-0.380	-0.143
pH_H2O	51	0.294	0.215	0.276	0.471	0.309	0.862	-0.956	-0.976	-1.000
P	52	0.397	0.074	0.368	0.577	0.353	0.416	-0.615	-0.675	-0.835
K	53	0.322	0.194	0.301	0.504	0.326	0.803	-0.919	-0.947	-0.997
Ca	54	0.213	0.253	0.202	0.367	0.254	0.965	-0.999	-0.999	-0.958
Mg	55	0.283	0.222	0.266	0.457	0.302	0.882	-0.967	-0.984	-0.998
Resist	56	-0.271	-0.228	-0.255	-0.442	-0.294	-0.901	0.976	0.991	0.994
APP_N	57	-0.314	-0.201	-0.294	-0.494	-0.322	-0.822	0.931	0.957	0.999

	1	2	3	4	5	6	7	8	9
DL1	10	1.000							
rain2	11	0.143	1.000						
Tx2	12	0.941	-0.201	1.000					
Tn2	13	0.842	-0.414	0.975	1.000				
HU0_2	14	0.918	-0.262	0.998	0.987	1.000			
HU5_2	15	0.918	-0.262	0.998	0.987	1.000	1.000		
HU10_2	16	0.909	-0.282	0.997	0.990	1.000	1.000	1.000	
HU15_2	17	0.814	-0.459	0.963	0.999	0.978	0.978	0.982	1.000
Rad2	18	-0.207	0.939	-0.527	-0.703	-0.579	-0.579	-0.596	-0.737	1.000
DL2	19	1.000	0.143	0.941	0.842	0.918	0.918	0.909	0.814	-0.207
rain3	20	-0.957	-0.424	-0.802	-0.649	-0.763	-0.763	-0.749	-0.610	-0.086
Tave3	21	0.919	-0.259	0.998	0.986	1.000	1.000	1.000	0.977	-0.576
HU0_3	22	0.924	-0.247	0.999	0.984	1.000	1.000	0.999	0.974	-0.566
HU5_3	23	0.924	-0.247	0.999	0.984	1.000	1.000	0.999	0.974	-0.566
HU10_3	24	0.923	-0.249	0.999	0.985	1.000	1.000	0.999	0.975	-0.568
HU15_3	25	0.914	-0.272	0.997	0.988	1.000	1.000	1.000	0.980	-0.587
WS3	26	-0.961	0.137	-0.998	-0.958	-0.992	-0.992	-0.989	-0.943	0.470
rad3	27	-0.221	0.934	-0.539	-0.713	-0.590	-0.590	-0.607	-0.746	1.000
DL3	28	-0.982	0.047	-0.988	-0.929	-0.976	-0.976	-0.971	-0.909	0.388
rain4	29	-0.992	-0.267	-0.890	-0.767	-0.860	-0.860	-0.849	-0.734	0.082
Tx4	30	0.951	-0.170	1.000	0.968	0.996	0.996	0.993	0.954	-0.500

Tn4 31 0.861 -0.381 0.982 0.999 0.992 0.992 0.995 0.996 -0.677

WS4 32 -0.971 0.099 -0.995 -0.947 -0.986 -0.986 -0.983 -0.930 0.436

RHx4 33 -0.935 0.217 -1.000 -0.978 -0.999 -0.999 -0.998 -0.967 0.540

RHn4 34 -1.000 -0.161 -0.934 -0.832 -0.910 -0.910 -0.901 -0.803 0.189

rad4 35 -0.194 0.943 -0.516 -0.693 -0.568 -0.568 -0.585 -0.728 1.000

ETx4 36 0.911 -0.277 0.997 0.989 1.000 1.000 1.000 0.981 -0.591

ETn4 37 0.387 -0.857 0.677 0.824 0.722 0.722 0.736 0.851 -0.982

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 0.927 -0.240 0.999 0.983 1.000 1.000 0.999 0.973 -0.560

HU5_4 40 0.927 -0.240 0.999 0.983 1.000 1.000 0.999 0.973 -0.560

HU10_4 41 0.923 -0.248 0.999 0.984 1.000 1.000 0.999 0.975 -0.567

HU15_4 42 0.897 -0.309 0.994 0.994 0.999 0.999 1.000 0.987 -0.618

RC4 43 -0.961 0.137 -0.998 -0.958 -0.992 -0.992 -0.989 -0.943 0.470

IC4 44 -0.976 0.078 -0.992 -0.940 -0.983 -0.983 -0.978 -0.922 0.417

PC4 45 -0.999 -0.097 -0.955 -0.866 -0.935 -0.935 -0.928 -0.840 0.253

Eto4 46 0.381 0.970 0.045 -0.178 -0.017 -0.017 -0.039 -0.227 0.825

DL4 47 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Alt 48 -0.864 0.375 -0.984 -0.999 -0.993 -0.993 -0.995 -0.996 0.672

Lat 49 -0.996 -0.054 -0.967 -0.887 -0.950 -0.950 -0.943 -0.863 0.294

Long 50 0.096 -0.971 0.428 0.618 0.483 0.483 0.502 0.656 -0.994

pH_H2O 51 0.997 0.068 0.963 0.880 0.945 0.945 0.938 0.855 -0.280

P 52 0.860 0.628 0.636 0.448 0.587 0.587 0.569 0.404 0.321

K 53 0.999 0.175 0.929 0.824 0.905 0.904 0.895 0.795 -0.176

Ca 54 0.943 -0.194 1.000 0.973 0.998 0.998 0.996 0.961 -0.520

Mg 55 0.993 0.027 0.974 0.899 0.958 0.958 0.951 0.876 -0.319

Resist 56 -0.988 0.013 -0.982 -0.915 -0.968 -0.968 -0.963 -0.894 0.357

APP_N 57 -1.000 -0.143 -0.941 -0.842 -0.918 -0.918 -0.909 -0.814 0.207

10 11 12 13 14 15 16 17 18

DL2 19 1.000

rain3 20 -0.957 1.000

Tave3 21 0.919 -0.765 1.000

HU0_3 22 0.924 -0.773 1.000 1.000

HU5_3 23 0.924 -0.773 1.000 1.000 1.000

HU10_3 24 0.923 -0.772 1.000 1.000 1.000 1.000

HU15_3 25 0.914 -0.756 1.000 1.000 1.000 1.000 1.000

WS3 26 -0.961 0.839 -0.992 -0.994 -0.994 -0.993 -0.991 1.000

rad3 27 -0.221 -0.072 -0.588 -0.577 -0.577 -0.579 -0.598 0.483 1.000

DL3 28 -0.982 0.885 -0.977 -0.980 -0.980 -0.979 -0.974 0.996 0.401

rain4 29 -0.992 0.986 -0.862 -0.868 -0.868 -0.867 -0.855 0.918 0.096

Tx4 30 0.951 -0.820 0.996 0.997 0.997 0.997 0.995 -0.999 -0.512

Tn4 31 0.861 -0.676 0.992 0.990 0.990 0.990 0.993 -0.968 -0.687

WS4 32 -0.971 0.859 -0.987 -0.989 -0.989 -0.988 -0.985 0.999 0.449

RHx4 33 -0.935 0.792 -0.999 -1.000 -1.000 -0.999 -0.998 0.997 0.552

RHn4 34 -1.000 0.962 -0.912 -0.917 -0.917 -0.916 -0.906 0.956 0.203

rad4 35 -0.194 -0.099 -0.565 -0.555 -0.555 -0.557 -0.576 0.459 1.000

ETx4 36 0.911 -0.753 1.000 1.000 1.000 1.000 1.000 -0.990 -0.603

ETn4 37 0.387 -0.103 0.719 0.711 0.711 0.712 0.728 -0.628 -0.985

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 0.927 -0.778 1.000 1.000 1.000 1.000 0.999 -0.995 -0.572

HU5_4 40 0.927 -0.778 1.000 1.000 1.000 1.000 0.999 -0.995 -0.572

HU10_4 41 0.923 -0.772 1.000 1.000 1.000 1.000 1.000 -0.994 -0.578

HU15_4 42 0.897 -0.730 0.999 0.998 0.998 0.998 0.999 -0.984 -0.629

RC4 43 -0.961 0.839 -0.992 -0.994 -0.994 -0.993 -0.991 1.000 0.483

IC4 44 -0.976 0.870 -0.983 -0.985 -0.985 -0.985 -0.981 0.998 0.430

PC4 45 -0.999 0.942 -0.936 -0.941 -0.941 -0.940 -0.932 0.973 0.266

Eto4 46 0.381 -0.633 -0.014 -0.002 -0.002 -0.004 -0.027 -0.110 0.817

DL4 47 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Alt 48 -0.864 0.680 -0.992 -0.991 -0.991 -0.991 -0.994 0.970 0.682

Lat 49 -0.996 0.927 -0.951 -0.954 -0.954 -0.954 -0.946 0.982 0.307

Long 50 0.096 0.197 0.480 0.469 0.469 0.472 0.492 -0.368 -0.992

pH_H2O 51 0.997 -0.932 0.946 0.950 0.950 0.949 0.942 -0.979 -0.294

P 52 0.860 -0.971 0.589 0.599 0.599 0.597 0.578 -0.685 0.308

K 53 0.999 -0.966 0.906 0.911 0.911 0.910 0.900 -0.951 -0.190

Ca 54 0.943 -0.806 0.998 0.999 0.999 0.998 0.997 -0.998 -0.532

Mg 55 0.993 -0.917 0.958 0.962 0.962 0.961 0.955 -0.986 -0.332

Resist 56 -0.988 0.900 -0.969 -0.972 -0.972 -0.972 -0.966 0.992 0.370

APP_N 57 -1.000 0.957 -0.919 -0.924 -0.924 -0.923 -0.914 0.961 0.221

	19	20	21	22	23	24	25	26	27
DL3 28	1.000								
rain4 29	0.950	1.000							
Tx4 30	-0.992	-0.904	1.000						
Tn4 31	-0.941	-0.790	0.976	1.000					
WS4 32	0.999	0.933	-0.997	-0.958	1.000				
RHx4 33	0.985	0.883	-0.999	-0.985	0.993	1.000			
RHn4 34	0.978	0.994	-0.945	-0.851	0.966	0.929	1.000		
rad4 35	0.376	0.069	-0.488	-0.667	0.424	0.529	0.176	1.000	
ETx4 36	-0.973	-0.852	0.994	0.994	-0.984	-0.998	-0.904	-0.581	1.000
ETn4 37	-0.554	-0.268	0.654	0.803	-0.597	-0.689	-0.370	-0.980	0.732
frost4 38	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HU0_4 39	-0.981	-0.872	0.997	0.989	-0.990	-1.000	-0.920	-0.549	0.999
HU5_4 40	-0.981	-0.872	0.997	0.989	-0.990	-1.000	-0.920	-0.549	0.999
HU10_4 41	-0.979	-0.868	0.997	0.990	-0.989	-0.999	-0.916	-0.556	1.000
HU15_4 42	-0.964	-0.834	0.990	0.997	-0.977	-0.995	-0.889	-0.608	0.999
RC4 43	0.996	0.918	-0.999	-0.968	0.999	0.997	0.956	0.459	-0.990
IC4 44	0.999	0.940	-0.996	-0.951	1.000	0.990	0.971	0.405	-0.980
PC4 45	0.990	0.985	-0.964	-0.883	0.981	0.951	0.998	0.240	-0.930
Eto4 46	-0.200	-0.495	0.076	-0.143	-0.148	-0.029	-0.398	0.833	-0.033
DL4 47	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Alt 48	0.943	0.793	-0.977	-1.000	0.960	0.986	0.854	0.662	-0.995
Lat 49	0.995	0.977	-0.975	-0.903	0.988	0.963	0.994	0.281	-0.945
Long 50	-0.282	0.030	0.399	0.589	-0.332	-0.442	-0.078	-0.995	0.497
pH_H2O 51	-0.993	-0.980	0.971	0.896	-0.986	-0.959	-0.996	-0.267	0.940

P 52 -0.748 -0.917 0.660 0.480 -0.712 -0.624 -0.869 0.333 0.574

K 53 -0.975 -0.996 0.940 0.844 -0.963 -0.923 -1.000 -0.163 0.898

Ca 54 -0.989 -0.894 1.000 0.981 -0.995 -1.000 -0.937 -0.509 0.996

Mg 55 -0.997 -0.971 0.980 0.914 -0.992 -0.970 -0.991 -0.306 0.953

Resist 56 0.999 0.960 -0.987 -0.929 0.996 0.979 0.985 0.344 -0.964

APP_N 57 0.982 0.992 -0.951 -0.861 0.971 0.935 1.000 0.194 -0.911

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 0.000 0.000

HU0_4 39 0.706 0.000 1.000

HU5_4 40 0.706 0.000 1.000 1.000

HU10_4 41 0.711 0.000 1.000 1.000 1.000

HU15_4 42 0.755 0.000 0.997 0.997 0.998 1.000

RC4 43 -0.628 0.000 -0.995 -0.995 -0.994 -0.984 1.000

IC4 44 -0.580 0.000 -0.987 -0.987 -0.985 -0.972 0.998 1.000

PC4 45 -0.430 0.000 -0.943 -0.943 -0.940 -0.917 0.973 0.985 1.000

Eto4 46 -0.705 0.000 0.006 0.005 -0.003 -0.066 -0.110 -0.169 -0.338

DL4 47 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Alt 48 -0.799 0.000 -0.990 -0.990 -0.991 -0.998 0.970 0.953 0.886

Lat 49 -0.468 0.000 -0.957 -0.957 -0.954 -0.933 0.982 0.991 0.999

Long 50 0.955 0.000 0.463 0.463 0.471 0.526 -0.368 -0.312 -0.142

pH_H2O 51 0.455 0.000 0.952 0.952 0.950 0.928 -0.979 -0.989 -1.000

P 52 -0.137 0.000 0.605 0.605 0.598 0.546 -0.685 -0.727 -0.835

K 53 0.357 0.000 0.914 0.914 0.911 0.882 -0.951 -0.968 -0.997

Ca 54 0.672 0.000 0.999 0.999 0.998 0.993 -0.998 -0.993 -0.958

Mg 55 0.491 0.000 0.964 0.964 0.962 0.942 -0.986 -0.994 -0.998

Resist 56 -0.526 0.000 -0.974 -0.974 -0.972 -0.955 0.992 0.998 0.994

APP_N 57 -0.387 0.000 -0.927 -0.927 -0.923 -0.897 0.961 0.976 0.999

37 38 39 40 41 42 43 44 45

Eto4 46 1.000

DL4 47 0.000 0.000

Alt 48 0.137 0.000 1.000

Lat 49 -0.297 0.000 0.905 1.000

Long 50 -0.884 0.000 -0.584 -0.185 1.000

pH_H2O 51 0.311 0.000 -0.899 -1.000 0.170 1.000

P 52 0.800 0.000 -0.486 -0.811 -0.425 0.819 1.000

K 53 0.411 0.000 -0.847 -0.993 0.064 0.994 0.876 1.000

Ca 54 0.052 0.000 -0.982 -0.969 0.421 0.965 0.642 0.932 1.000

Mg 55 0.272 0.000 -0.916 -1.000 0.210 0.999 0.795 0.989 0.975

Resist 56 -0.233 0.000 0.932 0.998 -0.249 -0.997 -0.770 -0.982 -0.983

APP_N 57 -0.381 0.000 0.864 0.996 -0.096 -0.997 -0.860 -0.999 -0.943

46 47 48 49 50 51 52 53 54

Mg 55 1.000

Resist 56 -0.999 1.000

APP_N 57 -0.993 0.988 1.000

55 56 57

===== Correlations for Year 6 =====

*** Degrees of freedom ***

Correlations: 31

*** Correlation matrix ***

fyield 1 1.000

Tclleftprun	2	0.541	1.000							
Tfertclad	3	0.864	0.732	1.000						
Tftotal	4	0.801	0.322	0.616	1.000					
Tfnoat	5	0.931	0.670	0.970	0.736	1.000				
Tn1	6	0.269	0.291	0.362	0.356	0.323	1.000			
RC1	7	-0.209	-0.302	-0.318	-0.275	-0.270	-0.994	1.000		
IC1	8	-0.263	-0.292	-0.358	-0.348	-0.317	-1.000	0.995	1.000	
C1	9	-0.284	-0.288	-0.372	-0.375	-0.335	-1.000	0.990	0.999	1.000
DL1	10	0.336	0.273	0.408	0.446	0.381	0.991	-0.971	-0.990	-0.995
rain2	11	-0.165	-0.307	-0.285	-0.215	-0.230	-0.982	0.997	0.984	0.976
Tx2	12	0.148	0.309	0.272	0.193	0.215	0.976	-0.994	-0.978	-0.970
Tn2	13	0.188	0.305	0.302	0.247	0.251	0.989	-0.999	-0.991	-0.985
HU0_2	14	0.163	0.308	0.284	0.213	0.228	0.982	-0.997	-0.984	-0.976
HU5_2	15	0.163	0.308	0.284	0.213	0.228	0.982	-0.997	-0.984	-0.976
HU10_2	16	0.159	0.308	0.280	0.208	0.224	0.980	-0.996	-0.982	-0.974
HU15_2	17	0.101	0.312	0.235	0.130	0.171	0.955	-0.982	-0.958	-0.947
Rad2	18	0.573	-0.048	0.444	0.771	0.522	0.221	-0.112	-0.210	-0.248
DL2	19	0.336	0.273	0.408	0.446	0.381	0.991	-0.971	-0.990	-0.995
rain3	20	-0.530	0.112	-0.377	-0.714	-0.465	-0.010	-0.101	-0.001	0.037
Tave3	21	0.130	0.310	0.258	0.169	0.198	0.969	-0.990	-0.972	-0.962
HU0_3	22	0.134	0.310	0.261	0.174	0.202	0.971	-0.991	-0.973	-0.964
HU5_3	23	0.134	0.310	0.261	0.174	0.202	0.971	-0.991	-0.973	-0.964
HU10_3	24	0.132	0.310	0.259	0.171	0.200	0.970	-0.991	-0.972	-0.962
HU15_3	25	0.120	0.311	0.250	0.155	0.189	0.964	-0.988	-0.967	-0.957
WS3	26	-0.132	-0.310	-0.259	-0.171	-0.200	-0.969	0.991	0.972	0.962
rad3	27	0.566	-0.062	0.431	0.761	0.511	0.174	-0.064	-0.163	-0.201
DL3	28	-0.336	-0.273	-0.408	-0.446	-0.381	-0.991	0.971	0.990	0.995
rain4	29	-0.573	0.049	-0.443	-0.770	-0.521	-0.216	0.107	0.205	0.243
Tx4	30	0.143	0.309	0.268	0.186	0.210	0.974	-0.993	-0.976	-0.967
Tn4	31	0.132	0.310	0.259	0.171	0.200	0.969	-0.991	-0.972	-0.962
WS4	32	-0.096	-0.312	-0.231	-0.123	-0.167	-0.953	0.980	0.956	0.944
RHx4	33	-0.592	-0.034	-0.499	-0.794	-0.559	-0.467	0.366	0.457	0.491

RHn4 34 -0.318 -0.279 -0.396 -0.422 -0.365 -0.995 0.979 0.994 0.998

rad4 35 0.566 -0.062 0.431 0.762 0.512 0.177 -0.067 -0.166 -0.204

ETx4 36 0.006 0.312 0.157 0.002 0.083 0.895 -0.939 -0.900 -0.882

ETn4 37 0.555 0.136 0.519 0.743 0.550 0.735 -0.656 -0.728 -0.754

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 0.143 0.309 0.268 0.187 0.210 0.974 -0.993 -0.977 -0.968

HU5_4 40 0.143 0.309 0.268 0.187 0.210 0.974 -0.993 -0.977 -0.968

HU10_4 41 0.141 0.309 0.267 0.183 0.208 0.973 -0.993 -0.976 -0.967

HU15_4 42 0.117 0.311 0.247 0.150 0.186 0.963 -0.987 -0.966 -0.955

RC4 43 -0.228 -0.299 -0.332 -0.301 -0.287 -0.997 0.999 0.998 0.995

IC4 44 -0.269 -0.291 -0.362 -0.356 -0.323 -1.000 0.994 1.000 1.000

PC4 45 -0.288 -0.286 -0.375 -0.382 -0.339 -0.999 0.989 0.999 1.000

Eto4 46 0.554 0.138 0.519 0.741 0.549 0.740 -0.661 -0.732 -0.758

DL4 47 0.253 -0.268 0.075 0.346 0.169 -0.610 0.694 0.619 0.588

Alt 48 -0.045 -0.313 -0.190 -0.055 -0.120 -0.923 0.960 0.927 0.912

Lat 49 -0.291 -0.286 -0.377 -0.386 -0.342 -0.999 0.988 0.999 1.000

Long 50 -0.452 0.178 -0.282 -0.611 -0.377 0.226 -0.333 -0.237 -0.199

pH_H2O 51 0.248 0.295 0.347 0.328 0.304 0.999 -0.997 -1.000 -0.998

P 52 0.502 0.190 0.502 0.671 0.514 0.857 -0.795 -0.851 -0.871

K 53 0.136 0.310 0.262 0.176 0.203 0.971 -0.992 -0.974 -0.964

Ca 54 0.125 0.311 0.254 0.162 0.193 0.966 -0.989 -0.969 -0.959

Mg 55 0.312 0.280 0.391 0.413 0.360 0.997 -0.981 -0.996 -0.998

Resist 56 -0.158 -0.308 -0.280 -0.207 -0.224 -0.980 0.996 0.982 0.974

APP_N 57 -0.336 -0.273 -0.408 -0.446 -0.381 -0.991 0.971 0.990 0.995

1 2 3 4 5 6 7 8 9

DL1 10 1.000

rain2 11 -0.948 1.000

Tx2 12 0.939 -1.000 1.000

Tn2 13 0.961 -0.999 0.998 1.000

HU0_2 14 0.948 -1.000 1.000 0.999 1.000

HU5_2 15 0.948 -1.000 1.000 0.999 1.000 1.000

HU10_2 16 0.945 -1.000 1.000 0.999 1.000 1.000 1.000

HU15_2 17 0.908 -0.994 0.997 0.988 0.994 0.994 0.995 1.000

Rad2 18 0.348 -0.033 0.004 0.074 0.030 0.030 0.023 -0.078 1.000

DL2 19 1.000 -0.948 0.939 0.961 0.948 0.948 0.945 0.908 0.348

rain3 20 -0.142 -0.179 0.208 0.138 0.182 0.182 0.189 0.287 -0.977

Tave3 21 0.928 -0.998 1.000 0.995 0.998 0.998 0.999 0.999 -0.027

HU0_3 22 0.930 -0.999 1.000 0.996 0.999 0.999 0.999 0.998 -0.020

HU5_3 23 0.930 -0.999 1.000 0.996 0.999 0.999 0.999 0.998 -0.020

HU10_3 24 0.929 -0.998 1.000 0.995 0.998 0.998 0.999 0.999 -0.024

HU15_3 25 0.921 -0.997 0.999 0.993 0.997 0.997 0.998 0.999 -0.045

WS3 26 -0.929 0.998 -1.000 -0.995 -0.998 -0.998 -0.999 -0.999 0.025

rad3 27 0.303 0.015 -0.044 0.026 -0.017 -0.017 -0.025 -0.125 0.999

DL3 28 -1.000 0.948 -0.939 -0.961 -0.948 -0.948 -0.945 -0.908 -0.348

rain4 29 -0.343 0.028 0.001 -0.069 -0.025 -0.025 -0.018 0.083 -1.000

Tx4 30 0.936 -0.999 1.000 0.997 0.999 0.999 1.000 0.997 -0.006

Tn4 31 0.929 -0.998 1.000 0.995 0.998 0.998 0.999 0.999 -0.025

WS4 32 -0.904 0.993 -0.996 -0.987 -0.993 -0.993 -0.994 -1.000 0.086

RHx4 33 -0.579 0.291 -0.263 -0.330 -0.289 -0.289 -0.281 -0.184 -0.966

RHn4 34 -0.999 0.959 -0.951 -0.970 -0.959 -0.959 -0.956 -0.922 -0.314

rad4 35 0.305 0.012 -0.041 0.029 -0.015 -0.015 -0.022 -0.122 0.999

ETx4 36 0.828 -0.963 0.971 0.951 0.964 0.964 0.966 0.987 -0.237

ETn4 37 0.818 -0.594 0.571 0.627 0.592 0.592 0.586 0.502 0.824

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 0.936 -0.999 1.000 0.997 0.999 0.999 1.000 0.997 -0.004

HU5_4 40 0.936 -0.999 1.000 0.997 0.999 0.999 1.000 0.997 -0.004

HU10_4 41 0.935 -0.999 1.000 0.997 0.999 0.999 1.000 0.998 -0.008

HU15_4 42 0.919 -0.996 0.998 0.992 0.997 0.997 0.997 1.000 -0.051

RC4 43 -0.978 0.993 -0.990 -0.997 -0.993 -0.993 -0.992 -0.975 -0.146

IC4 44 -0.991 0.982 -0.976 -0.989 -0.981 -0.981 -0.980 -0.955 -0.221

PC4 45 -0.995 0.974 -0.967 -0.983 -0.974 -0.974 -0.972 -0.944 -0.257

Eto4 46 0.822 -0.599 0.576 0.632 0.597 0.597 0.591 0.507 0.820

DL4 47 -0.500 0.749 -0.768 -0.721 -0.750 -0.750 -0.755 -0.817 0.638

Alt 48 -0.864 0.979 -0.984 -0.970 -0.979 -0.979 -0.981 -0.995 0.172

Lat 49 -0.996 0.973 -0.966 -0.982 -0.972 -0.972 -0.971 -0.942 -0.263

Long 50 0.096 -0.406 0.433 0.368 0.409 0.409 0.415 0.505 -0.900

pH_H2O 51 0.985 -0.989 0.984 0.994 0.988 0.988 0.987 0.966 0.183

P 52 0.918 -0.744 0.725 0.771 0.743 0.743 0.738 0.666 0.692

K 53 0.931 -0.999 1.000 0.996 0.999 0.999 0.999 0.998 -0.017

Ca 54 0.924 -0.998 0.999 0.994 0.998 0.998 0.998 0.999 -0.037

Mg 55 0.999 -0.963 0.955 0.973 0.962 0.962 0.960 0.928 0.301

Resist 56 -0.945 1.000 -1.000 -0.999 -1.000 -1.000 -1.000 -0.995 -0.022

APP_N 57 -1.000 0.948 -0.939 -0.961 -0.948 -0.948 -0.945 -0.908 -0.348

10 11 12 13 14 15 16 17 18

DL2 19 1.000

rain3 20 -0.142 1.000

Tave3 21 0.928 0.238 1.000

HU0_3 22 0.930 0.231 1.000 1.000

HU5_3 23 0.930 0.231 1.000 1.000 1.000

HU10_3 24 0.929 0.235 1.000 1.000 1.000 1.000

HU15_3 25 0.921 0.255 1.000 1.000 1.000 1.000 1.000

WS3 26 -0.929 -0.236 -1.000 -1.000 -1.000 -1.000 -1.000 1.000

rad3 27 0.303 -0.986 -0.075 -0.068 -0.068 -0.072 -0.093 0.073 1.000

DL3 28 -1.000 0.142 -0.928 -0.930 -0.930 -0.929 -0.921 0.929 -0.303

rain4 29 -0.343 0.978 0.032 0.026 0.026 0.030 0.050 -0.030 -0.999

Tx4 30 0.936 0.217 1.000 1.000 1.000 1.000 0.999 -1.000 -0.054

Tn4 31 0.929 0.236 1.000 1.000 1.000 1.000 1.000 -1.000 -0.073

WS4 32 -0.904 -0.295 -0.998 -0.998 -0.998 -0.998 -0.999 0.998 0.133

RHx4 33 -0.579 0.889 -0.233 -0.240 -0.240 -0.236 -0.215 0.235 -0.952

RHn4 34 -0.999 0.106 -0.941 -0.943 -0.943 -0.942 -0.934 0.941 -0.268

rad4 35 0.305 -0.986 -0.072 -0.065 -0.065 -0.069 -0.090 0.070 1.000

ETx4 36 0.828 0.437 0.978 0.976 0.976 0.977 0.981 -0.977 -0.283

ETn4 37 0.818 -0.685 0.545 0.550 0.550 0.547 0.529 -0.547 0.795

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 0.936 0.216 1.000 1.000 1.000 1.000 0.999 -1.000 -0.052

HU5_4 40 0.936 0.216 1.000 1.000 1.000 1.000 0.999 -1.000 -0.052

HU10_4 41 0.935 0.220 1.000 1.000 1.000 1.000 0.999 -1.000 -0.056

HU15_4 42 0.919 0.261 1.000 1.000 1.000 1.000 1.000 -1.000 -0.099

RC4 43 -0.978 -0.066 -0.985 -0.986 -0.986 -0.985 -0.982 0.985 -0.099

IC4 44 -0.991 0.010 -0.969 -0.970 -0.970 -0.970 -0.964 0.969 -0.174

PC4 45 -0.995 0.047 -0.959 -0.961 -0.961 -0.960 -0.954 0.960 -0.210

Eto4 46 0.822 -0.680 0.550 0.556 0.556 0.552 0.535 -0.552 0.792

DL4 47 -0.500 -0.786 -0.787 -0.783 -0.783 -0.785 -0.798 0.786 0.674

Alt 48 -0.864 -0.376 -0.989 -0.988 -0.988 -0.989 -0.992 0.989 0.219

Lat 49 -0.996 0.053 -0.957 -0.959 -0.959 -0.958 -0.952 0.958 -0.216

Long 50 0.096 0.972 0.460 0.455 0.455 0.458 0.476 -0.458 -0.920

pH_H2O 51 0.985 0.029 0.978 0.979 0.979 0.978 0.974 -0.978 0.136

P 52 0.918 -0.524 0.703 0.708 0.708 0.705 0.690 -0.705 0.656

K 53 0.931 0.228 1.000 1.000 1.000 1.000 1.000 -1.000 -0.065

Ca 54 0.924 0.247 1.000 1.000 1.000 1.000 1.000 -1.000 -0.084

Mg 55 0.999 -0.092 0.945 0.947 0.947 0.946 0.939 -0.946 0.255

Resist 56 -0.945 -0.190 -0.999 -0.999 -0.999 -0.999 -0.998 0.999 0.026

APP_N 57 -1.000 0.142 -0.928 -0.930 -0.930 -0.929 -0.921 0.929 -0.303

19 20 21 22 23 24 25 26 27

DL3 28 1.000

rain4 29 0.343 1.000

Tx4 30 -0.936 0.011 1.000

Tn4 31 -0.929 0.030 1.000 1.000

WS4 32 0.904 -0.091 -0.997 -0.998 1.000

RHx4 33 0.579 0.964 -0.254 -0.235 0.176 1.000

RHn4 34 0.999 0.309 -0.948 -0.941 0.919 0.549 1.000

rad4 35 -0.305 -0.999 -0.051 -0.070 0.131 -0.953 -0.271 1.000

ETx4 36 -0.828 0.242 0.973 0.977 -0.988 -0.023 -0.848 -0.280 1.000

ETn4 37 -0.818 -0.821 0.563 0.547 -0.495 -0.942 -0.797 0.797 0.356

frost4 38 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

HU0_4 39 -0.936 0.010 1.000 1.000 -0.997 -0.255 -0.948 -0.049 0.973

HU5_4 40 -0.936 0.010 1.000 1.000 -0.997 -0.255 -0.948 -0.049 0.973

HU10_4 41 -0.935 0.014 1.000 1.000 -0.997 -0.251 -0.947 -0.053 0.973

HU15_4 42 -0.919 0.056 0.999 1.000 -0.999 -0.210 -0.932 -0.096 0.982

RC4 43 0.978 0.141 -0.988 -0.985 0.973 0.398 0.985 -0.102 -0.926

IC4 44 0.991 0.216 -0.974 -0.969 0.953 0.467 0.995 -0.177 -0.895

PC4 45 0.995 0.252 -0.965 -0.960 0.941 0.499 0.998 -0.213 -0.878

Eto4 46 -0.822 -0.817 0.568 0.552 -0.500 -0.940 -0.801 0.793 0.362

DL4 47 0.500 -0.642 -0.774 -0.786 0.822 -0.416 0.531 0.672 -0.899

Alt 48 0.864 -0.177 -0.986 -0.989 0.996 0.090 0.882 0.216 -0.998

Lat 49 0.996 0.258 -0.963 -0.958 0.939 0.504 0.999 -0.219 -0.875

Long 50 -0.096 0.902 0.441 0.458 -0.512 0.756 -0.132 -0.919 0.637

pH_H2O 51 -0.985 -0.178 0.982 0.978 -0.964 -0.432 -0.991 0.138 0.912

P 52 -0.918 -0.688 0.718 0.705 -0.660 -0.855 -0.903 0.659 0.538

K 53 -0.931 0.023 1.000 1.000 -0.998 -0.243 -0.944 -0.062 0.976

Ca 54 -0.924 0.042 1.000 1.000 -0.999 -0.224 -0.937 -0.082 0.980

Mg 55 -0.999 -0.296 0.952 0.946 -0.924 -0.538 -1.000 0.257 0.855

Resist 56 0.945 0.017 -1.000 -0.999 0.994 0.281 0.956 0.023 -0.966

APP_N 57 1.000 0.343 -0.936 -0.929 0.904 0.579 0.999 -0.305 -0.828

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 0.000 0.000

HU0_4 39 0.564 0.000 1.000

HU5_4 40 0.564 0.000 1.000 1.000

HU10_4 41 0.560 0.000 1.000 1.000 1.000

HU15_4 42 0.525 0.000 0.999 0.999 0.999 1.000

RC4 43 -0.682 0.000 -0.989 -0.989 -0.988 -0.980 1.000

IC4 44 -0.735 0.000 -0.974 -0.974 -0.973 -0.963 0.997 1.000

PC4 45 -0.760 0.000 -0.965 -0.965 -0.964 -0.952 0.994 0.999 1.000

Eto4 46 1.000 0.000 0.569 0.569 0.566 0.530 -0.686 -0.740 -0.764

DL4 47 0.088 0.000 -0.773 -0.773 -0.775 -0.802 0.668 0.610 0.580

Alt 48 -0.417 0.000 -0.986 -0.986 -0.987 -0.993 0.949 0.923 0.908

Lat 49 -0.764 0.000 -0.964 -0.964 -0.963 -0.950 0.993 0.999 1.000

Long 50 -0.494 0.000 0.440 0.440 0.444 0.481 -0.300 -0.226 -0.190

pH_H2O 51 0.708 0.000 0.982 0.982 0.982 0.973 -0.999 -0.999 -0.997

P 52 0.979 0.000 0.719 0.719 0.716 0.686 -0.816 -0.857 -0.876

K 53 0.553 0.000 1.000 1.000 1.000 0.999 -0.987 -0.971 -0.962

Ca 54 0.537 0.000 0.999 0.999 1.000 1.000 -0.983 -0.966 -0.956

Mg 55 0.789 0.000 0.952 0.952 0.951 0.937 -0.987 -0.997 -0.999

Resist 56 -0.585 0.000 -1.000 -1.000 -1.000 -0.997 0.992 0.980 0.972

APP_N 57 -0.818 0.000 -0.936 -0.936 -0.935 -0.919 0.978 0.991 0.995

37 38 39 40 41 42 43 44 45

Eto4 46 1.000

DL4 47 0.082 1.000

Alt 48 -0.423 0.868 1.000

Lat 49 -0.768 0.576 0.905 1.000

Long 50 -0.488 -0.910 -0.584 -0.185 1.000

pH_H2O 51 0.713 -0.640 -0.937 -0.997 0.264 1.000

P 52 0.981 -0.115 -0.592 -0.878 -0.308 0.836 1.000

K 53 0.558 -0.781 -0.988 -0.960 0.452 0.980 0.710 1.000

Ca 54 0.542 -0.793 -0.991 -0.955 0.469 0.976 0.696 1.000 1.000

Mg 55 0.792 -0.543 -0.888 -0.999 0.145 0.993 0.897 0.948 0.942

Resist 56 -0.590 0.756 0.981 0.970 -0.416 -0.987 -0.737 -0.999 -0.998

APP_N 57 -0.822 0.500 0.864 0.996 -0.096 -0.985 -0.918 -0.931 -0.924

46 47 48 49 50 51 52 53 54

Mg 55 1.000

Resist 56 -0.960 1.000

APP_N 57 -0.999 0.945 1.000

55 56 57

===== Correlations for Year 7 =====

*** Degrees of freedom ***

Correlations: 31

*** Correlation matrix ***

fyield 1 1.000

Tcllefprun 2 0.662 1.000

Tfertclad 3 0.870 0.724 1.000

Tftotal 4 0.760 0.448 0.572 1.000

Tfnoat 5 0.957 0.720 0.966 0.695 1.000

Tn1 6 -0.250 0.340 -0.057 -0.289 -0.142 1.000

RC1 7 0.204 -0.353 -0.051 0.287 0.068 -0.905 1.000

IC1 8 0.214 -0.356 -0.036 0.291 0.080 -0.931 0.998 1.000

C1 9 0.131 -0.309 -0.139 0.240 -0.009 -0.677 0.925 0.900 1.000

DL1 10 -0.091 0.273 0.173 -0.206 0.044 0.539 -0.846 -0.810 -0.985

rain2 11 0.250 -0.270 0.148 0.242 0.187 -0.918 0.662 0.709 0.329

Tx2 12 -0.193 0.349 0.069 -0.281 -0.054 0.872 -0.997 -0.991 -0.951

Tn2 13 -0.242 0.351 -0.027 -0.294 -0.123 0.993 -0.950 -0.968 -0.762

HU0_2 14 -0.209 0.355 0.044 -0.289 -0.073 0.918 -1.000 -0.999 -0.914

HU5_2 15 -0.209 0.355 0.044 -0.289 -0.073 0.918 -1.000 -0.999 -0.914

HU10_2 16 -0.212 0.355 0.039 -0.290 -0.077 0.925 -0.999 -1.000 -0.906

HU15_2 17 -0.235 0.355 -0.008 -0.295 -0.111 0.980 -0.971 -0.985 -0.809

Rad2 18 0.213 -0.165 0.211 0.162 0.201 -0.706 0.339 0.398 -0.043

DL2 19 -0.087 0.269 0.176 -0.203 0.047 0.525 -0.836 -0.800 -0.982

rain3 20 -0.011 -0.159 -0.229 0.106 -0.118 -0.161 0.565 0.511 0.835

Tave3 21 -0.166 0.334 0.103 -0.266 -0.025 0.792 -0.976 -0.960 -0.986

HU0_3 22 -0.164 0.333 0.106 -0.264 -0.022 0.783 -0.973 -0.956 -0.988

HU5_3 23 -0.164 0.333 0.106 -0.264 -0.022 0.783 -0.973 -0.956 -0.988

HU10_3 24 -0.164 0.333 0.106 -0.264 -0.022 0.783 -0.973 -0.956 -0.988

HU15_3 25 -0.166 0.334 0.103 -0.265 -0.025 0.791 -0.976 -0.960 -0.986

WS3 26 0.055 -0.236 -0.197 0.173 -0.072 -0.409 0.758 0.715 0.948

rad3 27 0.249 -0.268 0.150 0.240 0.187 -0.913 0.654 0.701 0.319

DL3 28 0.105 -0.286 -0.162 0.218 -0.032 -0.587 0.875 0.843 0.993

rain4 29 0.134 -0.311 -0.136 0.242 -0.006 -0.688 0.931 0.906 1.000

Tx4 30 -0.165 0.333 0.104 -0.265 -0.024 0.788 -0.975 -0.958 -0.987

Tn4 31 -0.207 0.354 0.047 -0.288 -0.071 0.913 -1.000 -0.999 -0.918

WS4 32 0.087 -0.268 -0.176 0.202 -0.047 -0.523 0.836 0.799 0.981

RHx4 33 -0.016 0.192 0.218 -0.134 0.100 0.264 -0.648 -0.599 -0.888

RHn4 34 0.205 -0.148 0.218 0.149 0.201 -0.668 0.288 0.349 -0.096

rad4 35 0.243 -0.246 0.167 0.224 0.193 -0.874 0.585 0.635 0.234

ETx4 36 -0.161 0.331 0.109 -0.262 -0.020 0.776 -0.970 -0.953 -0.990

ETn4 37 -0.119 0.298 0.151 -0.230 0.020 0.635 -0.903 -0.873 -0.998

frost4 38 0.059 -0.240 -0.195 0.177 -0.069 -0.423 0.768 0.726 0.953

HU0_4 39 -0.179 0.342 0.087 -0.274 -0.038 0.831 -0.989 -0.977 -0.972

HU5_4 40 -0.179 0.342 0.087 -0.274 -0.038 0.831 -0.989 -0.977 -0.972

HU10_4 41 -0.180 0.342 0.086 -0.274 -0.039 0.834 -0.989 -0.978 -0.971

HU15_4 42 -0.184 0.345 0.080 -0.277 -0.044 0.847 -0.993 -0.983 -0.965

RC4 43 0.166 -0.334 -0.103 0.266 0.025 -0.792 0.976 0.960 0.986

IC4 44 0.183 -0.344 -0.082 0.276 0.043 -0.843 0.992 0.981 0.967

PC4 45 0.125 -0.303 -0.145 0.235 -0.015 -0.655 0.914 0.886 1.000

Eto4 46 -0.059 0.240 0.195 -0.177 0.069 0.423 -0.768 -0.726 -0.953

DL4 47 0.244 -0.348 0.036 0.293 0.129 -0.996 0.939 0.959 0.738

Alt 48 0.176 -0.340 -0.091 0.272 0.035 -0.822 0.986 0.973 0.976

Lat 49 0.081 -0.263 -0.180 0.197 -0.052 -0.503 0.822 0.784 0.977

Long	50	-0.253	0.285	-0.134	-0.253	-0.181	0.942	-0.711	-0.754	-0.392
pH_H2O	51	-0.091	0.273	0.173	-0.206	0.044	0.539	-0.846	-0.810	-0.985
P	52	0.097	0.041	0.248	-0.005	0.167	-0.187	-0.248	-0.186	-0.596
K	53	-0.213	0.356	0.037	-0.291	-0.079	0.929	-0.998	-1.000	-0.901
Ca	54	-0.179	0.342	0.087	-0.274	-0.039	0.832	-0.989	-0.977	-0.972
Mg	55	-0.083	0.264	0.179	-0.199	0.051	0.509	-0.826	-0.789	-0.978
Resist	56	-0.100	-0.036	-0.248	0.001	-0.168	0.200	0.235	0.172	0.585
APP_N	57	0.059	-0.240	-0.195	0.177	-0.069	-0.423	0.768	0.726	0.953

		1	2	3	4	5	6	7	8	9
DL1	10	1.000								
rain2	11	-0.160	1.000							
Tx2	12	0.882	-0.606	1.000						
Tn2	13	0.638	-0.863	0.925	1.000					
HU0_2	14	0.830	-0.684	0.995	0.959	1.000				
HU5_2	15	0.830	-0.684	0.995	0.959	1.000	1.000			
HU10_2	16	0.818	-0.698	0.993	0.965	1.000	1.000	1.000		
HU15_2	17	0.695	-0.821	0.951	0.997	0.978	0.978	0.982	1.000	
Rad2	18	0.216	0.929	-0.269	-0.615	-0.367	-0.367	-0.385	-0.553	1.000
DL2	19	1.000	-0.143	0.874	0.624	0.820	0.820	0.808	0.682	0.233
rain3	20	-0.918	-0.245	-0.623	-0.280	-0.540	-0.540	-0.523	-0.352	-0.585
Tave3	21	0.941	-0.484	0.989	0.860	0.969	0.969	0.964	0.897	-0.126
HU0_3	22	0.946	-0.472	0.987	0.853	0.966	0.966	0.960	0.890	-0.113
HU5_3	23	0.946	-0.472	0.987	0.853	0.966	0.966	0.960	0.890	-0.113
HU10_3	24	0.946	-0.472	0.987	0.853	0.966	0.966	0.960	0.890	-0.113
HU15_3	25	0.942	-0.482	0.989	0.859	0.969	0.969	0.964	0.896	-0.125
WS3	26	-0.989	0.013	-0.803	-0.517	-0.738	-0.738	-0.725	-0.581	-0.357
rad3	27	-0.149	1.000	-0.597	-0.857	-0.676	-0.676	-0.690	-0.815	0.933
DL3	28	-0.998	0.217	-0.908	-0.681	-0.860	-0.860	-0.850	-0.735	-0.159
rain4	29	-0.982	0.343	-0.955	-0.771	-0.920	-0.920	-0.912	-0.818	-0.028
Tx4	30	0.944	-0.478	0.988	0.857	0.968	0.968	0.962	0.894	-0.120

Tn4 31 0.836 -0.676 0.996 0.956 1.000 1.000 1.000 0.976 -0.356

WS4 32 -1.000 0.142 -0.873 -0.623 -0.819 -0.819 -0.807 -0.681 -0.234

RHx4 33 0.955 0.141 0.702 0.379 0.626 0.626 0.610 0.449 0.497

RHn4 34 0.267 0.908 -0.218 -0.572 -0.317 -0.317 -0.335 -0.508 0.999

rad4 35 -0.062 0.995 -0.524 -0.808 -0.609 -0.609 -0.624 -0.761 0.961

ETx4 36 0.950 -0.461 0.985 0.847 0.963 0.963 0.957 0.885 -0.101

ETn4 37 0.993 -0.275 0.932 0.724 0.889 0.889 0.880 0.774 0.099

frost4 38 -0.991 0.029 -0.813 -0.530 -0.749 -0.749 -0.735 -0.594 -0.343

HU0_4 39 0.917 -0.542 0.997 0.892 0.984 0.984 0.980 0.924 -0.193

HU5_4 40 0.917 -0.542 0.997 0.892 0.984 0.984 0.980 0.924 -0.193

HU10_4 41 0.915 -0.546 0.997 0.895 0.985 0.985 0.981 0.926 -0.198

HU15_4 42 0.904 -0.566 0.999 0.905 0.988 0.988 0.985 0.935 -0.222

RC4 43 -0.941 0.484 -0.989 -0.860 -0.969 -0.969 -0.964 -0.897 0.127

IC4 44 -0.908 0.560 -0.998 -0.902 -0.987 -0.987 -0.984 -0.933 0.214

PC4 45 -0.990 0.301 -0.941 -0.742 -0.901 -0.901 -0.893 -0.791 -0.072

Eto4 46 0.991 -0.029 0.813 0.530 0.749 0.749 0.735 0.594 0.343

DL4 47 -0.610 0.880 -0.911 -0.999 -0.949 -0.949 -0.955 -0.994 0.642

Alt 48 -0.923 0.528 -0.996 -0.885 -0.981 -0.981 -0.977 -0.918 0.177

Lat 49 -0.999 0.118 -0.861 -0.604 -0.805 -0.805 -0.793 -0.663 -0.257

Long 50 0.226 -0.998 0.658 0.895 0.732 0.732 0.745 0.858 -0.902

pH_H2O 51 1.000 -0.160 0.882 0.638 0.830 0.830 0.818 0.695 0.216

P 52 0.726 0.562 0.318 -0.066 0.219 0.219 0.200 0.011 0.828

K 53 0.812 -0.706 0.991 0.967 1.000 1.000 1.000 0.984 -0.395

Ca 54 0.916 -0.543 0.997 0.893 0.984 0.984 0.980 0.925 -0.194

Mg 55 0.999 -0.125 0.865 0.610 0.809 0.809 0.797 0.669 0.250

Resist 56 -0.717 -0.573 -0.305 0.080 -0.206 -0.206 -0.186 0.003 -0.835

APP_N 57 -0.991 0.029 -0.813 -0.530 -0.749 -0.749 -0.735 -0.594 -0.343

10 11 12 13 14 15 16 17 18

DL2 19 1.000

rain3 20 -0.925 1.000

Tave3 21 0.935 -0.730 1.000

HU0_3 22 0.940 -0.740 1.000 1.000

HU5_3 23 0.940 -0.740 1.000 1.000 1.000

HU10_3 24 0.940 -0.740 1.000 1.000 1.000 1.000

HU15_3 25 0.936 -0.732 1.000 1.000 1.000 1.000 1.000

WS3 26 -0.991 0.966 -0.881 -0.888 -0.888 -0.888 -0.882 1.000

rad3 27 -0.132 -0.255 -0.474 -0.462 -0.462 -0.462 -0.472 0.002 1.000

DL3 28 -0.997 0.894 -0.959 -0.963 -0.963 -0.963 -0.960 0.979 0.206

rain4 29 -0.979 0.827 -0.988 -0.990 -0.990 -0.990 -0.988 0.944 0.333

Tx4 30 0.938 -0.735 1.000 1.000 1.000 1.000 1.000 -0.885 -0.468

Tn4 31 0.826 -0.549 0.972 0.969 0.969 0.969 0.972 -0.746 -0.668

WS4 32 -1.000 0.925 -0.935 -0.940 -0.940 -0.940 -0.936 0.992 0.131

RHx4 33 0.960 -0.994 0.798 0.806 0.806 0.806 0.799 -0.988 0.152

RHn4 34 0.284 -0.627 -0.074 -0.060 -0.060 -0.060 -0.072 -0.406 0.913

rad4 35 -0.044 -0.339 -0.395 -0.382 -0.382 -0.382 -0.393 -0.086 0.996

ETx4 36 0.944 -0.748 1.000 1.000 1.000 1.000 1.000 -0.893 -0.451

ETn4 37 0.991 -0.865 0.975 0.978 0.978 0.978 0.975 -0.965 -0.265

frost4 38 -0.993 0.962 -0.889 -0.895 -0.895 -0.895 -0.890 1.000 0.017

HU0_4 39 0.909 -0.683 0.998 0.997 0.997 0.997 0.998 -0.848 -0.532

HU5_4 40 0.909 -0.683 0.998 0.997 0.997 0.997 0.998 -0.848 -0.532

HU10_4 41 0.907 -0.679 0.997 0.996 0.996 0.996 0.997 -0.845 -0.537

HU15_4 42 0.897 -0.661 0.995 0.994 0.994 0.994 0.995 -0.832 -0.557

RC4 43 -0.935 0.730 -1.000 -1.000 -1.000 -1.000 -1.000 0.881 0.474

IC4 44 -0.900 0.667 -0.996 -0.995 -0.995 -0.995 -0.996 0.836 0.551

PC4 45 -0.987 0.851 -0.980 -0.983 -0.983 -0.983 -0.981 0.957 0.290

Eto4 46 0.993 -0.962 0.889 0.895 0.895 0.895 0.890 -1.000 -0.017

DL4 47 -0.596 0.245 -0.841 -0.834 -0.834 -0.834 -0.840 0.486 0.875

Alt 48 -0.916 0.694 -0.999 -0.998 -0.998 -0.998 -0.999 0.856 0.519

Lat 49 -1.000 0.934 -0.926 -0.931 -0.931 -0.931 -0.927 0.994 0.107

Long 50 0.209 0.179 0.542 0.530 0.530 0.530 0.540 -0.080 -0.997

pH_H2O 51 1.000 -0.918 0.941 0.946 0.946 0.946 0.942 -0.989 -0.149

P 52 0.738 -0.940 0.452 0.464 0.464 0.464 0.454 -0.820 0.571

K 53 0.802 -0.514 0.961 0.957 0.957 0.957 0.961 -0.717 -0.698

Ca 54 0.909 -0.682 0.998 0.997 0.997 0.997 0.998 -0.847 -0.533

Mg 55 1.000 -0.932 0.929 0.934 0.934 0.934 0.929 -0.994 -0.114

Resist 56 -0.729 0.935 -0.440 -0.453 -0.453 -0.453 -0.442 0.812 -0.582

APP_N 57 -0.993 0.962 -0.889 -0.895 -0.895 -0.895 -0.890 1.000 0.017

19 20 21 22 23 24 25 26 27

DL3 28 1.000

rain4 29 0.991 1.000

Tx4 30 -0.961 -0.989 1.000

Tn4 31 -0.866 -0.924 0.970 1.000

WS4 32 0.997 0.978 -0.937 -0.825 1.000

RHx4 33 -0.936 -0.882 0.802 0.634 -0.960 1.000

RHn4 34 -0.211 -0.081 -0.067 -0.306 -0.285 0.542 1.000

rad4 35 0.119 0.248 -0.388 -0.600 0.043 0.238 0.945 1.000

ETx4 36 -0.966 -0.992 1.000 0.966 -0.944 0.814 -0.048 -0.371 1.000

ETn4 37 -0.998 -0.997 0.976 0.894 -0.991 0.913 0.152 -0.178 0.980

frost4 38 0.982 0.949 -0.892 -0.756 0.994 -0.986 -0.392 -0.071 -0.900

HU0_4 39 -0.938 -0.975 0.997 0.986 -0.909 0.756 -0.141 -0.456 0.996

HU5_4 40 -0.938 -0.975 0.997 0.986 -0.909 0.756 -0.141 -0.456 0.996

HU10_4 41 -0.936 -0.974 0.997 0.986 -0.907 0.752 -0.146 -0.460 0.995

HU15_4 42 -0.928 -0.968 0.995 0.990 -0.896 0.736 -0.170 -0.481 0.992

RC4 43 0.959 0.988 -1.000 -0.972 0.935 -0.798 0.074 0.395 -1.000

IC4 44 0.930 0.970 -0.995 -0.989 0.900 -0.741 0.162 0.475 -0.993

PC4 45 0.996 0.999 -0.982 -0.906 0.987 -0.902 -0.125 0.205 -0.985

Eto4 46 -0.982 -0.949 0.892 0.756 -0.994 0.986 0.392 0.071 0.900

DL4 47 0.655 0.748 -0.838 -0.945 0.595 -0.346 0.601 0.828 -0.827

Alt 48 0.943 0.979 -0.998 -0.983 0.915 -0.766 0.125 0.442 -0.997

Lat 49 0.995 0.973 -0.929 -0.812 1.000 -0.966 -0.308 0.019 -0.936

Long 50 -0.282 -0.405 0.536 0.724 -0.208 -0.074 -0.878 -0.986 0.520

pH_H2O 51 -0.998 -0.982 0.944 0.836 -1.000 0.955 0.267 -0.062 0.950

P 52 -0.686 -0.584 0.458 0.230 -0.739 0.898 0.856 0.641 0.475

K 53 -0.844 -0.907 0.959 0.999 -0.801 0.601 -0.346 -0.632 0.954

Ca 54 -0.938 -0.975 0.997 0.986 -0.908 0.755 -0.142 -0.457 0.996

Mg 55 -0.996 -0.975 0.931 0.816 -1.000 0.965 0.301 -0.026 0.938

Resist 56 0.676 0.573 -0.446 -0.217 0.730 -0.892 -0.863 -0.651 -0.463

APP_N 57 0.982 0.949 -0.892 -0.756 0.994 -0.986 -0.392 -0.071 -0.900

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 -0.969 1.000

HU0_4 39 0.957 -0.856 1.000

HU5_4 40 0.957 -0.856 1.000 1.000

HU10_4 41 0.956 -0.853 1.000 1.000 1.000

HU15_4 42 0.948 -0.840 1.000 1.000 1.000 1.000

RC4 43 -0.974 0.888 -0.998 -0.998 -0.997 -0.995 1.000

IC4 44 -0.951 0.844 -1.000 -1.000 -1.000 -1.000 0.996 1.000

PC4 45 -1.000 0.962 -0.965 -0.965 -0.963 -0.957 0.980 0.959 1.000

Eto4 46 0.969 -1.000 0.856 0.856 0.853 0.840 -0.888 -0.844 -0.962

DL4 47 -0.699 0.500 -0.876 -0.876 -0.878 -0.890 0.842 0.886 0.718

Alt 48 -0.962 0.864 -1.000 -1.000 -1.000 -0.999 0.999 0.999 0.969

Lat 49 -0.987 0.996 -0.899 -0.899 -0.896 -0.885 0.926 0.889 0.982

Long 50 0.339 -0.096 0.597 0.597 0.601 0.620 -0.542 -0.614 -0.364

pH_H2O 51 0.993 -0.991 0.917 0.917 0.915 0.904 -0.941 -0.908 -0.990

P 52 0.641 -0.811 0.391 0.391 0.386 0.364 -0.452 -0.371 -0.620

K 53 0.875 -0.728 0.978 0.978 0.979 0.983 -0.961 -0.982 -0.888

Ca 54 0.957 -0.855 1.000 1.000 1.000 1.000 -0.998 -1.000 -0.964

Mg 55 0.988 -0.995 0.902 0.902 0.899 0.889 -0.929 -0.892 -0.984

Resist 56 -0.630 0.803 -0.379 -0.379 -0.374 -0.351 0.440 0.359 0.609

APP_N 57 -0.969 1.000 -0.856 -0.856 -0.853 -0.840 0.888 0.844 0.962

37 38 39 40 41 42 43 44 45

Eto4 46 1.000

DL4 47 -0.500 1.000

Alt 48 -0.864 0.868 1.000

Lat 49 -0.996 0.576 0.905 1.000

Long 50 0.096 -0.910 -0.584 -0.185 1.000

pH_H2O 51 0.991 -0.610 -0.923 -0.999 0.226 1.000

P 52 0.811 0.101 -0.406 -0.755 -0.505 0.726 1.000

K 53 0.728 -0.958 -0.974 -0.786 0.752 0.812 0.189 1.000

Ca 54 0.855 -0.877 -1.000 -0.898 0.598 0.916 0.390 0.978 1.000

Mg 55 0.995 -0.581 -0.908 -1.000 0.191 0.999 0.751 0.791 0.901

Resist 56 -0.803 -0.115 0.393 0.746 0.516 -0.717 -1.000 -0.176 -0.377

APP_N 57 -1.000 0.500 0.864 0.996 -0.096 -0.991 -0.811 -0.728 -0.855

46 47 48 49 50 51 52 53 54

Mg 55 1.000

Resist 56 -0.742 1.000

APP_N 57 -0.995 0.803 1.000

55 56 57

1

Appendix 3.8.4 Correlation matrix for all cultivars, production years and areas combined

JPcorrCULTyld.out

file is JPfyieldFS.gen

========== CACTUS PEAR ENVIRONMENTAL ADAPTIBILITY: FRUIT YIELD

===== Correlations for Cultivar 1 =====

*** Degrees of freedom ***

Correlations: 19

*** Correlation matrix ***

fyield	1	1.000									
Tclleftprun	2	0.470	1.000								
Tfertclad	3	0.931	0.491	1.000							
Tftotal	4	0.740	0.567	0.788	1.000						
Tfnoat	5	0.951	0.418	0.962	0.762	1.000					
Tn1	6	0.099	0.298	0.179	0.542	0.113	1.000				
RC1	7	-0.170	-0.222	-0.264	-0.569	-0.213	-0.935	1.000			
IC1	8	-0.224	-0.273	-0.306	-0.598	-0.252	-0.935	0.989	1.000		
C1	9	-0.329	-0.281	-0.443	-0.639	-0.394	-0.871	0.968	0.972	1.000	
DL1	10	0.405	0.122	0.525	0.642	0.486	0.762	-0.903	-0.891	-0.948	
rain2	11	0.087	0.371	0.070	-0.084	0.062	-0.367	0.465	0.462	0.401	
Tx2	12	0.135	0.156	0.210	0.522	0.172	0.868	-0.982	-0.968	-0.948	
Tn2	13	0.079	0.257	0.156	0.507	0.098	0.989	-0.965	-0.961	-0.903	
HU0_2	14	0.124	0.187	0.201	0.528	0.157	0.917	-0.994	-0.982	-0.952	
HU5_2	15	0.123	0.187	0.200	0.528	0.157	0.917	-0.994	-0.982	-0.952	
HU10_2	16	0.105	0.175	0.178	0.515	0.134	0.913	-0.991	-0.977	-0.941	
HU15_2	17	-0.014	0.109	0.035	0.426	-0.003	0.894	-0.960	-0.937	-0.872	

Rad2 18 0.643 0.267 0.618 0.275 0.594 -0.347 0.165 0.114 -0.020

DL2 19 0.418 0.144 0.542 0.651 0.509 0.752 -0.891 -0.877 -0.942

rain3 20 -0.270 0.060 -0.389 -0.386 -0.404 -0.238 0.425 0.368 0.495

Tave3 21 0.105 0.039 0.230 0.501 0.188 0.840 -0.957 -0.915 -0.925

HU0_3 22 0.117 0.046 0.243 0.508 0.200 0.844 -0.959 -0.918 -0.929

HU5_3 23 0.117 0.046 0.243 0.508 0.200 0.843 -0.959 -0.918 -0.928

HU10_3 24 0.114 0.046 0.241 0.507 0.198 0.843 -0.958 -0.917 -0.927

HU15_3 25 0.095 0.033 0.220 0.495 0.177 0.836 -0.954 -0.910 -0.918

WS3 26 -0.277 -0.279 -0.408 -0.576 -0.361 -0.820 0.940 0.923 0.967

rad3 27 0.676 0.208 0.662 0.242 0.652 -0.445 0.342 0.293 0.142

DL3 28 -0.332 -0.083 -0.421 -0.581 -0.378 -0.794 0.924 0.918 0.944

rain4 29 -0.226 0.155 -0.342 -0.382 -0.359 -0.321 0.521 0.467 0.568

Tx4 30 0.127 0.069 0.235 0.511 0.196 0.837 -0.969 -0.936 -0.941

Tn4 31 0.075 0.110 0.184 0.504 0.138 0.919 -0.981 -0.949 -0.929

WS4 32 -0.225 -0.152 -0.320 -0.462 -0.302 -0.734 0.896 0.886 0.929

RHx4 33 -0.028 0.327 -0.090 -0.099 -0.103 -0.197 0.227 0.216 0.245

RHn4 34 0.018 0.429 -0.039 0.012 -0.062 -0.292 0.477 0.464 0.511

rad4 35 0.688 0.208 0.665 0.263 0.653 -0.435 0.303 0.252 0.103

ETx4 36 0.018 0.036 0.168 0.422 0.114 0.834 -0.945 -0.897 -0.911

ETn4 37 0.241 0.387 0.262 0.555 0.182 0.827 -0.763 -0.767 -0.728

frost4 38 -0.232 -0.324 -0.296 -0.443 -0.277 -0.550 0.532 0.558 0.605

HU0_4 39 0.121 0.093 0.229 0.518 0.187 0.875 -0.981 -0.950 -0.947

HU5_4 40 0.120 0.092 0.229 0.518 0.187 0.875 -0.981 -0.949 -0.946

HU10_4 41 0.113 0.086 0.221 0.512 0.178 0.871 -0.978 -0.946 -0.941

HU15_4 42 0.070 0.050 0.178 0.483 0.137 0.859 -0.968 -0.930 -0.920

RC4 43 -0.232 -0.163 -0.340 -0.584 -0.300 -0.884 0.985 0.963 0.973

IC4 44 -0.275 -0.224 -0.374 -0.609 -0.328 -0.901 0.987 0.985 0.987

PC4 45 -0.344 -0.255 -0.459 -0.638 -0.414 -0.860 0.962 0.963 0.997

Eto4 46 0.321 -0.256 0.351 0.095 0.385 0.021 -0.283 -0.282 -0.400

DL4 47 0.261 0.110 0.247 0.001 0.324 -0.495 0.472 0.484 0.377

Alt 48 -0.045 -0.065 -0.131 -0.437 -0.102 -0.859 0.962 0.928 0.910

Lat 49 -0.379 -0.128 -0.493 -0.632 -0.463 -0.773 0.915 0.897 0.953

Long	50	-0.621	-0.094	-0.639	-0.196	-0.649	0.511	-0.478	-0.433	-0.286
pH_H2O	51	0.261	-0.039	0.394	0.439	0.327	0.735	-0.838	-0.832	-0.874
P	52	0.692	0.171	0.751	0.629	0.736	0.266	-0.423	-0.468	-0.561
K	53	-0.131	-0.166	-0.115	0.122	-0.139	0.457	-0.490	-0.490	-0.435
Ca	54	0.173	0.024	0.218	0.365	0.214	0.714	-0.864	-0.877	-0.878
Mg	55	0.268	-0.344	0.339	0.280	0.360	0.444	-0.642	-0.634	-0.700
Resist	56	-0.341	-0.085	-0.295	-0.338	-0.338	-0.277	0.402	0.466	0.473
APP_N	57	0.105	0.731	0.138	0.354	0.097	0.029	0.113	0.097	0.124

		1	2	3	4	5	6	7	8	9
DL1	10	1.000								
rain2	11	-0.465	1.000							
Tx2	12	0.892	-0.513	1.000						
Tn2	13	0.803	-0.424	0.919	1.000					
HU0_2	14	0.883	-0.494	0.994	0.958	1.000				
HU5_2	15	0.883	-0.494	0.994	0.957	1.000	1.000			
HU10_2	16	0.874	-0.502	0.994	0.955	0.999	0.999	1.000		
HU15_2	17	0.799	-0.537	0.974	0.940	0.980	0.980	0.986	1.000	
Rad2	18	0.075	0.025	-0.110	-0.315	-0.170	-0.170	-0.186	-0.278	1.000
DL2	19	0.994	-0.406	0.874	0.791	0.867	0.867	0.857	0.776	0.053
rain3	20	-0.572	0.107	-0.443	-0.271	-0.405	-0.405	-0.400	-0.340	-0.122
Tave3	21	0.919	-0.458	0.954	0.879	0.950	0.950	0.950	0.920	-0.194
HU0_3	22	0.926	-0.461	0.954	0.883	0.951	0.951	0.951	0.918	-0.188
HU5_3	23	0.925	-0.461	0.954	0.882	0.950	0.950	0.950	0.918	-0.188
HU10_3	24	0.925	-0.460	0.953	0.881	0.950	0.950	0.950	0.918	-0.190
HU15_3	25	0.916	-0.468	0.952	0.876	0.947	0.947	0.949	0.921	-0.200
WS3	26	-0.934	0.315	-0.925	-0.858	-0.923	-0.923	-0.914	-0.849	0.031
rad3	27	-0.059	0.276	-0.338	-0.458	-0.376	-0.377	-0.396	-0.505	0.864
DL3	28	-0.973	0.572	-0.923	-0.837	-0.915	-0.915	-0.909	-0.854	-0.059
rain4	29	-0.655	0.365	-0.550	-0.366	-0.510	-0.510	-0.507	-0.461	-0.105
Tx4	30	0.925	-0.492	0.980	0.887	0.971	0.971	0.971	0.943	-0.133

Tn4 31 0.888 -0.443 0.960 0.946 0.973 0.973 0.973 0.951 -0.283

WS4 32 -0.901 0.324 -0.908 -0.786 -0.890 -0.890 -0.884 -0.824 0.018

RHx4 33 -0.308 0.515 -0.236 -0.220 -0.235 -0.234 -0.226 -0.230 -0.053

RHn4 34 -0.552 0.558 -0.544 -0.376 -0.505 -0.505 -0.499 -0.487 -0.096

rad4 35 -0.017 0.189 -0.279 -0.434 -0.327 -0.327 -0.345 -0.450 0.927

ETx4 36 0.883 -0.460 0.945 0.878 0.942 0.942 0.941 0.917 -0.201

ETn4 37 0.640 -0.308 0.698 0.797 0.739 0.738 0.732 0.704 -0.066

frost4 38 -0.537 0.076 -0.494 -0.535 -0.514 -0.513 -0.493 -0.424 -0.094

HU0_4 39 0.922 -0.478 0.979 0.917 0.978 0.979 0.978 0.950 -0.183

HU5_4 40 0.922 -0.478 0.979 0.916 0.978 0.978 0.978 0.950 -0.183

HU10_4 41 0.919 -0.479 0.978 0.914 0.977 0.977 0.977 0.951 -0.189

HU15_4 42 0.902 -0.491 0.972 0.903 0.969 0.969 0.972 0.953 -0.220

RC4 43 -0.954 0.463 -0.971 -0.922 -0.974 -0.974 -0.971 -0.926 0.117

IC4 44 -0.945 0.454 -0.969 -0.935 -0.977 -0.976 -0.970 -0.919 0.080

PC4 45 -0.959 0.404 -0.943 -0.894 -0.946 -0.946 -0.935 -0.865 -0.018

Eto4 46 0.503 -0.327 0.352 0.102 0.289 0.289 0.279 0.216 0.470

DL4 47 -0.311 0.652 -0.482 -0.523 -0.498 -0.498 -0.506 -0.555 0.073

Alt 48 -0.879 0.444 -0.966 -0.907 -0.966 -0.966 -0.969 -0.953 0.262

Lat 49 -0.995 0.435 -0.905 -0.815 -0.897 -0.896 -0.889 -0.817 -0.031

Long 50 0.131 -0.198 0.505 0.541 0.522 0.523 0.544 0.645 -0.667

pH_H2O 51 0.936 -0.545 0.814 0.771 0.817 0.817 0.808 0.740 0.003

P 52 0.687 -0.426 0.431 0.295 0.401 0.400 0.385 0.288 0.568

K 53 0.385 -0.178 0.513 0.497 0.518 0.519 0.526 0.543 -0.312

Ca 54 0.859 -0.490 0.891 0.774 0.874 0.874 0.868 0.828 -0.025

Mg 55 0.827 -0.593 0.676 0.514 0.643 0.643 0.635 0.580 0.084

Resist 56 -0.448 0.085 -0.434 -0.296 -0.404 -0.404 -0.395 -0.337 -0.151

APP_N 57 -0.253 0.509 -0.171 -0.052 -0.140 -0.141 -0.143 -0.154 -0.019

10 11 12 13 14 15 16 17 18

DL2 19 1.000

rain3 20 -0.590 1.000

Tave3 21 0.917 -0.550 1.000

HU0_3 22 0.923 -0.543 1.000 1.000

HU5_3 23 0.923 -0.545 1.000 1.000 1.000

HU10_3 24 0.922 -0.546 1.000 1.000 1.000 1.000

HU15_3 25 0.914 -0.545 0.999 0.999 0.999 0.999 1.000

WS3 26 -0.937 0.515 -0.935 -0.938 -0.938 -0.938 -0.930 1.000

rad3 27 -0.060 -0.043 -0.338 -0.331 -0.331 -0.332 -0.346 0.161 1.000

DL3 28 -0.952 0.468 -0.917 -0.923 -0.922 -0.921 -0.915 0.910 0.126

rain4 29 -0.657 0.965 -0.635 -0.630 -0.632 -0.632 -0.633 0.564 0.035

Tx4 30 0.917 -0.539 0.992 0.991 0.991 0.991 0.991 -0.938 -0.319

Tn4 31 0.884 -0.451 0.984 0.984 0.984 0.984 0.982 -0.927 -0.419

WS4 32 -0.906 0.524 -0.916 -0.916 -0.916 -0.916 -0.911 0.960 0.165

RHx4 33 -0.251 0.421 -0.227 -0.228 -0.229 -0.227 -0.220 0.165 0.068

RHn4 34 -0.513 0.536 -0.538 -0.534 -0.534 -0.533 -0.529 0.473 0.118

rad4 35 -0.026 -0.076 -0.305 -0.299 -0.299 -0.300 -0.312 0.135 0.987

ETx4 36 0.872 -0.509 0.980 0.980 0.980 0.980 0.978 -0.928 -0.362

ETn4 37 0.627 -0.129 0.670 0.676 0.674 0.673 0.668 -0.667 -0.229

frost4 38 -0.537 0.131 -0.477 -0.478 -0.478 -0.477 -0.470 0.559 -0.072

HU0_4 39 0.915 -0.504 0.994 0.994 0.994 0.994 0.993 -0.943 -0.349

HU5_4 40 0.915 -0.506 0.994 0.994 0.994 0.994 0.993 -0.943 -0.350

HU10_4 41 0.912 -0.507 0.994 0.994 0.994 0.994 0.994 -0.940 -0.356

HU15_4 42 0.895 -0.507 0.995 0.994 0.994 0.994 0.995 -0.924 -0.388

RC4 43 -0.949 0.508 -0.978 -0.981 -0.981 -0.980 -0.976 0.963 0.272

IC4 44 -0.936 0.459 -0.945 -0.949 -0.949 -0.948 -0.940 0.958 0.242

PC4 45 -0.955 0.510 -0.927 -0.932 -0.932 -0.931 -0.920 0.969 0.138

Eto4 46 0.488 -0.599 0.378 0.377 0.378 0.377 0.371 -0.407 0.312

DL4 47 -0.255 -0.248 -0.396 -0.400 -0.398 -0.397 -0.406 0.279 0.308

Alt 48 -0.878 0.441 -0.980 -0.979 -0.979 -0.979 -0.980 0.925 0.429

Lat 49 -0.996 0.571 -0.937 -0.943 -0.943 -0.942 -0.935 0.950 0.099

Long 50 0.130 0.071 0.476 0.464 0.464 0.466 0.482 -0.325 -0.805

pH_H2O 51 0.921 -0.404 0.853 0.863 0.862 0.861 0.852 -0.846 -0.108

P 52 0.655 -0.364 0.398 0.410 0.409 0.408 0.394 -0.522 0.457

K 53 0.401 -0.195 0.510 0.500 0.500 0.501 0.511 -0.408 -0.271

Ca 54 0.844 -0.360 0.856 0.857 0.857 0.856 0.851 -0.871 -0.238

Mg 55 0.808 -0.507 0.719 0.724 0.724 0.722 0.715 -0.683 -0.033

Resist 56 -0.459 0.050 -0.402 -0.400 -0.399 -0.399 -0.393 0.501 -0.185

APP_N 57 -0.230 0.181 -0.204 -0.208 -0.207 -0.205 -0.206 0.089 0.093

19 20 21 22 23 24 25 26 27

DL3 28 1.000

rain4 29 0.588 1.000

Tx4 30 -0.932 -0.634 1.000

Tn4 31 -0.897 -0.539 0.976 1.000

WS4 32 0.892 0.574 -0.925 -0.890 1.000

RHx4 33 0.310 0.533 -0.241 -0.207 0.104 1.000

RHn4 34 0.564 0.650 -0.564 -0.476 0.547 0.728 1.000

rad4 35 0.069 -0.018 -0.272 -0.394 0.132 0.013 0.050 1.000

ETx4 36 -0.893 -0.598 0.974 0.967 -0.892 -0.272 -0.566 -0.327 1.000

ETn4 37 -0.720 -0.203 0.667 0.731 -0.594 -0.046 -0.092 -0.197 0.649

frost4 38 0.553 0.141 -0.484 -0.496 0.558 0.089 0.160 -0.077 -0.456

HU0_4 39 -0.930 -0.598 0.996 0.990 -0.919 -0.231 -0.532 -0.310 0.976

HU5_4 40 -0.930 -0.599 0.996 0.990 -0.919 -0.231 -0.532 -0.311 0.976

HU10_4 41 -0.927 -0.601 0.997 0.990 -0.917 -0.227 -0.530 -0.317 0.976

HU15_4 42 -0.913 -0.604 0.995 0.988 -0.906 -0.225 -0.531 -0.348 0.976

RC4 43 0.952 0.597 -0.983 -0.978 0.923 0.249 0.521 0.235 -0.959

IC4 44 0.946 0.549 -0.960 -0.959 0.914 0.254 0.517 0.204 -0.928

PC4 45 0.946 0.583 -0.942 -0.928 0.924 0.263 0.527 0.100 -0.913

Eto4 46 -0.452 -0.645 0.402 0.272 -0.507 -0.477 -0.823 0.366 0.353

DL4 47 0.461 -0.059 -0.427 -0.439 0.278 0.222 0.301 0.244 -0.435

Alt 48 0.893 0.529 -0.981 -0.983 0.923 0.141 0.498 0.394 -0.959

Lat 49 0.967 0.647 -0.941 -0.907 0.923 0.258 0.531 0.060 -0.901

Long 50 -0.219 0.011 0.473 0.542 -0.371 0.166 -0.139 -0.797 0.498

pH_H2O 51 -0.944 -0.520 0.850 0.832 -0.827 -0.281 -0.539 -0.075 0.838

P 52 -0.651 -0.450 0.431 0.341 -0.487 -0.456 -0.442 0.516 0.355

K 53 -0.393 -0.228 0.527 0.515 -0.448 -0.021 -0.303 -0.278 0.463

Ca 54 -0.894 -0.465 0.878 0.847 -0.938 -0.164 -0.620 -0.187 0.830

Mg 55 -0.818 -0.629 0.726 0.649 -0.744 -0.461 -0.789 0.016 0.695

Resist 56 0.449 0.067 -0.414 -0.386 0.623 -0.234 0.206 -0.175 -0.321

APP_N 57 0.305 0.302 -0.216 -0.140 0.210 0.426 0.706 0.044 -0.221

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 -0.640 1.000

HU0_4 39 0.699 -0.497 1.000

HU5_4 40 0.697 -0.496 1.000 1.000

HU10_4 41 0.693 -0.487 1.000 1.000 1.000

HU15_4 42 0.681 -0.466 0.997 0.997 0.998 1.000

RC4 43 -0.710 0.517 -0.990 -0.990 -0.988 -0.978 1.000

IC4 44 -0.717 0.529 -0.969 -0.969 -0.965 -0.949 0.989 1.000

PC4 45 -0.702 0.571 -0.947 -0.947 -0.942 -0.920 0.977 0.989 1.000

Eto4 46 -0.034 -0.103 0.356 0.356 0.355 0.346 -0.373 -0.366 -0.420

DL4 47 -0.535 0.293 -0.436 -0.435 -0.436 -0.447 0.401 0.400 0.343

Alt 48 -0.679 0.466 -0.987 -0.987 -0.988 -0.989 0.966 0.941 0.909

Lat 49 -0.646 0.537 -0.938 -0.938 -0.936 -0.921 0.965 0.951 0.964

Long 50 0.336 -0.052 0.490 0.490 0.498 0.529 -0.392 -0.362 -0.262

pH_H2O 51 0.639 -0.499 0.856 0.856 0.852 0.837 -0.883 -0.878 -0.887

P 52 0.286 -0.373 0.412 0.412 0.406 0.375 -0.493 -0.520 -0.573

K 53 0.162 -0.239 0.523 0.523 0.526 0.536 -0.476 -0.472 -0.426

Ca 54 0.596 -0.499 0.874 0.874 0.871 0.860 -0.876 -0.887 -0.878

Mg 55 0.277 -0.280 0.706 0.706 0.704 0.695 -0.727 -0.714 -0.729

Resist 56 -0.228 0.369 -0.409 -0.409 -0.405 -0.389 0.416 0.455 0.464

APP_N 57 0.107 -0.183 -0.190 -0.189 -0.190 -0.201 0.179 0.157 0.152

37 38 39 40 41 42 43 44 45

Eto4 46 1.000

DL4 47 -0.038 1.000

Alt 48 -0.319 0.445 1.000

Lat 49 -0.477 0.295 0.905 1.000

Long 50 -0.174 -0.466 -0.584 -0.185 1.000

pH_H2O 51 0.429 -0.428 -0.823 -0.925 0.136 1.000

P 52 0.609 -0.163 -0.328 -0.639 -0.462 0.602 1.000

K 53 0.106 -0.293 -0.547 -0.402 0.497 0.359 -0.039 1.000

Ca 54 0.530 -0.409 -0.888 -0.869 0.394 0.842 0.507 0.394 1.000

Mg 55 0.706 -0.246 -0.680 -0.815 0.015 0.850 0.653 0.325 0.800

Resist 56 -0.375 0.058 0.446 0.467 -0.140 -0.391 -0.405 -0.366 -0.654

APP_N 57 -0.568 0.304 0.209 0.241 -0.023 -0.415 -0.198 -0.215 -0.352

46 47 48 49 50 51 52 53 54

Mg 55 1.000

Resist 56 -0.453 1.000

APP_N 57 -0.688 0.073 1.000

55 56 57

===== Correlations for Cultivar 2 =====

*** Degrees of freedom ***

Correlations: 19

*** Correlation matrix ***

fyield 1 1.000

Tclleftprun 2 0.432 1.000

Tfertclad 3 0.891 0.535 1.000

Tftotal 4 0.442 0.627 0.416 1.000

Tfnoat 5 0.940 0.502 0.948 0.356 1.000

Tn1 6 0.302 0.443 0.368 0.012 0.376 1.000

RC1 7 -0.376 -0.323 -0.408 0.094 -0.435 -0.935 1.000

IC1 8 -0.375 -0.336 -0.383 0.046 -0.411 -0.935 0.989 1.000

C1 9 -0.445 -0.261 -0.422 0.041 -0.447 -0.871 0.968 0.972 1.000

DL1 10 0.465 0.048 0.438 -0.131 0.469 0.762 -0.903 -0.891 -0.948

rain2 11 0.260 0.268 0.287 0.348 0.200 -0.367 0.465 0.462 0.401

Tx2 12 0.354 0.272 0.373 -0.160 0.409 0.868 -0.982 -0.968 -0.948

Tn2 13 0.294 0.395 0.344 -0.080 0.368 0.989 -0.965 -0.961 -0.903

HU0_2 14 0.346 0.310 0.373 -0.139 0.406 0.917 -0.994 -0.982 -0.952

HU5_2 15 0.346 0.310 0.374 -0.140 0.407 0.917 -0.994 -0.982 -0.952

HU10_2 16 0.341 0.313 0.377 -0.149 0.410 0.913 -0.991 -0.977 -0.941

HU15_2 17 0.264 0.319 0.322 -0.203 0.359 0.894 -0.960 -0.937 -0.872

Rad2 18 0.348 -0.138 0.113 0.304 0.120 -0.347 0.165 0.114 -0.020

DL2 19 0.495 0.062 0.474 -0.121 0.508 0.752 -0.891 -0.877 -0.942

rain3 20 -0.263 0.120 -0.282 0.076 -0.288 -0.238 0.425 0.368 0.495

Tave3 21 0.358 0.187 0.440 -0.212 0.452 0.840 -0.957 -0.915 -0.925

HU0_3 22 0.363 0.183 0.441 -0.210 0.454 0.844 -0.959 -0.918 -0.929

HU5_3 23 0.363 0.183 0.441 -0.210 0.455 0.843 -0.959 -0.918 -0.928

HU10_3 24 0.363 0.184 0.442 -0.210 0.455 0.843 -0.958 -0.917 -0.927

HU15_3 25 0.354 0.186 0.442 -0.217 0.454 0.836 -0.954 -0.910 -0.918

WS3 26 -0.481 -0.284 -0.469 0.081 -0.494 -0.820 0.940 0.923 0.967

rad3 27 0.323 -0.193 0.151 0.430 0.074 -0.445 0.342 0.293 0.142

DL3 28 -0.404 -0.065 -0.371 0.174 -0.409 -0.794 0.924 0.918 0.944

rain4 29 -0.176 0.181 -0.186 0.161 -0.215 -0.321 0.521 0.467 0.568

Tx4 30 0.363 0.195 0.420 -0.210 0.440 0.837 -0.969 -0.936 -0.941

Tn4 31 0.337 0.278 0.419 -0.172 0.436 0.919 -0.981 -0.949 -0.929

WS4 32 -0.391 -0.175 -0.391 0.197 -0.411 -0.734 0.896 0.886 0.929

RHx4 33 0.265 0.381 0.311 0.286 0.305 -0.197 0.227 0.216 0.245

RHn4 34 0.211 0.445 0.237 0.610 0.222 -0.292 0.477 0.464 0.511

rad4 35 0.334 -0.206 0.138 0.395 0.082 -0.435 0.303 0.252 0.103

ETx4 36 0.299 0.192 0.373 -0.258 0.384 0.834 -0.945 -0.897 -0.911

ETn4 37 0.434 0.479 0.427 0.158 0.460 0.827 -0.763 -0.767 -0.728

frost4 38 -0.256 -0.334 -0.318 -0.185 -0.215 -0.550 0.532 0.558 0.605

HU0_4 39 0.361 0.226 0.423 -0.193 0.443 0.875 -0.981 -0.950 -0.947

HU5_4 40 0.361 0.226 0.423 -0.193 0.443 0.875 -0.981 -0.949 -0.946

HU10_4 41 0.359 0.225 0.425 -0.197 0.445 0.871 -0.978 -0.946 -0.941

HU15_4 42 0.337 0.218 0.419 -0.222 0.438 0.859 -0.968 -0.930 -0.920

RC4 43 -0.413 -0.219 -0.435 0.141 -0.465 -0.884 0.985 0.963 0.973

IC4 44 -0.408 -0.243 -0.398 0.097 -0.433 -0.901 0.987 0.985 0.987

PC4 45 -0.446 -0.216 -0.410 0.067 -0.443 -0.860 0.962 0.963 0.997

Eto4 46 0.046 -0.452 -0.054 -0.378 -0.029 0.021 -0.283 -0.282 -0.400

DL4 47 0.100 -0.118 0.018 0.282 0.009 -0.495 0.472 0.484 0.377

Alt 48 -0.341 -0.233 -0.409 0.264 -0.443 -0.859 0.962 0.928 0.910

Lat 49 -0.478 -0.072 -0.455 0.145 -0.490 -0.773 0.915 0.897 0.953

Long 50 -0.123 0.401 0.077 -0.334 0.090 0.511 -0.478 -0.433 -0.286

pH_H2O 51 0.267 -0.098 0.244 -0.294 0.272 0.735 -0.838 -0.832 -0.874

P 52 0.410 -0.169 0.231 0.108 0.268 0.266 -0.423 -0.468 -0.561

K 53 0.103 0.102 0.293 -0.251 0.191 0.457 -0.490 -0.490 -0.435

Ca 54 0.248 0.050 0.204 -0.315 0.267 0.714 -0.864 -0.877 -0.878

Mg 55 0.091 -0.471 0.022 -0.512 0.065 0.444 -0.642 -0.634 -0.700

Resist 56 -0.331 -0.069 -0.257 -0.042 -0.251 -0.277 0.402 0.466 0.473

APP_N 57 0.342 0.811 0.421 0.857 0.356 0.029 0.113 0.097 0.124

1 2 3 4 5 6 7 8 9

DL1 10 1.000

rain2 11 -0.465 1.000

Tx2 12 0.892 -0.513 1.000

Tn2 13 0.803 -0.424 0.919 1.000

HU0_2 14 0.883 -0.494 0.994 0.958 1.000

HU5_2 15 0.883 -0.494 0.994 0.957 1.000 1.000

HU10_2 16 0.874 -0.502 0.994 0.955 0.999 0.999 1.000

HU15_2 17 0.799 -0.537 0.974 0.940 0.980 0.980 0.986 1.000

Rad2 18 0.075 0.025 -0.110 -0.315 -0.170 -0.170 -0.186 -0.278 1.000

DL2 19 0.994 -0.406 0.874 0.791 0.867 0.867 0.857 0.776 0.053

rain3 20 -0.572 0.107 -0.443 -0.271 -0.405 -0.405 -0.400 -0.340 -0.122

Tave3 21 0.919 -0.458 0.954 0.879 0.950 0.950 0.950 0.920 -0.194

HU0_3 22 0.926 -0.461 0.954 0.883 0.951 0.951 0.951 0.918 -0.188

HU5_3 23 0.925 -0.461 0.954 0.882 0.950 0.950 0.950 0.918 -0.188

HU10_3 24 0.925 -0.460 0.953 0.881 0.950 0.950 0.950 0.918 -0.190

HU15_3 25 0.916 -0.468 0.952 0.876 0.947 0.947 0.949 0.921 -0.200

WS3 26 -0.934 0.315 -0.925 -0.858 -0.923 -0.923 -0.914 -0.849 0.031

rad3 27 -0.059 0.276 -0.338 -0.458 -0.376 -0.377 -0.396 -0.505 0.864

DL3 28 -0.973 0.572 -0.923 -0.837 -0.915 -0.915 -0.909 -0.854 -0.059

rain4 29 -0.655 0.365 -0.550 -0.366 -0.510 -0.510 -0.507 -0.461 -0.105

Tx4 30 0.925 -0.492 0.980 0.887 0.971 0.971 0.971 0.943 -0.133

Tn4 31 0.888 -0.443 0.960 0.946 0.973 0.973 0.973 0.951 -0.283

WS4 32 -0.901 0.324 -0.908 -0.786 -0.890 -0.890 -0.884 -0.824 0.018

RHx4 33 -0.308 0.515 -0.236 -0.220 -0.235 -0.234 -0.226 -0.230 -0.053

RHn4 34 -0.552 0.558 -0.544 -0.376 -0.505 -0.505 -0.499 -0.487 -0.096

rad4 35 -0.017 0.189 -0.279 -0.434 -0.327 -0.327 -0.345 -0.450 0.927

ETx4 36 0.883 -0.460 0.945 0.878 0.942 0.942 0.941 0.917 -0.201

ETn4 37 0.640 -0.308 0.698 0.797 0.739 0.738 0.732 0.704 -0.066

frost4 38 -0.537 0.076 -0.494 -0.535 -0.514 -0.513 -0.493 -0.424 -0.094

HU0_4 39 0.922 -0.478 0.979 0.917 0.978 0.979 0.978 0.950 -0.183

HU5_4 40 0.922 -0.478 0.979 0.916 0.978 0.978 0.978 0.950 -0.183

HU10_4 41 0.919 -0.479 0.978 0.914 0.977 0.977 0.977 0.951 -0.189

HU15_4 42 0.902 -0.491 0.972 0.903 0.969 0.969 0.972 0.953 -0.220

RC4 43 -0.954 0.463 -0.971 -0.922 -0.974 -0.974 -0.971 -0.926 0.117

IC4 44 -0.945 0.454 -0.969 -0.935 -0.977 -0.976 -0.970 -0.919 0.080

PC4 45 -0.959 0.404 -0.943 -0.894 -0.946 -0.946 -0.935 -0.865 -0.018

Eto4 46 0.503 -0.327 0.352 0.102 0.289 0.289 0.279 0.216 0.470

DL4 47 -0.311 0.652 -0.482 -0.523 -0.498 -0.498 -0.506 -0.555 0.073

Alt 48 -0.879 0.444 -0.966 -0.907 -0.966 -0.966 -0.969 -0.953 0.262

Lat 49 -0.995 0.435 -0.905 -0.815 -0.897 -0.896 -0.889 -0.817 -0.031

Long 50 0.131 -0.198 0.505 0.541 0.522 0.523 0.544 0.645 -0.667

pH_H2O 51 0.936 -0.545 0.814 0.771 0.817 0.817 0.808 0.740 0.003

P 52 0.687 -0.426 0.431 0.295 0.401 0.400 0.385 0.288 0.568

K 53 0.385 -0.178 0.513 0.497 0.518 0.519 0.526 0.543 -0.312

Ca 54 0.859 -0.490 0.891 0.774 0.874 0.874 0.868 0.828 -0.025

Mg 55 0.827 -0.593 0.676 0.514 0.643 0.643 0.635 0.580 0.084

Resist 56 -0.448 0.085 -0.434 -0.296 -0.404 -0.404 -0.395 -0.337 -0.151

APP_N 57 -0.253 0.509 -0.171 -0.052 -0.140 -0.141 -0.143 -0.154 -0.019

10 11 12 13 14 15 16 17 18

DL2 19 1.000

rain3 20 -0.590 1.000

Tave3 21 0.917 -0.550 1.000

HU0_3 22 0.923 -0.543 1.000 1.000

HU5_3 23 0.923 -0.545 1.000 1.000 1.000

HU10_3 24 0.922 -0.546 1.000 1.000 1.000 1.000

HU15_3 25 0.914 -0.545 0.999 0.999 0.999 0.999 1.000

WS3 26 -0.937 0.515 -0.935 -0.938 -0.938 -0.938 -0.930 1.000

rad3 27 -0.060 -0.043 -0.338 -0.331 -0.331 -0.332 -0.346 0.161 1.000

DL3 28 -0.952 0.468 -0.917 -0.923 -0.922 -0.921 -0.915 0.910 0.126

rain4 29 -0.657 0.965 -0.635 -0.630 -0.632 -0.632 -0.633 0.564 0.035

Tx4 30 0.917 -0.539 0.992 0.991 0.991 0.991 0.991 -0.938 -0.319

Tn4 31 0.884 -0.451 0.984 0.984 0.984 0.984 0.982 -0.927 -0.419

WS4 32 -0.906 0.524 -0.916 -0.916 -0.916 -0.916 -0.911 0.960 0.165

RHx4 33 -0.251 0.421 -0.227 -0.228 -0.229 -0.227 -0.220 0.165 0.068

RHn4 34 -0.513 0.536 -0.538 -0.534 -0.534 -0.533 -0.529 0.473 0.118

rad4 35 -0.026 -0.076 -0.305 -0.299 -0.299 -0.300 -0.312 0.135 0.987

ETx4 36 0.872 -0.509 0.980 0.980 0.980 0.980 0.978 -0.928 -0.362

ETn4 37 0.627 -0.129 0.670 0.676 0.674 0.673 0.668 -0.667 -0.229

frost4 38 -0.537 0.131 -0.477 -0.478 -0.478 -0.477 -0.470 0.559 -0.072

HU0_4 39 0.915 -0.504 0.994 0.994 0.994 0.994 0.993 -0.943 -0.349

HU5_4 40 0.915 -0.506 0.994 0.994 0.994 0.994 0.993 -0.943 -0.350

HU10_4 41 0.912 -0.507 0.994 0.994 0.994 0.994 0.994 -0.940 -0.356

HU15_4 42 0.895 -0.507 0.995 0.994 0.994 0.994 0.995 -0.924 -0.388

RC4 43 -0.949 0.508 -0.978 -0.981 -0.981 -0.980 -0.976 0.963 0.272

IC4 44 -0.936 0.459 -0.945 -0.949 -0.949 -0.948 -0.940 0.958 0.242

PC4 45 -0.955 0.510 -0.927 -0.932 -0.932 -0.931 -0.920 0.969 0.138

Eto4 46 0.488 -0.599 0.378 0.377 0.378 0.377 0.371 -0.407 0.312

DL4 47 -0.255 -0.248 -0.396 -0.400 -0.398 -0.397 -0.406 0.279 0.308

Alt 48 -0.878 0.441 -0.980 -0.979 -0.979 -0.979 -0.980 0.925 0.429

Lat 49 -0.996 0.571 -0.937 -0.943 -0.943 -0.942 -0.935 0.950 0.099

Long 50 0.130 0.071 0.476 0.464 0.464 0.466 0.482 -0.325 -0.805

pH_H2O 51 0.921 -0.404 0.853 0.863 0.862 0.861 0.852 -0.846 -0.108

P 52 0.655 -0.364 0.398 0.410 0.409 0.408 0.394 -0.522 0.457

K 53 0.401 -0.195 0.510 0.500 0.500 0.501 0.511 -0.408 -0.271

Ca 54 0.844 -0.360 0.856 0.857 0.857 0.856 0.851 -0.871 -0.238

Mg 55 0.808 -0.507 0.719 0.724 0.724 0.722 0.715 -0.683 -0.033

Resist 56 -0.459 0.050 -0.402 -0.400 -0.399 -0.399 -0.393 0.501 -0.185

APP_N 57 -0.230 0.181 -0.204 -0.208 -0.207 -0.205 -0.206 0.089 0.093

	19	20	21	22	23	24	25	26	27
DL3	28	1.000							
rain4	29	0.588	1.000						
Tx4	30	-0.932	-0.634	1.000					
Tn4	31	-0.897	-0.539	0.976	1.000				
WS4	32	0.892	0.574	-0.925	-0.890	1.000			
RHx4	33	0.310	0.533	-0.241	-0.207	0.104	1.000		
RHn4	34	0.564	0.650	-0.564	-0.476	0.547	0.728	1.000	
rad4	35	0.069	-0.018	-0.272	-0.394	0.132	0.013	0.050	1.000

ETx4 36 -0.893 -0.598 0.974 0.967 -0.892 -0.272 -0.566 -0.327 1.000

ETn4 37 -0.720 -0.203 0.667 0.731 -0.594 -0.046 -0.092 -0.197 0.649

frost4 38 0.553 0.141 -0.484 -0.496 0.558 0.089 0.160 -0.077 -0.456

HU0_4 39 -0.930 -0.598 0.996 0.990 -0.919 -0.231 -0.532 -0.310 0.976

HU5_4 40 -0.930 -0.599 0.996 0.990 -0.919 -0.231 -0.532 -0.311 0.976

HU10_4 41 -0.927 -0.601 0.997 0.990 -0.917 -0.227 -0.530 -0.317 0.976

HU15_4 42 -0.913 -0.604 0.995 0.988 -0.906 -0.225 -0.531 -0.348 0.976

RC4 43 0.952 0.597 -0.983 -0.978 0.923 0.249 0.521 0.235 -0.959

IC4 44 0.946 0.549 -0.960 -0.959 0.914 0.254 0.517 0.204 -0.928

PC4 45 0.946 0.583 -0.942 -0.928 0.924 0.263 0.527 0.100 -0.913

Eto4 46 -0.452 -0.645 0.402 0.272 -0.507 -0.477 -0.823 0.366 0.353

DL4 47 0.461 -0.059 -0.427 -0.439 0.278 0.222 0.301 0.244 -0.435

Alt 48 0.893 0.529 -0.981 -0.983 0.923 0.141 0.498 0.394 -0.959

Lat 49 0.967 0.647 -0.941 -0.907 0.923 0.258 0.531 0.060 -0.901

Long 50 -0.219 0.011 0.473 0.542 -0.371 0.166 -0.139 -0.797 0.498

pH_H2O 51 -0.944 -0.520 0.850 0.832 -0.827 -0.281 -0.539 -0.075 0.838

P 52 -0.651 -0.450 0.431 0.341 -0.487 -0.456 -0.442 0.516 0.355

K 53 -0.393 -0.228 0.527 0.515 -0.448 -0.021 -0.303 -0.278 0.463

Ca 54 -0.894 -0.465 0.878 0.847 -0.938 -0.164 -0.620 -0.187 0.830

Mg 55 -0.818 -0.629 0.726 0.649 -0.744 -0.461 -0.789 0.016 0.695

Resist 56 0.449 0.067 -0.414 -0.386 0.623 -0.234 0.206 -0.175 -0.321

APP_N 57 0.305 0.302 -0.216 -0.140 0.210 0.426 0.706 0.044 -0.221

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 -0.640 1.000

HU0_4 39 0.699 -0.497 1.000

HU5_4 40 0.697 -0.496 1.000 1.000

HU10_4 41 0.693 -0.487 1.000 1.000 1.000

HU15_4 42 0.681 -0.466 0.997 0.997 0.998 1.000

RC4 43 -0.710 0.517 -0.990 -0.990 -0.988 -0.978 1.000

IC4 44 -0.717 0.529 -0.969 -0.969 -0.965 -0.949 0.989 1.000

PC4 45 -0.702 0.571 -0.947 -0.947 -0.942 -0.920 0.977 0.989 1.000

Eto4 46 -0.034 -0.103 0.356 0.356 0.355 0.346 -0.373 -0.366 -0.420

DL4 47 -0.535 0.293 -0.436 -0.435 -0.436 -0.447 0.401 0.400 0.343

Alt 48 -0.679 0.466 -0.987 -0.987 -0.988 -0.989 0.966 0.941 0.909

Lat 49 -0.646 0.537 -0.938 -0.938 -0.936 -0.921 0.965 0.951 0.964

Long 50 0.336 -0.052 0.490 0.490 0.498 0.529 -0.392 -0.362 -0.262

pH_H2O 51 0.639 -0.499 0.856 0.856 0.852 0.837 -0.883 -0.878 -0.887

P 52 0.286 -0.373 0.412 0.412 0.406 0.375 -0.493 -0.520 -0.573

K 53 0.162 -0.239 0.523 0.523 0.526 0.536 -0.476 -0.472 -0.426

Ca 54 0.596 -0.499 0.874 0.874 0.871 0.860 -0.876 -0.887 -0.878

Mg 55 0.277 -0.280 0.706 0.706 0.704 0.695 -0.727 -0.714 -0.729

Resist 56 -0.228 0.369 -0.409 -0.409 -0.405 -0.389 0.416 0.455 0.464

APP_N 57 0.107 -0.183 -0.190 -0.189 -0.190 -0.201 0.179 0.157 0.152

37 38 39 40 41 42 43 44 45

Eto4 46 1.000

DL4 47 -0.038 1.000

Alt 48 -0.319 0.445 1.000

Lat 49 -0.477 0.295 0.905 1.000

Long 50 -0.174 -0.466 -0.584 -0.185 1.000

pH_H2O 51 0.429 -0.428 -0.823 -0.925 0.136 1.000

P 52 0.609 -0.163 -0.328 -0.639 -0.462 0.602 1.000

K 53 0.106 -0.293 -0.547 -0.402 0.497 0.359 -0.039 1.000

Ca 54 0.530 -0.409 -0.888 -0.869 0.394 0.842 0.507 0.394 1.000

Mg 55 0.706 -0.246 -0.680 -0.815 0.015 0.850 0.653 0.325 0.800

Resist 56 -0.375 0.058 0.446 0.467 -0.140 -0.391 -0.405 -0.366 -0.654

APP_N 57 -0.568 0.304 0.209 0.241 -0.023 -0.415 -0.198 -0.215 -0.352

46 47 48 49 50 51 52 53 54

Mg 55 1.000

Resist 56 -0.453 1.000

APP_N 57 -0.688 0.073 1.000

55 56 57

===== Correlations for Cultivar 3 =====

*** Degrees of freedom ***

Correlations: 18

*** Correlation matrix ***

fyield 1 1.000

Tcllefprun 2 0.403 1.000

Tfertclad 3 0.942 0.479 1.000

Tftotal 4 0.705 0.759 0.674 1.000

Tfnoat 5 0.960 0.467 0.980 0.734 1.000

Tn1 6 0.158 0.347 0.052 0.480 0.136 1.000

RC1 7 -0.190 -0.182 -0.082 -0.365 -0.164 -0.933 1.000

IC1 8 -0.230 -0.217 -0.099 -0.408 -0.177 -0.939 0.989 1.000

C1 9 -0.289 -0.183 -0.188 -0.364 -0.254 -0.878 0.970 0.971 1.000

DL1 10 0.331 -0.020 0.216 0.270 0.289 0.768 -0.906 -0.890 -0.947

rain2 11 0.011 0.419 0.215 0.047 0.108 -0.297 0.419 0.423 0.367

Tx2 12 0.148 0.096 0.035 0.294 0.116 0.865 -0.982 -0.966 -0.946

Tn2 13 0.106 0.278 -0.008 0.402 0.074 0.987 -0.965 -0.965 -0.910

HU0_2 14 0.140 0.146 0.025 0.328 0.107 0.913 -0.994 -0.981 -0.952

HU5_2 15 0.140 0.145 0.024 0.327 0.107 0.913 -0.994 -0.981 -0.952

HU10_2 16 0.128 0.138 0.013 0.322 0.096 0.908 -0.990 -0.975 -0.940

HU15_2 17 0.033 0.102 -0.082 0.282 0.007 0.882 -0.956 -0.934 -0.869

Rad2 18 0.629 0.102 0.608 0.174 0.563 -0.279 0.099 0.053 -0.076

DL2 19 0.321 -0.002 0.217 0.259 0.282 0.763 -0.897 -0.877 -0.942

rain3 20 -0.235 0.168 -0.246 -0.023 -0.296 -0.260 0.446 0.382 0.507

Tave3 21 0.119 -0.012 0.037 0.203 0.122 0.829 -0.953 -0.909 -0.922

HU0_3 22 0.128 -0.007 0.045 0.209 0.130 0.832 -0.956 -0.912 -0.927

HU5_3 23 0.128 -0.007 0.045 0.208 0.130 0.832 -0.955 -0.912 -0.927

HU10_3 24 0.126 -0.007 0.044 0.208 0.128 0.831 -0.955 -0.911 -0.925

HU15_3 25 0.112 -0.017 0.031 0.200 0.116 0.822 -0.950 -0.903 -0.915

WS3 26 -0.199 -0.172 -0.138 -0.302 -0.200 -0.838 0.949 0.927 0.968

rad3 27 0.637 0.102 0.682 0.206 0.609 -0.403 0.300 0.254 0.104

DL3 28 -0.289 0.046 -0.156 -0.255 -0.229 -0.790 0.922 0.914 0.941

rain4 29 -0.217 0.264 -0.176 -0.010 -0.250 -0.321 0.525 0.466 0.568

Tx4 30 0.134 0.005 0.039 0.221 0.121 0.828 -0.967 -0.931 -0.939

Tn4 31 0.099 0.090 0.006 0.271 0.093 0.911 -0.979 -0.946 -0.930

WS4 32 -0.121 -0.025 -0.063 -0.146 -0.102 -0.753 0.908 0.892 0.931

RHx4 33 -0.045 0.352 0.056 0.058 -0.047 -0.148 0.190 0.183 0.219

RHn4 34 0.094 0.520 0.210 0.342 0.146 -0.266 0.464 0.450 0.499

rad4 35 0.654 0.078 0.677 0.205 0.613 -0.388 0.255 0.207 0.060

ETx4 36 0.036 -0.001 -0.023 0.157 0.063 0.818 -0.940 -0.890 -0.909

ETn4 37 0.348 0.411 0.255 0.490 0.306 0.799 -0.737 -0.748 -0.716

frost4 38 -0.204 -0.282 -0.220 -0.328 -0.215 -0.564 0.532 0.557 0.603

HU0_4 39 0.130 0.041 0.033 0.248 0.117 0.867 -0.979 -0.946 -0.946

HU5_4 40 0.130 0.041 0.033 0.247 0.117 0.866 -0.979 -0.946 -0.946

HU10_4 41 0.124 0.036 0.029 0.243 0.113 0.862 -0.977 -0.942 -0.940

HU15_4 42 0.091 0.007 0.000 0.217 0.086 0.847 -0.965 -0.925 -0.919

RC4 43 -0.216 -0.090 -0.115 -0.303 -0.194 -0.880 0.984 0.961 0.974

IC4 44 -0.247 -0.143 -0.122 -0.350 -0.201 -0.905 0.988 0.984 0.987

PC4 45 -0.291 -0.151 -0.181 -0.342 -0.251 -0.866 0.965 0.962 0.997

Eto4 46 0.194 -0.423 0.112 -0.281 0.128 0.054 -0.319 -0.312 -0.425

DL4 47 0.148 0.053 0.253 -0.023 0.218 -0.384 0.396 0.426 0.325

Alt 48 -0.023 -0.016 0.065 -0.169 -0.006 -0.849 0.958 0.923 0.907

Lat 49 -0.298 0.008 -0.195 -0.257 -0.264 -0.775 0.916 0.895 0.951

Long 50 -0.532 0.054 -0.533 -0.112 -0.503 0.453 -0.430 -0.389 -0.241

pH_H2O 51 0.175 -0.170 0.028 0.093 0.094 0.706 -0.823 -0.819 -0.869

P 52 0.588 -0.049 0.460 0.352 0.518 0.337 -0.479 -0.516 -0.600

K 53 -0.195 -0.133 -0.268 0.032 -0.259 0.454 -0.483 -0.482 -0.425

Ca 54 0.072 -0.112 -0.062 0.043 -0.014 0.737 -0.878 -0.885 -0.881

Mg 55 0.113 -0.514 -0.037 -0.170 0.025 0.427 -0.634 -0.624 -0.692

Resist 56 -0.208 0.037 -0.122 -0.165 -0.111 -0.392 0.492 0.545 0.536

APP_N 57 0.292 0.848 0.419 0.708 0.420 0.150 0.037 0.031 0.073

1 2 3 4 5 6 7 8 9

DL1 10 1.000

rain2 11 -0.442 1.000

Tx2 12 0.890 -0.480 1.000

Tn2 13 0.809 -0.363 0.921 1.000

HU0_2 14 0.884 -0.453 0.994 0.958 1.000

HU5_2 15 0.884 -0.454 0.994 0.958 1.000 1.000

HU10_2 16 0.875 -0.460 0.994 0.954 0.999 0.999 1.000

HU15_2 17 0.798 -0.495 0.975 0.934 0.978 0.979 0.985 1.000

Rad2 18 0.123 -0.045 -0.052 -0.247 -0.107 -0.108 -0.123 -0.217 1.000

DL2 19 0.994 -0.385 0.873 0.802 0.870 0.869 0.860 0.777 0.094

rain3 20 -0.580 0.112 -0.457 -0.294 -0.423 -0.423 -0.418 -0.360 -0.125

Tave3 21 0.921 -0.417 0.951 0.872 0.946 0.946 0.946 0.914 -0.136

HU0_3 22 0.928 -0.419 0.951 0.875 0.946 0.947 0.946 0.911 -0.128

HU5_3 23 0.928 -0.418 0.951 0.874 0.946 0.946 0.946 0.911 -0.128

HU10_3 24 0.927 -0.417 0.951 0.873 0.946 0.946 0.946 0.911 -0.130

HU15_3 25 0.919 -0.426 0.949 0.867 0.943 0.943 0.944 0.914 -0.140

WS3 26 -0.932 0.290 -0.927 -0.876 -0.929 -0.929 -0.921 -0.856 -0.005

rad3 27 -0.025 0.234 -0.303 -0.419 -0.338 -0.339 -0.358 -0.473 0.857

DL3 28 -0.974 0.547 -0.919 -0.835 -0.912 -0.912 -0.906 -0.849 -0.119

rain4 29 -0.655 0.361 -0.551 -0.369 -0.513 -0.513 -0.510 -0.465 -0.126

Tx4 30 0.925 -0.455 0.979 0.883 0.969 0.969 0.970 0.940 -0.075

Tn4 31 0.892 -0.393 0.960 0.941 0.971 0.971 0.970 0.945 -0.223

WS4 32 -0.900 0.306 -0.913 -0.807 -0.900 -0.900 -0.894 -0.836 -0.011

RHx4 33 -0.289 0.496 -0.205 -0.174 -0.200 -0.199 -0.190 -0.191 -0.098

RHn4 34 -0.543 0.548 -0.533 -0.357 -0.493 -0.493 -0.487 -0.475 -0.133

rad4 35 0.021 0.139 -0.239 -0.388 -0.283 -0.283 -0.301 -0.410 0.923

ETx4 36 0.885 -0.415 0.942 0.867 0.937 0.937 0.936 0.909 -0.138

ETn4 37 0.631 -0.236 0.675 0.765 0.712 0.712 0.703 0.666 0.027

frost4 38 -0.532 0.056 -0.490 -0.544 -0.513 -0.512 -0.491 -0.420 -0.119

HU0_4 39 0.925 -0.437 0.978 0.913 0.977 0.977 0.976 0.946 -0.122

HU5_4 40 0.924 -0.436 0.978 0.912 0.976 0.976 0.976 0.946 -0.122

HU10_4 41 0.921 -0.438 0.977 0.909 0.975 0.975 0.975 0.947 -0.128

HU15_4 42 0.905 -0.449 0.971 0.896 0.966 0.967 0.969 0.949 -0.159

RC4 43 -0.957 0.423 -0.969 -0.921 -0.973 -0.973 -0.969 -0.921 0.055

IC4 44 -0.945 0.418 -0.967 -0.940 -0.976 -0.976 -0.969 -0.916 0.022

PC4 45 -0.959 0.372 -0.941 -0.901 -0.947 -0.946 -0.935 -0.862 -0.072

Eto4 46 0.525 -0.360 0.382 0.141 0.323 0.323 0.315 0.254 0.468

DL4 47 -0.267 0.619 -0.430 -0.425 -0.432 -0.432 -0.439 -0.485 -0.050

Alt 48 -0.878 0.401 -0.964 -0.902 -0.963 -0.963 -0.966 -0.950 0.208

Lat 49 -0.995 0.408 -0.903 -0.819 -0.896 -0.896 -0.888 -0.814 -0.080

Long 50 0.088 -0.131 0.469 0.488 0.480 0.481 0.502 0.610 -0.641

pH_H2O 51 0.940 -0.507 0.801 0.747 0.801 0.801 0.791 0.714 0.082

P 52 0.720 -0.476 0.475 0.365 0.453 0.452 0.437 0.343 0.562

K 53 0.375 -0.156 0.505 0.496 0.512 0.512 0.521 0.540 -0.296

Ca 54 0.859 -0.483 0.898 0.799 0.886 0.886 0.881 0.844 0.000

Mg 55 0.823 -0.582 0.668 0.502 0.634 0.634 0.627 0.570 0.125

Resist 56 -0.498 0.146 -0.506 -0.407 -0.489 -0.489 -0.481 -0.430 -0.107

APP_N 57 -0.219 0.472 -0.113 0.054 -0.070 -0.070 -0.071 -0.076 -0.092

10 11 12 13 14 15 16 17 18

DL2 19 1.000

rain3 20 -0.597 1.000

Tave3 21 0.920 -0.572 1.000

HU0_3 22 0.928 -0.566 1.000 1.000

HU5_3 23 0.927 -0.568 1.000 1.000 1.000

HU10_3 24 0.927 -0.569 1.000 1.000 1.000 1.000

HU15_3 25 0.919 -0.569 0.999 0.999 0.999 0.999 1.000

WS3 26 -0.936 0.521 -0.940 -0.944 -0.944 -0.944 -0.936 1.000

rad3 27 -0.030 -0.044 -0.299 -0.290 -0.291 -0.292 -0.306 0.135 1.000

DL3 28 -0.952 0.480 -0.913 -0.920 -0.919 -0.918 -0.911 0.910 0.085

rain4 29 -0.656 0.967 -0.642 -0.638 -0.639 -0.640 -0.642 0.561 0.021

Tx4 30 0.919 -0.559 0.991 0.991 0.991 0.991 0.991 -0.942 -0.281

Tn4 31 0.892 -0.476 0.983 0.984 0.983 0.983 0.981 -0.938 -0.381

WS4 32 -0.905 0.528 -0.924 -0.926 -0.926 -0.925 -0.921 0.960 0.145

RHx4 33 -0.233 0.427 -0.193 -0.194 -0.194 -0.192 -0.184 0.145 0.035

RHn4 34 -0.504 0.541 -0.527 -0.523 -0.524 -0.522 -0.518 0.463 0.095

rad4 35 0.007 -0.077 -0.262 -0.253 -0.254 -0.255 -0.268 0.106 0.987

ETx4 36 0.876 -0.533 0.979 0.979 0.979 0.978 0.976 -0.936 -0.322

ETn4 37 0.621 -0.139 0.637 0.643 0.641 0.640 0.634 -0.666 -0.168

frost4 38 -0.533 0.132 -0.473 -0.475 -0.474 -0.473 -0.466 0.555 -0.092

HU0_4 39 0.920 -0.526 0.993 0.993 0.993 0.993 0.992 -0.950 -0.310

HU5_4 40 0.920 -0.527 0.993 0.994 0.993 0.993 0.992 -0.950 -0.310

HU10_4 41 0.917 -0.529 0.994 0.994 0.994 0.994 0.993 -0.946 -0.317

HU15_4 42 0.900 -0.531 0.994 0.993 0.993 0.994 0.995 -0.931 -0.350

RC4 43 -0.953 0.527 -0.976 -0.980 -0.980 -0.979 -0.974 0.968 0.230

IC4 44 -0.937 0.473 -0.942 -0.947 -0.946 -0.945 -0.937 0.961 0.203

PC4 45 -0.955 0.522 -0.925 -0.931 -0.930 -0.929 -0.918 0.969 0.100

Eto4 46 0.506 -0.600 0.415 0.414 0.415 0.414 0.409 -0.423 0.304

DL4 47 -0.213 -0.279 -0.317 -0.319 -0.318 -0.316 -0.325 0.242 0.243

Alt 48 -0.881 0.459 -0.978 -0.977 -0.977 -0.977 -0.979 0.930 0.396

Lat 49 -0.996 0.581 -0.938 -0.944 -0.944 -0.943 -0.936 0.949 0.063

Long 50 0.092 0.073 0.432 0.418 0.418 0.420 0.437 -0.298 -0.795

pH_H2O 51 0.928 -0.423 0.841 0.851 0.850 0.849 0.839 -0.849 -0.051

P 52 0.683 -0.366 0.447 0.461 0.460 0.458 0.445 -0.547 0.446

K 53 0.392 -0.196 0.503 0.493 0.493 0.494 0.504 -0.399 -0.256

Ca 54 0.843 -0.362 0.865 0.867 0.867 0.866 0.861 -0.870 -0.223

Mg 55 0.804 -0.513 0.713 0.720 0.719 0.718 0.710 -0.676 -0.003

Resist 56 -0.504 0.050 -0.482 -0.482 -0.481 -0.481 -0.476 0.546 -0.150

APP_N 57 -0.199 0.189 -0.143 -0.144 -0.144 -0.142 -0.142 0.052 0.039

19 20 21 22 23 24 25 26 27

DL3 28 1.000

rain4 29 0.589 1.000

Tx4 30 -0.929 -0.640 1.000

Tn4 31 -0.894 -0.547 0.976 1.000

WS4 32 0.894 0.571 -0.932 -0.905 1.000

RHx4 33 0.286 0.530 -0.210 -0.167 0.087 1.000

RHn4 34 0.554 0.648 -0.555 -0.463 0.541 0.723 1.000

rad4 35 0.023 -0.034 -0.229 -0.351 0.110 -0.024 0.023 1.000

ETx4 36 -0.889 -0.606 0.972 0.964 -0.903 -0.238 -0.558 -0.282 1.000

ETn4 37 -0.706 -0.192 0.638 0.698 -0.596 0.014 -0.050 -0.129 0.609

frost4 38 0.550 0.137 -0.480 -0.496 0.554 0.077 0.151 -0.098 -0.453

HU0_4 39 -0.928 -0.604 0.996 0.990 -0.929 -0.196 -0.521 -0.266 0.974

HU5_4 40 -0.927 -0.606 0.996 0.990 -0.929 -0.196 -0.522 -0.266 0.974

HU10_4 41 -0.924 -0.607 0.997 0.990 -0.927 -0.192 -0.520 -0.273 0.974

HU15_4 42 -0.910 -0.612 0.995 0.987 -0.917 -0.189 -0.521 -0.305 0.974

RC4 43 0.950 0.602 -0.982 -0.978 0.931 0.216 0.509 0.188 -0.956

IC4 44 0.943 0.549 -0.957 -0.959 0.919 0.225 0.505 0.160 -0.924

PC4 45 0.944 0.583 -0.940 -0.930 0.926 0.238 0.517 0.058 -0.912

Eto4 46 -0.480 -0.654 0.436 0.311 -0.521 -0.497 -0.842 0.360 0.392

DL4 47 0.418 -0.102 -0.361 -0.349 0.255 0.168 0.276 0.163 -0.353

Alt 48 0.888 0.532 -0.980 -0.982 0.933 0.102 0.486 0.356 -0.956

Lat 49 0.966 0.647 -0.940 -0.910 0.924 0.235 0.521 0.021 -0.901

Long 50 -0.168 0.032 0.432 0.497 -0.355 0.224 -0.108 -0.785 0.452

pH_H2O 51 -0.943 -0.524 0.839 0.816 -0.834 -0.248 -0.529 -0.012 0.823

P 52 -0.695 -0.461 0.477 0.398 -0.506 -0.483 -0.462 0.507 0.407

K 53 -0.382 -0.222 0.520 0.511 -0.441 -0.004 -0.294 -0.262 0.454

Ca 54 -0.898 -0.461 0.886 0.864 -0.938 -0.151 -0.616 -0.170 0.841

Mg 55 -0.814 -0.627 0.720 0.643 -0.740 -0.449 -0.785 0.049 0.690

Resist 56 0.513 0.082 -0.490 -0.481 0.663 -0.209 0.238 -0.137 -0.403

APP_N 57 0.263 0.295 -0.159 -0.061 0.186 0.402 0.703 -0.016 -0.155

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 -0.656 1.000

HU0_4 39 0.668 -0.494 1.000

HU5_4 40 0.667 -0.493 1.000 1.000

HU10_4 41 0.661 -0.484 1.000 1.000 1.000

HU15_4 42 0.646 -0.463 0.997 0.997 0.998 1.000

RC4 43 -0.684 0.514 -0.989 -0.989 -0.987 -0.976 1.000

IC4 44 -0.697 0.525 -0.968 -0.968 -0.964 -0.946 0.989 1.000

PC4 45 -0.689 0.567 -0.947 -0.946 -0.941 -0.919 0.977 0.990 1.000

Eto4 46 -0.008 -0.110 0.393 0.393 0.392 0.385 -0.408 -0.396 -0.445

DL4 47 -0.444 0.288 -0.361 -0.360 -0.360 -0.369 0.326 0.337 0.287

Alt 48 -0.646 0.462 -0.986 -0.986 -0.987 -0.988 0.964 0.938 0.907

Lat 49 -0.633 0.532 -0.940 -0.940 -0.937 -0.922 0.967 0.950 0.963

Long 50 0.260 -0.028 0.446 0.446 0.454 0.487 -0.342 -0.316 -0.218

pH_H2O 51 0.599 -0.497 0.844 0.843 0.839 0.822 -0.874 -0.871 -0.883

P 52 0.351 -0.386 0.464 0.463 0.457 0.427 -0.544 -0.565 -0.611

K 53 0.134 -0.232 0.516 0.516 0.520 0.530 -0.467 -0.462 -0.415

Ca 54 0.604 -0.495 0.886 0.885 0.882 0.872 -0.885 -0.893 -0.880

Mg 55 0.244 -0.271 0.701 0.701 0.698 0.690 -0.722 -0.708 -0.722

Resist 56 -0.328 0.395 -0.493 -0.492 -0.488 -0.475 0.495 0.526 0.525

APP_N 57 0.227 -0.214 -0.124 -0.124 -0.125 -0.134 0.117 0.100 0.104

37 38 39 40 41 42 43 44 45

Eto4 46 1.000

DL4 47 -0.082 1.000

Alt 48 -0.354 0.372 1.000

Lat 49 -0.501 0.241 0.905 1.000

Long 50 -0.160 -0.392 -0.549 -0.140 1.000

pH_H2O 51 0.472 -0.347 -0.808 -0.927 0.057 1.000

P 52 0.607 -0.243 -0.375 -0.674 -0.452 0.667 1.000

K 53 0.115 -0.276 -0.542 -0.392 0.490 0.345 -0.027 1.000

Ca 54 0.542 -0.412 -0.899 -0.870 0.384 0.854 0.523 0.387 1.000

Mg 55 0.726 -0.205 -0.673 -0.811 -0.028 0.853 0.680 0.314 0.798

Resist 56 -0.368 0.173 0.531 0.522 -0.210 -0.478 -0.393 -0.397 -0.690

APP_N 57 -0.611 0.210 0.146 0.203 0.058 -0.366 -0.238 -0.194 -0.339

46 47 48 49 50 51 52 53 54

Mg 55 1.000

Resist 56 -0.496 1.000

APP_N 57 -0.682 0.133 1.000

55 56 57

===== Correlations for Cultivar 4 =====

*** Degrees of freedom ***

Correlations: 19

*** Correlation matrix ***

fyield 1 1.000

Tclleftprun 2 0.524 1.000

Tfertclad 3 0.909 0.700 1.000

Tftotal 4 0.850 0.550 0.820 1.000

Tfnoat 5 0.952 0.620 0.958 0.837 1.000

Tn1 6 -0.142 0.351 -0.137 0.181 -0.146 1.000

RC1 7 0.208 -0.223 0.215 -0.163 0.222 -0.935 1.000

IC1 8 0.114 -0.274 0.138 -0.222 0.146 -0.935 0.989 1.000

C1 9 0.130 -0.220 0.176 -0.219 0.167 -0.871 0.968 0.972 1.000

DL1 10 -0.200 -0.008 -0.283 0.194 -0.250 0.762 -0.903 -0.891 -0.948

rain2 11 0.140 0.337 0.237 0.042 0.196 -0.367 0.465 0.462 0.401

Tx2 12 -0.227 0.161 -0.223 0.142 -0.234 0.868 -0.982 -0.968 -0.948

Tn2 13 -0.196 0.308 -0.183 0.137 -0.198 0.989 -0.965 -0.961 -0.903

HU0_2 14 -0.222 0.205 -0.217 0.144 -0.229 0.917 -0.994 -0.982 -0.952

HU5_2 15 -0.223 0.204 -0.218 0.143 -0.229 0.917 -0.994 -0.982 -0.952

HU10_2 16 -0.233 0.197 -0.223 0.136 -0.237 0.913 -0.991 -0.977 -0.941

HU15_2 17 -0.271 0.175 -0.239 0.085 -0.257 0.894 -0.960 -0.937 -0.872

Rad2 18 0.531 -0.002 0.374 0.419 0.409 -0.347 0.165 0.114 -0.020

DL2 19 -0.217 0.013 -0.285 0.187 -0.265 0.752 -0.891 -0.877 -0.942

rain3 20 0.204 0.191 0.312 -0.069 0.221 -0.238 0.425 0.368 0.495

Tave3 21 -0.381 0.026 -0.386 0.036 -0.385 0.840 -0.957 -0.915 -0.925

HU0_3 22 -0.379 0.028 -0.386 0.038 -0.385 0.844 -0.959 -0.918 -0.929

HU5_3 23 -0.379 0.028 -0.385 0.038 -0.385 0.843 -0.959 -0.918 -0.928

HU10_3 24 -0.379 0.028 -0.385 0.039 -0.384 0.843 -0.958 -0.917 -0.927

HU15_3 25 -0.386 0.021 -0.387 0.035 -0.388 0.836 -0.954 -0.910 -0.918

WS3 26 0.219 -0.224 0.226 -0.157 0.215 -0.820 0.940 0.923 0.967

rad3 27 0.533 -0.063 0.345 0.403 0.405 -0.445 0.342 0.293 0.142

DL3 28 0.189 0.018 0.280 -0.166 0.249 -0.794 0.924 0.918 0.944

rain4 29 0.227 0.268 0.355 -0.053 0.258 -0.321 0.521 0.467 0.568

Tx4 30 -0.330 0.053 -0.334 0.075 -0.338 0.837 -0.969 -0.936 -0.941

Tn4 31 -0.340 0.134 -0.333 0.061 -0.339 0.919 -0.981 -0.949 -0.929

WS4 32 0.259 -0.121 0.294 -0.065 0.277 -0.734 0.896 0.886 0.929

RHx4 33 0.098 0.361 0.274 0.075 0.097 -0.197 0.227 0.216 0.245

RHn4 34 0.383 0.444 0.556 0.323 0.439 -0.292 0.477 0.464 0.511

rad4 35 0.547 -0.075 0.360 0.423 0.417 -0.435 0.303 0.252 0.103

ETx4 36 -0.444 0.033 -0.429 -0.058 -0.426 0.834 -0.945 -0.897 -0.911

ETn4 37 0.073 0.368 0.034 0.324 0.030 0.827 -0.763 -0.767 -0.728

frost4 38 -0.176 -0.303 -0.147 -0.328 -0.207 -0.550 0.532 0.558 0.605

HU0_4 39 -0.328 0.087 -0.331 0.077 -0.335 0.875 -0.981 -0.950 -0.947

HU5_4 40 -0.329 0.087 -0.331 0.077 -0.335 0.875 -0.981 -0.949 -0.946

HU10_4 41 -0.335 0.082 -0.335 0.073 -0.340 0.871 -0.978 -0.946 -0.941

HU15_4 42 -0.364 0.058 -0.357 0.047 -0.363 0.859 -0.968 -0.930 -0.920

RC4 43 0.263 -0.121 0.286 -0.136 0.283 -0.884 0.985 0.963 0.973

IC4 44 0.187 -0.185 0.221 -0.184 0.220 -0.901 0.987 0.985 0.987

PC4 45 0.161 -0.182 0.210 -0.200 0.200 -0.860 0.962 0.963 0.997

Eto4 46 -0.120 -0.382 -0.351 -0.088 -0.226 0.021 -0.283 -0.282 -0.400

DL4 47 0.130 -0.005 0.145 0.104 0.172 -0.495 0.472 0.484 0.377

Alt 48 0.389 -0.096 0.365 -0.006 0.385 -0.859 0.962 0.928 0.910

Lat 49 0.236 -0.012 0.297 -0.169 0.276 -0.773 0.915 0.897 0.953

Long 50 -0.449 0.200 -0.277 -0.308 -0.363 0.511 -0.478 -0.433 -0.286

pH_H2O 51 -0.331 -0.148 -0.445 -0.014 -0.416 0.735 -0.838 -0.832 -0.874

P 52 0.297 -0.061 0.114 0.464 0.222 0.266 -0.423 -0.468 -0.561

K 53 -0.292 -0.059 -0.259 -0.066 -0.329 0.457 -0.490 -0.490 -0.435

Ca 54 -0.247 0.025 -0.323 0.012 -0.298 0.714 -0.864 -0.877 -0.878

Mg 55 -0.401 -0.468 -0.568 -0.170 -0.496 0.444 -0.642 -0.634 -0.700

Resist 56 -0.126 -0.103 -0.043 -0.241 -0.048 -0.277 0.402 0.466 0.473

APP_N 57 0.568 0.777 0.761 0.635 0.711 0.029 0.113 0.097 0.124

1 2 3 4 5 6 7 8 9

DL1 10 1.000

rain2 11 -0.465 1.000

Tx2 12 0.892 -0.513 1.000

Tn2 13 0.803 -0.424 0.919 1.000

HU0_2 14 0.883 -0.494 0.994 0.958 1.000

HU5_2 15 0.883 -0.494 0.994 0.957 1.000 1.000

HU10_2 16 0.874 -0.502 0.994 0.955 0.999 0.999 1.000

HU15_2 17 0.799 -0.537 0.974 0.940 0.980 0.980 0.986 1.000

Rad2 18 0.075 0.025 -0.110 -0.315 -0.170 -0.170 -0.186 -0.278 1.000

DL2 19 0.994 -0.406 0.874 0.791 0.867 0.867 0.857 0.776 0.053

rain3 20 -0.572 0.107 -0.443 -0.271 -0.405 -0.405 -0.400 -0.340 -0.122

Tave3 21 0.919 -0.458 0.954 0.879 0.950 0.950 0.950 0.920 -0.194

HU0_3 22 0.926 -0.461 0.954 0.883 0.951 0.951 0.951 0.918 -0.188

HU5_3 23 0.925 -0.461 0.954 0.882 0.950 0.950 0.950 0.918 -0.188

HU10_3 24 0.925 -0.460 0.953 0.881 0.950 0.950 0.950 0.918 -0.190

HU15_3 25 0.916 -0.468 0.952 0.876 0.947 0.947 0.949 0.921 -0.200

WS3 26 -0.934 0.315 -0.925 -0.858 -0.923 -0.923 -0.914 -0.849 0.031

rad3 27 -0.059 0.276 -0.338 -0.458 -0.376 -0.377 -0.396 -0.505 0.864

DL3 28 -0.973 0.572 -0.923 -0.837 -0.915 -0.915 -0.909 -0.854 -0.059

rain4 29 -0.655 0.365 -0.550 -0.366 -0.510 -0.510 -0.507 -0.461 -0.105

Tx4 30 0.925 -0.492 0.980 0.887 0.971 0.971 0.971 0.943 -0.133

Tn4 31 0.888 -0.443 0.960 0.946 0.973 0.973 0.973 0.951 -0.283

WS4 32 -0.901 0.324 -0.908 -0.786 -0.890 -0.890 -0.884 -0.824 0.018

RHx4 33 -0.308 0.515 -0.236 -0.220 -0.235 -0.234 -0.226 -0.230 -0.053

RHn4 34 -0.552 0.558 -0.544 -0.376 -0.505 -0.505 -0.499 -0.487 -0.096

rad4 35 -0.017 0.189 -0.279 -0.434 -0.327 -0.327 -0.345 -0.450 0.927

ETx4 36 0.883 -0.460 0.945 0.878 0.942 0.942 0.941 0.917 -0.201

ETn4 37 0.640 -0.308 0.698 0.797 0.739 0.738 0.732 0.704 -0.066

frost4 38 -0.537 0.076 -0.494 -0.535 -0.514 -0.513 -0.493 -0.424 -0.094

HU0_4 39 0.922 -0.478 0.979 0.917 0.978 0.979 0.978 0.950 -0.183

HU5_4 40 0.922 -0.478 0.979 0.916 0.978 0.978 0.978 0.950 -0.183

HU10_4 41 0.919 -0.479 0.978 0.914 0.977 0.977 0.977 0.951 -0.189

HU15_4 42 0.902 -0.491 0.972 0.903 0.969 0.969 0.972 0.953 -0.220

RC4 43 -0.954 0.463 -0.971 -0.922 -0.974 -0.974 -0.971 -0.926 0.117

IC4 44 -0.945 0.454 -0.969 -0.935 -0.977 -0.976 -0.970 -0.919 0.080

PC4 45 -0.959 0.404 -0.943 -0.894 -0.946 -0.946 -0.935 -0.865 -0.018

Eto4 46 0.503 -0.327 0.352 0.102 0.289 0.289 0.279 0.216 0.470

DL4 47 -0.311 0.652 -0.482 -0.523 -0.498 -0.498 -0.506 -0.555 0.073

Alt 48 -0.879 0.444 -0.966 -0.907 -0.966 -0.966 -0.969 -0.953 0.262

Lat 49 -0.995 0.435 -0.905 -0.815 -0.897 -0.896 -0.889 -0.817 -0.031

Long 50 0.131 -0.198 0.505 0.541 0.522 0.523 0.544 0.645 -0.667

pH_H2O 51 0.936 -0.545 0.814 0.771 0.817 0.817 0.808 0.740 0.003

P 52 0.687 -0.426 0.431 0.295 0.401 0.400 0.385 0.288 0.568

K 53 0.385 -0.178 0.513 0.497 0.518 0.519 0.526 0.543 -0.312

Ca 54 0.859 -0.490 0.891 0.774 0.874 0.874 0.868 0.828 -0.025

Mg 55 0.827 -0.593 0.676 0.514 0.643 0.643 0.635 0.580 0.084

Resist 56 -0.448 0.085 -0.434 -0.296 -0.404 -0.404 -0.395 -0.337 -0.151

APP_N 57 -0.253 0.509 -0.171 -0.052 -0.140 -0.141 -0.143 -0.154 -0.019

10 11 12 13 14 15 16 17 18

DL2 19 1.000

rain3 20 -0.590 1.000

Tave3 21 0.917 -0.550 1.000

HU0_3 22 0.923 -0.543 1.000 1.000

HU5_3 23 0.923 -0.545 1.000 1.000 1.000

HU10_3 24 0.922 -0.546 1.000 1.000 1.000 1.000

HU15_3 25 0.914 -0.545 0.999 0.999 0.999 0.999 1.000

WS3 26 -0.937 0.515 -0.935 -0.938 -0.938 -0.938 -0.930 1.000

rad3 27 -0.060 -0.043 -0.338 -0.331 -0.331 -0.332 -0.346 0.161 1.000

DL3 28 -0.952 0.468 -0.917 -0.923 -0.922 -0.921 -0.915 0.910 0.126

rain4 29 -0.657 0.965 -0.635 -0.630 -0.632 -0.632 -0.633 0.564 0.035

Tx4 30 0.917 -0.539 0.992 0.991 0.991 0.991 0.991 -0.938 -0.319

Tn4 31 0.884 -0.451 0.984 0.984 0.984 0.984 0.982 -0.927 -0.419

WS4 32 -0.906 0.524 -0.916 -0.916 -0.916 -0.916 -0.911 0.960 0.165

RHx4 33 -0.251 0.421 -0.227 -0.228 -0.229 -0.227 -0.220 0.165 0.068

RHn4 34 -0.513 0.536 -0.538 -0.534 -0.534 -0.533 -0.529 0.473 0.118

rad4 35 -0.026 -0.076 -0.305 -0.299 -0.299 -0.300 -0.312 0.135 0.987

ETx4 36 0.872 -0.509 0.980 0.980 0.980 0.980 0.978 -0.928 -0.362

ETn4 37 0.627 -0.129 0.670 0.676 0.674 0.673 0.668 -0.667 -0.229

frost4 38 -0.537 0.131 -0.477 -0.478 -0.478 -0.477 -0.470 0.559 -0.072

HU0_4 39 0.915 -0.504 0.994 0.994 0.994 0.994 0.993 -0.943 -0.349

HU5_4 40 0.915 -0.506 0.994 0.994 0.994 0.994 0.993 -0.943 -0.350

HU10_4 41 0.912 -0.507 0.994 0.994 0.994 0.994 0.994 -0.940 -0.356

HU15_4 42 0.895 -0.507 0.995 0.994 0.994 0.994 0.995 -0.924 -0.388

RC4 43 -0.949 0.508 -0.978 -0.981 -0.981 -0.980 -0.976 0.963 0.272

IC4 44 -0.936 0.459 -0.945 -0.949 -0.949 -0.948 -0.940 0.958 0.242

PC4 45 -0.955 0.510 -0.927 -0.932 -0.932 -0.931 -0.920 0.969 0.138

Eto4 46 0.488 -0.599 0.378 0.377 0.378 0.377 0.371 -0.407 0.312

DL4 47 -0.255 -0.248 -0.396 -0.400 -0.398 -0.397 -0.406 0.279 0.308

Alt 48 -0.878 0.441 -0.980 -0.979 -0.979 -0.979 -0.980 0.925 0.429

Lat 49 -0.996 0.571 -0.937 -0.943 -0.943 -0.942 -0.935 0.950 0.099

Long 50 0.130 0.071 0.476 0.464 0.464 0.466 0.482 -0.325 -0.805

pH_H2O 51 0.921 -0.404 0.853 0.863 0.862 0.861 0.852 -0.846 -0.108

P 52 0.655 -0.364 0.398 0.410 0.409 0.408 0.394 -0.522 0.457

K 53 0.401 -0.195 0.510 0.500 0.500 0.501 0.511 -0.408 -0.271

Ca 54 0.844 -0.360 0.856 0.857 0.857 0.856 0.851 -0.871 -0.238

Mg 55 0.808 -0.507 0.719 0.724 0.724 0.722 0.715 -0.683 -0.033

Resist 56 -0.459 0.050 -0.402 -0.400 -0.399 -0.399 -0.393 0.501 -0.185

APP_N 57 -0.230 0.181 -0.204 -0.208 -0.207 -0.205 -0.206 0.089 0.093

19 20 21 22 23 24 25 26 27

DL3 28 1.000

rain4 29 0.588 1.000

Tx4 30 -0.932 -0.634 1.000

Tn4 31 -0.897 -0.539 0.976 1.000

WS4 32 0.892 0.574 -0.925 -0.890 1.000

RHx4 33 0.310 0.533 -0.241 -0.207 0.104 1.000

RHn4 34 0.564 0.650 -0.564 -0.476 0.547 0.728 1.000

rad4 35 0.069 -0.018 -0.272 -0.394 0.132 0.013 0.050 1.000

ETx4 36 -0.893 -0.598 0.974 0.967 -0.892 -0.272 -0.566 -0.327 1.000

ETn4 37 -0.720 -0.203 0.667 0.731 -0.594 -0.046 -0.092 -0.197 0.649

frost4 38 0.553 0.141 -0.484 -0.496 0.558 0.089 0.160 -0.077 -0.456

HU0_4 39 -0.930 -0.598 0.996 0.990 -0.919 -0.231 -0.532 -0.310 0.976

HU5_4 40 -0.930 -0.599 0.996 0.990 -0.919 -0.231 -0.532 -0.311 0.976

HU10_4 41 -0.927 -0.601 0.997 0.990 -0.917 -0.227 -0.530 -0.317 0.976

HU15_4 42 -0.913 -0.604 0.995 0.988 -0.906 -0.225 -0.531 -0.348 0.976

RC4 43 0.952 0.597 -0.983 -0.978 0.923 0.249 0.521 0.235 -0.959

IC4 44 0.946 0.549 -0.960 -0.959 0.914 0.254 0.517 0.204 -0.928

PC4 45 0.946 0.583 -0.942 -0.928 0.924 0.263 0.527 0.100 -0.913

Eto4 46 -0.452 -0.645 0.402 0.272 -0.507 -0.477 -0.823 0.366 0.353

DL4 47 0.461 -0.059 -0.427 -0.439 0.278 0.222 0.301 0.244 -0.435

Alt 48 0.893 0.529 -0.981 -0.983 0.923 0.141 0.498 0.394 -0.959

Lat 49 0.967 0.647 -0.941 -0.907 0.923 0.258 0.531 0.060 -0.901

Long 50 -0.219 0.011 0.473 0.542 -0.371 0.166 -0.139 -0.797 0.498

pH_H2O 51 -0.944 -0.520 0.850 0.832 -0.827 -0.281 -0.539 -0.075 0.838

P 52 -0.651 -0.450 0.431 0.341 -0.487 -0.456 -0.442 0.516 0.355

K 53 -0.393 -0.228 0.527 0.515 -0.448 -0.021 -0.303 -0.278 0.463

Ca 54 -0.894 -0.465 0.878 0.847 -0.938 -0.164 -0.620 -0.187 0.830

Mg 55 -0.818 -0.629 0.726 0.649 -0.744 -0.461 -0.789 0.016 0.695

Resist 56 0.449 0.067 -0.414 -0.386 0.623 -0.234 0.206 -0.175 -0.321

APP_N 57 0.305 0.302 -0.216 -0.140 0.210 0.426 0.706 0.044 -0.221

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 -0.640 1.000

HU0_4 39 0.699 -0.497 1.000

HU5_4 40 0.697 -0.496 1.000 1.000

HU10_4 41 0.693 -0.487 1.000 1.000 1.000

HU15_4 42 0.681 -0.466 0.997 0.997 0.998 1.000

RC4 43 -0.710 0.517 -0.990 -0.990 -0.988 -0.978 1.000

IC4 44 -0.717 0.529 -0.969 -0.969 -0.965 -0.949 0.989 1.000

PC4 45 -0.702 0.571 -0.947 -0.947 -0.942 -0.920 0.977 0.989 1.000

Eto4 46 -0.034 -0.103 0.356 0.356 0.355 0.346 -0.373 -0.366 -0.420

DL4 47 -0.535 0.293 -0.436 -0.435 -0.436 -0.447 0.401 0.400 0.343

Alt 48 -0.679 0.466 -0.987 -0.987 -0.988 -0.989 0.966 0.941 0.909

Lat 49 -0.646 0.537 -0.938 -0.938 -0.936 -0.921 0.965 0.951 0.964

Long 50 0.336 -0.052 0.490 0.490 0.498 0.529 -0.392 -0.362 -0.262

pH_H2O 51 0.639 -0.499 0.856 0.856 0.852 0.837 -0.883 -0.878 -0.887

P 52 0.286 -0.373 0.412 0.412 0.406 0.375 -0.493 -0.520 -0.573

K 53 0.162 -0.239 0.523 0.523 0.526 0.536 -0.476 -0.472 -0.426

Ca 54 0.596 -0.499 0.874 0.874 0.871 0.860 -0.876 -0.887 -0.878

Mg 55 0.277 -0.280 0.706 0.706 0.704 0.695 -0.727 -0.714 -0.729

Resist 56 -0.228 0.369 -0.409 -0.409 -0.405 -0.389 0.416 0.455 0.464

APP_N 57 0.107 -0.183 -0.190 -0.189 -0.190 -0.201 0.179 0.157 0.152

37 38 39 40 41 42 43 44 45

Eto4 46 1.000

DL4 47 -0.038 1.000

Alt 48 -0.319 0.445 1.000

Lat 49 -0.477 0.295 0.905 1.000

Long 50 -0.174 -0.466 -0.584 -0.185 1.000

pH_H2O 51 0.429 -0.428 -0.823 -0.925 0.136 1.000

P 52 0.609 -0.163 -0.328 -0.639 -0.462 0.602 1.000

K 53 0.106 -0.293 -0.547 -0.402 0.497 0.359 -0.039 1.000

Ca 54 0.530 -0.409 -0.888 -0.869 0.394 0.842 0.507 0.394 1.000

Mg 55 0.706 -0.246 -0.680 -0.815 0.015 0.850 0.653 0.325 0.800

Resist 56 -0.375 0.058 0.446 0.467 -0.140 -0.391 -0.405 -0.366 -0.654

APP_N 57 -0.568 0.304 0.209 0.241 -0.023 -0.415 -0.198 -0.215 -0.352

46 47 48 49 50 51 52 53 54

Mg 55 1.000

Resist 56 -0.453 1.000

APP_N 57 -0.688 0.073 1.000

55 56 57

===== Correlations for Cultivar 5 =====

*** Degrees of freedom ***

Correlations: 19

*** Correlation matrix ***

fyield 1 1.000

Tcllefprun 2 0.513 1.000

Tfertclad 3 0.819 0.824 1.000

Tftotal 4 0.865 0.366 0.711 1.000

Tfnoat 5 0.950 0.589 0.871 0.901 1.000

Tn1 6 0.505 0.791 0.715 0.419 0.633 1.000

RC1 7 -0.592 -0.765 -0.750 -0.572 -0.732 -0.935 1.000

IC1 8 -0.627 -0.770 -0.781 -0.580 -0.751 -0.935 0.989 1.000

C1 9 -0.656 -0.720 -0.765 -0.650 -0.784 -0.871 0.968 0.972 1.000

DL1 10 0.702 0.587 0.706 0.735 0.814 0.762 -0.903 -0.891 -0.948

rain2 11 -0.276 -0.023 -0.166 -0.336 -0.343 -0.367 0.465 0.462 0.401

Tx2 12 0.589 0.715 0.721 0.582 0.729 0.868 -0.982 -0.968 -0.948

Tn2 13 0.508 0.783 0.699 0.422 0.638 0.989 -0.965 -0.961 -0.903

HU0_2 14 0.578 0.746 0.728 0.548 0.717 0.917 -0.994 -0.982 -0.952

HU5_2 15 0.578 0.746 0.728 0.548 0.717 0.917 -0.994 -0.982 -0.952

HU10_2 16 0.569 0.746 0.724 0.538 0.708 0.913 -0.991 -0.977 -0.941

HU15_2 17 0.504 0.719 0.666 0.459 0.643 0.894 -0.960 -0.937 -0.872

Rad2 18 0.390 -0.130 0.139 0.413 0.269 -0.347 0.165 0.114 -0.020

DL2 19 0.678 0.600 0.704 0.716 0.792 0.752 -0.891 -0.877 -0.942

rain3 20 -0.440 -0.155 -0.299 -0.561 -0.524 -0.238 0.425 0.368 0.495

Tave3 21 0.528 0.661 0.667 0.610 0.701 0.840 -0.957 -0.915 -0.925

HU0_3 22 0.532 0.664 0.668 0.611 0.702 0.844 -0.959 -0.918 -0.929

HU5_3 23 0.532 0.663 0.668 0.611 0.702 0.843 -0.959 -0.918 -0.928

HU10_3 24 0.531 0.664 0.668 0.611 0.702 0.843 -0.958 -0.917 -0.927

HU15_3 25 0.521 0.660 0.664 0.603 0.695 0.836 -0.954 -0.910 -0.918

WS3 26 -0.587 -0.732 -0.720 -0.613 -0.731 -0.820 0.940 0.923 0.967

rad3 27 0.272 -0.277 0.058 0.341 0.147 -0.445 0.342 0.293 0.142

DL3 28 -0.685 -0.580 -0.699 -0.691 -0.798 -0.794 0.924 0.918 0.944

rain4 29 -0.484 -0.151 -0.323 -0.614 -0.580 -0.321 0.521 0.467 0.568

Tx4 30 0.563 0.670 0.687 0.615 0.723 0.837 -0.969 -0.936 -0.941

Tn4 31 0.515 0.728 0.689 0.548 0.681 0.919 -0.981 -0.949 -0.929

WS4 32 -0.524 -0.630 -0.658 -0.590 -0.686 -0.734 0.896 0.886 0.929

RHx4 33 -0.338 0.168 0.042 -0.340 -0.357 -0.197 0.227 0.216 0.245

RHn4 34 -0.299 0.039 -0.044 -0.432 -0.386 -0.292 0.477 0.464 0.511

rad4 35 0.326 -0.261 0.082 0.378 0.197 -0.435 0.303 0.252 0.103

ETx4 36 0.444 0.641 0.589 0.525 0.623 0.834 -0.945 -0.897 -0.911

ETn4 37 0.543 0.726 0.694 0.458 0.636 0.827 -0.763 -0.767 -0.728

frost4 38 -0.416 -0.443 -0.565 -0.427 -0.588 -0.550 0.532 0.558 0.605

HU0_4 39 0.555 0.698 0.697 0.596 0.716 0.875 -0.981 -0.950 -0.947

HU5_4 40 0.555 0.698 0.697 0.596 0.716 0.875 -0.981 -0.949 -0.946

HU10_4 41 0.551 0.697 0.694 0.593 0.713 0.871 -0.978 -0.946 -0.941

HU15_4 42 0.525 0.683 0.674 0.576 0.694 0.859 -0.968 -0.930 -0.920

RC4 43 -0.613 -0.709 -0.726 -0.628 -0.752 -0.884 0.985 0.963 0.973

IC4 44 -0.642 -0.726 -0.748 -0.627 -0.762 -0.901 0.987 0.985 0.987

PC4 45 -0.658 -0.698 -0.741 -0.659 -0.777 -0.860 0.962 0.963 0.997

Eto4 46 0.404 -0.078 0.105 0.590 0.434 0.021 -0.283 -0.282 -0.400

DL4 47 -0.140 -0.317 -0.261 -0.078 -0.234 -0.495 0.472 0.484 0.377

Alt 48 -0.478 -0.703 -0.654 -0.507 -0.645 -0.859 0.962 0.928 0.910

Lat 49 -0.670 -0.608 -0.702 -0.708 -0.791 -0.773 0.915 0.897 0.953

Long	50	-0.173	0.463	0.171	-0.180	-0.020	0.511	-0.478	-0.433	-0.286
pH_H2O	51	0.517	0.446	0.530	0.570	0.637	0.735	-0.838	-0.832	-0.874
P	52	0.776	0.214	0.522	0.762	0.758	0.266	-0.423	-0.468	-0.561
K	53	0.221	0.308	0.381	0.156	0.304	0.457	-0.490	-0.490	-0.435
Ca	54	0.512	0.539	0.582	0.558	0.646	0.714	-0.864	-0.877	-0.878
Mg	55	0.466	0.103	0.284	0.590	0.548	0.444	-0.642	-0.634	-0.700
Resist	56	-0.417	-0.296	-0.514	-0.490	-0.475	-0.277	0.402	0.466	0.473
APP_N	57	0.052	0.415	0.353	-0.023	0.060	0.029	0.113	0.097	0.124

		1	2	3	4	5	6	7	8	9
DL1	10	1.000								
rain2	11	-0.465	1.000							
Tx2	12	0.892	-0.513	1.000						
Tn2	13	0.803	-0.424	0.919	1.000					
HU0_2	14	0.883	-0.494	0.994	0.958	1.000				
HU5_2	15	0.883	-0.494	0.994	0.957	1.000	1.000			
HU10_2	16	0.874	-0.502	0.994	0.955	0.999	0.999	1.000		
HU15_2	17	0.799	-0.537	0.974	0.940	0.980	0.980	0.986	1.000	
Rad2	18	0.075	0.025	-0.110	-0.315	-0.170	-0.170	-0.186	-0.278	1.000
DL2	19	0.994	-0.406	0.874	0.791	0.867	0.867	0.857	0.776	0.053
rain3	20	-0.572	0.107	-0.443	-0.271	-0.405	-0.405	-0.400	-0.340	-0.122
Tave3	21	0.919	-0.458	0.954	0.879	0.950	0.950	0.950	0.920	-0.194
HU0_3	22	0.926	-0.461	0.954	0.883	0.951	0.951	0.951	0.918	-0.188
HU5_3	23	0.925	-0.461	0.954	0.882	0.950	0.950	0.950	0.918	-0.188
HU10_3	24	0.925	-0.460	0.953	0.881	0.950	0.950	0.950	0.918	-0.190
HU15_3	25	0.916	-0.468	0.952	0.876	0.947	0.947	0.949	0.921	-0.200
WS3	26	-0.934	0.315	-0.925	-0.858	-0.923	-0.923	-0.914	-0.849	0.031
rad3	27	-0.059	0.276	-0.338	-0.458	-0.376	-0.377	-0.396	-0.505	0.864
DL3	28	-0.973	0.572	-0.923	-0.837	-0.915	-0.915	-0.909	-0.854	-0.059
rain4	29	-0.655	0.365	-0.550	-0.366	-0.510	-0.510	-0.507	-0.461	-0.105
Tx4	30	0.925	-0.492	0.980	0.887	0.971	0.971	0.971	0.943	-0.133

Tn4 31 0.888 -0.443 0.960 0.946 0.973 0.973 0.973 0.951 -0.283

WS4 32 -0.901 0.324 -0.908 -0.786 -0.890 -0.890 -0.884 -0.824 0.018

RHx4 33 -0.308 0.515 -0.236 -0.220 -0.235 -0.234 -0.226 -0.230 -0.053

RHn4 34 -0.552 0.558 -0.544 -0.376 -0.505 -0.505 -0.499 -0.487 -0.096

rad4 35 -0.017 0.189 -0.279 -0.434 -0.327 -0.327 -0.345 -0.450 0.927

ETx4 36 0.883 -0.460 0.945 0.878 0.942 0.942 0.941 0.917 -0.201

ETn4 37 0.640 -0.308 0.698 0.797 0.739 0.738 0.732 0.704 -0.066

frost4 38 -0.537 0.076 -0.494 -0.535 -0.514 -0.513 -0.493 -0.424 -0.094

HU0_4 39 0.922 -0.478 0.979 0.917 0.978 0.979 0.978 0.950 -0.183

HU5_4 40 0.922 -0.478 0.979 0.916 0.978 0.978 0.978 0.950 -0.183

HU10_4 41 0.919 -0.479 0.978 0.914 0.977 0.977 0.977 0.951 -0.189

HU15_4 42 0.902 -0.491 0.972 0.903 0.969 0.969 0.972 0.953 -0.220

RC4 43 -0.954 0.463 -0.971 -0.922 -0.974 -0.974 -0.971 -0.926 0.117

IC4 44 -0.945 0.454 -0.969 -0.935 -0.977 -0.976 -0.970 -0.919 0.080

PC4 45 -0.959 0.404 -0.943 -0.894 -0.946 -0.946 -0.935 -0.865 -0.018

Eto4 46 0.503 -0.327 0.352 0.102 0.289 0.289 0.279 0.216 0.470

DL4 47 -0.311 0.652 -0.482 -0.523 -0.498 -0.498 -0.506 -0.555 0.073

Alt 48 -0.879 0.444 -0.966 -0.907 -0.966 -0.966 -0.969 -0.953 0.262

Lat 49 -0.995 0.435 -0.905 -0.815 -0.897 -0.896 -0.889 -0.817 -0.031

Long 50 0.131 -0.198 0.505 0.541 0.522 0.523 0.544 0.645 -0.667

pH_H2O 51 0.936 -0.545 0.814 0.771 0.817 0.817 0.808 0.740 0.003

P 52 0.687 -0.426 0.431 0.295 0.401 0.400 0.385 0.288 0.568

K 53 0.385 -0.178 0.513 0.497 0.518 0.519 0.526 0.543 -0.312

Ca 54 0.859 -0.490 0.891 0.774 0.874 0.874 0.868 0.828 -0.025

Mg 55 0.827 -0.593 0.676 0.514 0.643 0.643 0.635 0.580 0.084

Resist 56 -0.448 0.085 -0.434 -0.296 -0.404 -0.404 -0.395 -0.337 -0.151

APP_N 57 -0.253 0.509 -0.171 -0.052 -0.140 -0.141 -0.143 -0.154 -0.019

10 11 12 13 14 15 16 17 18

DL2 19 1.000

rain3 20 -0.590 1.000

Tave3 21 0.917 -0.550 1.000

HU0_3 22 0.923 -0.543 1.000 1.000

HU5_3 23 0.923 -0.545 1.000 1.000 1.000

HU10_3 24 0.922 -0.546 1.000 1.000 1.000 1.000

HU15_3 25 0.914 -0.545 0.999 0.999 0.999 0.999 1.000

WS3 26 -0.937 0.515 -0.935 -0.938 -0.938 -0.938 -0.930 1.000

rad3 27 -0.060 -0.043 -0.338 -0.331 -0.331 -0.332 -0.346 0.161 1.000

DL3 28 -0.952 0.468 -0.917 -0.923 -0.922 -0.921 -0.915 0.910 0.126

rain4 29 -0.657 0.965 -0.635 -0.630 -0.632 -0.632 -0.633 0.564 0.035

Tx4 30 0.917 -0.539 0.992 0.991 0.991 0.991 0.991 -0.938 -0.319

Tn4 31 0.884 -0.451 0.984 0.984 0.984 0.984 0.982 -0.927 -0.419

WS4 32 -0.906 0.524 -0.916 -0.916 -0.916 -0.916 -0.911 0.960 0.165

RHx4 33 -0.251 0.421 -0.227 -0.228 -0.229 -0.227 -0.220 0.165 0.068

RHn4 34 -0.513 0.536 -0.538 -0.534 -0.534 -0.533 -0.529 0.473 0.118

rad4 35 -0.026 -0.076 -0.305 -0.299 -0.299 -0.300 -0.312 0.135 0.987

ETx4 36 0.872 -0.509 0.980 0.980 0.980 0.980 0.978 -0.928 -0.362

ETn4 37 0.627 -0.129 0.670 0.676 0.674 0.673 0.668 -0.667 -0.229

frost4 38 -0.537 0.131 -0.477 -0.478 -0.478 -0.477 -0.470 0.559 -0.072

HU0_4 39 0.915 -0.504 0.994 0.994 0.994 0.994 0.993 -0.943 -0.349

HU5_4 40 0.915 -0.506 0.994 0.994 0.994 0.994 0.993 -0.943 -0.350

HU10_4 41 0.912 -0.507 0.994 0.994 0.994 0.994 0.994 -0.940 -0.356

HU15_4 42 0.895 -0.507 0.995 0.994 0.994 0.994 0.995 -0.924 -0.388

RC4 43 -0.949 0.508 -0.978 -0.981 -0.981 -0.980 -0.976 0.963 0.272

IC4 44 -0.936 0.459 -0.945 -0.949 -0.949 -0.948 -0.940 0.958 0.242

PC4 45 -0.955 0.510 -0.927 -0.932 -0.932 -0.931 -0.920 0.969 0.138

Eto4 46 0.488 -0.599 0.378 0.377 0.378 0.377 0.371 -0.407 0.312

DL4 47 -0.255 -0.248 -0.396 -0.400 -0.398 -0.397 -0.406 0.279 0.308

Alt 48 -0.878 0.441 -0.980 -0.979 -0.979 -0.979 -0.980 0.925 0.429

Lat 49 -0.996 0.571 -0.937 -0.943 -0.943 -0.942 -0.935 0.950 0.099

Long 50 0.130 0.071 0.476 0.464 0.464 0.466 0.482 -0.325 -0.805

pH_H2O 51 0.921 -0.404 0.853 0.863 0.862 0.861 0.852 -0.846 -0.108

P 52 0.655 -0.364 0.398 0.410 0.409 0.408 0.394 -0.522 0.457

K 53 0.401 -0.195 0.510 0.500 0.500 0.501 0.511 -0.408 -0.271

Ca 54 0.844 -0.360 0.856 0.857 0.857 0.856 0.851 -0.871 -0.238

Mg 55 0.808 -0.507 0.719 0.724 0.724 0.722 0.715 -0.683 -0.033

Resist 56 -0.459 0.050 -0.402 -0.400 -0.399 -0.399 -0.393 0.501 -0.185

APP_N 57 -0.230 0.181 -0.204 -0.208 -0.207 -0.205 -0.206 0.089 0.093

19 20 21 22 23 24 25 26 27

DL3 28 1.000

rain4 29 0.588 1.000

Tx4 30 -0.932 -0.634 1.000

Tn4 31 -0.897 -0.539 0.976 1.000

WS4 32 0.892 0.574 -0.925 -0.890 1.000

RHx4 33 0.310 0.533 -0.241 -0.207 0.104 1.000

RHn4 34 0.564 0.650 -0.564 -0.476 0.547 0.728 1.000

rad4 35 0.069 -0.018 -0.272 -0.394 0.132 0.013 0.050 1.000

ETx4 36 -0.893 -0.598 0.974 0.967 -0.892 -0.272 -0.566 -0.327 1.000

ETn4 37 -0.720 -0.203 0.667 0.731 -0.594 -0.046 -0.092 -0.197 0.649

frost4 38 0.553 0.141 -0.484 -0.496 0.558 0.089 0.160 -0.077 -0.456

HU0_4 39 -0.930 -0.598 0.996 0.990 -0.919 -0.231 -0.532 -0.310 0.976

HU5_4 40 -0.930 -0.599 0.996 0.990 -0.919 -0.231 -0.532 -0.311 0.976

HU10_4 41 -0.927 -0.601 0.997 0.990 -0.917 -0.227 -0.530 -0.317 0.976

HU15_4 42 -0.913 -0.604 0.995 0.988 -0.906 -0.225 -0.531 -0.348 0.976

RC4 43 0.952 0.597 -0.983 -0.978 0.923 0.249 0.521 0.235 -0.959

IC4 44 0.946 0.549 -0.960 -0.959 0.914 0.254 0.517 0.204 -0.928

PC4 45 0.946 0.583 -0.942 -0.928 0.924 0.263 0.527 0.100 -0.913

Eto4 46 -0.452 -0.645 0.402 0.272 -0.507 -0.477 -0.823 0.366 0.353

DL4 47 0.461 -0.059 -0.427 -0.439 0.278 0.222 0.301 0.244 -0.435

Alt 48 0.893 0.529 -0.981 -0.983 0.923 0.141 0.498 0.394 -0.959

Lat 49 0.967 0.647 -0.941 -0.907 0.923 0.258 0.531 0.060 -0.901

Long 50 -0.219 0.011 0.473 0.542 -0.371 0.166 -0.139 -0.797 0.498

pH_H2O 51 -0.944 -0.520 0.850 0.832 -0.827 -0.281 -0.539 -0.075 0.838

P 52 -0.651 -0.450 0.431 0.341 -0.487 -0.456 -0.442 0.516 0.355

K 53 -0.393 -0.228 0.527 0.515 -0.448 -0.021 -0.303 -0.278 0.463

Ca 54 -0.894 -0.465 0.878 0.847 -0.938 -0.164 -0.620 -0.187 0.830

Mg 55 -0.818 -0.629 0.726 0.649 -0.744 -0.461 -0.789 0.016 0.695

Resist 56 0.449 0.067 -0.414 -0.386 0.623 -0.234 0.206 -0.175 -0.321

APP_N 57 0.305 0.302 -0.216 -0.140 0.210 0.426 0.706 0.044 -0.221

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 -0.640 1.000

HU0_4 39 0.699 -0.497 1.000

HU5_4 40 0.697 -0.496 1.000 1.000

HU10_4 41 0.693 -0.487 1.000 1.000 1.000

HU15_4 42 0.681 -0.466 0.997 0.997 0.998 1.000

RC4 43 -0.710 0.517 -0.990 -0.990 -0.988 -0.978 1.000

IC4 44 -0.717 0.529 -0.969 -0.969 -0.965 -0.949 0.989 1.000

PC4 45 -0.702 0.571 -0.947 -0.947 -0.942 -0.920 0.977 0.989 1.000

Eto4 46 -0.034 -0.103 0.356 0.356 0.355 0.346 -0.373 -0.366 -0.420

DL4 47 -0.535 0.293 -0.436 -0.435 -0.436 -0.447 0.401 0.400 0.343

Alt 48 -0.679 0.466 -0.987 -0.987 -0.988 -0.989 0.966 0.941 0.909

Lat 49 -0.646 0.537 -0.938 -0.938 -0.936 -0.921 0.965 0.951 0.964

Long 50 0.336 -0.052 0.490 0.490 0.498 0.529 -0.392 -0.362 -0.262

pH_H2O 51 0.639 -0.499 0.856 0.856 0.852 0.837 -0.883 -0.878 -0.887

P 52 0.286 -0.373 0.412 0.412 0.406 0.375 -0.493 -0.520 -0.573

K 53 0.162 -0.239 0.523 0.523 0.526 0.536 -0.476 -0.472 -0.426

Ca 54 0.596 -0.499 0.874 0.874 0.871 0.860 -0.876 -0.887 -0.878

Mg 55 0.277 -0.280 0.706 0.706 0.704 0.695 -0.727 -0.714 -0.729

Resist 56 -0.228 0.369 -0.409 -0.409 -0.405 -0.389 0.416 0.455 0.464

APP_N 57 0.107 -0.183 -0.190 -0.189 -0.190 -0.201 0.179 0.157 0.152

37 38 39 40 41 42 43 44 45

Eto4 46 1.000

DL4 47 -0.038 1.000

Alt 48 -0.319 0.445 1.000

Lat 49 -0.477 0.295 0.905 1.000

Long 50 -0.174 -0.466 -0.584 -0.185 1.000

pH_H2O 51 0.429 -0.428 -0.823 -0.925 0.136 1.000

P 52 0.609 -0.163 -0.328 -0.639 -0.462 0.602 1.000

K 53 0.106 -0.293 -0.547 -0.402 0.497 0.359 -0.039 1.000

Ca 54 0.530 -0.409 -0.888 -0.869 0.394 0.842 0.507 0.394 1.000

Mg 55 0.706 -0.246 -0.680 -0.815 0.015 0.850 0.653 0.325 0.800

Resist 56 -0.375 0.058 0.446 0.467 -0.140 -0.391 -0.405 -0.366 -0.654

APP_N 57 -0.568 0.304 0.209 0.241 -0.023 -0.415 -0.198 -0.215 -0.352

46 47 48 49 50 51 52 53 54

Mg 55 1.000

Resist 56 -0.453 1.000

APP_N 57 -0.688 0.073 1.000

55 56 57

===== Correlations for Cultivar 6 =====

*** Degrees of freedom ***

Correlations: 19

*** Correlation matrix ***

fyield 1 1.000

Tclleftprun 2 0.346 1.000

Tfertclad 3 0.842 0.640 1.000

Tftotal 4 0.938 0.343 0.852 1.000

Tfnoat 5 0.969 0.367 0.831 0.928 1.000

Tn1 6 -0.327 0.288 -0.169 -0.251 -0.351 1.000

RC1 7 0.373 -0.127 0.263 0.259 0.394 -0.935 1.000

IC1 8 0.335 -0.166 0.227 0.236 0.356 -0.935 0.989 1.000

C1 9 0.309 -0.092 0.249 0.232 0.343 -0.871 0.968 0.972 1.000

DL1 10 -0.317 -0.140 -0.344 -0.208 -0.362 0.762 -0.903 -0.891 -0.948

rain2 11 0.245 0.403 0.404 0.171 0.249 -0.367 0.465 0.462 0.401

Tx2 12 -0.392 0.062 -0.289 -0.258 -0.396 0.868 -0.982 -0.968 -0.948

Tn2 13 -0.389 0.233 -0.237 -0.304 -0.406 0.989 -0.965 -0.961 -0.903

HU0_2 14 -0.398 0.110 -0.280 -0.275 -0.406 0.917 -0.994 -0.982 -0.952

HU5_2 15 -0.399 0.110 -0.280 -0.275 -0.406 0.917 -0.994 -0.982 -0.952

HU10_2 16 -0.406 0.106 -0.281 -0.275 -0.411 0.913 -0.991 -0.977 -0.941

HU15_2 17 -0.432 0.105 -0.290 -0.287 -0.420 0.894 -0.960 -0.937 -0.872

Rad2 18 0.368 -0.121 0.205 0.309 0.315 -0.347 0.165 0.114 -0.020

DL2 19 -0.329 -0.118 -0.337 -0.221 -0.373 0.752 -0.891 -0.877 -0.942

rain3 20 -0.020 0.244 0.173 -0.064 -0.014 -0.238 0.425 0.368 0.495

Tave3 21 -0.432 -0.051 -0.362 -0.289 -0.446 0.840 -0.957 -0.915 -0.925

HU0_3 22 -0.434 -0.052 -0.366 -0.293 -0.451 0.844 -0.959 -0.918 -0.929

HU5_3 23 -0.433 -0.052 -0.366 -0.292 -0.450 0.843 -0.959 -0.918 -0.928

HU10_3 24 -0.433 -0.051 -0.365 -0.290 -0.449 0.843 -0.958 -0.917 -0.927

HU15_3 25 -0.440 -0.056 -0.366 -0.292 -0.451 0.836 -0.954 -0.910 -0.918

WS3 26 0.323 -0.109 0.251 0.221 0.343 -0.820 0.940 0.923 0.967

rad3 27 0.512 -0.133 0.373 0.420 0.443 -0.445 0.342 0.293 0.142

DL3 28 0.391 0.157 0.390 0.275 0.425 -0.794 0.924 0.918 0.944

rain4 29 0.044 0.333 0.267 -0.017 0.050 -0.321 0.521 0.467 0.568

Tx4 30 -0.426 -0.039 -0.351 -0.285 -0.435 0.837 -0.969 -0.936 -0.941

Tn4 31 -0.428 0.065 -0.320 -0.294 -0.441 0.919 -0.981 -0.949 -0.929

WS4 32 0.401 0.007 0.344 0.297 0.402 -0.734 0.896 0.886 0.929

RHx4 33 -0.119 0.378 0.289 -0.011 -0.111 -0.197 0.227 0.216 0.245

RHn4 34 0.272 0.509 0.588 0.321 0.281 -0.292 0.477 0.464 0.511

rad4 35 0.483 -0.164 0.327 0.402 0.420 -0.435 0.303 0.252 0.103

ETx4 36 -0.466 -0.039 -0.399 -0.351 -0.487 0.834 -0.945 -0.897 -0.911

ETn4 37 -0.286 0.271 -0.125 -0.194 -0.294 0.827 -0.763 -0.767 -0.728

frost4 38 0.108 -0.180 0.018 0.143 0.097 -0.550 0.532 0.558 0.605

HU0_4 39 -0.429 0.001 -0.341 -0.291 -0.441 0.875 -0.981 -0.950 -0.947

HU5_4 40 -0.428 0.000 -0.341 -0.290 -0.440 0.875 -0.981 -0.949 -0.946

HU10_4 41 -0.431 -0.003 -0.342 -0.289 -0.442 0.871 -0.978 -0.946 -0.941

HU15_4 42 -0.447 -0.021 -0.356 -0.298 -0.452 0.859 -0.968 -0.930 -0.920

RC4 43 0.380 -0.017 0.311 0.261 0.411 -0.884 0.985 0.963 0.973

IC4 44 0.342 -0.076 0.273 0.238 0.377 -0.901 0.987 0.985 0.987

PC4 45 0.312 -0.059 0.268 0.229 0.352 -0.860 0.962 0.963 0.997

Eto4 46 -0.022 -0.474 -0.374 -0.053 -0.040 0.021 -0.283 -0.282 -0.400

DL4 47 0.457 0.062 0.385 0.445 0.426 -0.495 0.472 0.484 0.377

Alt 48 0.511 -0.014 0.386 0.361 0.504 -0.859 0.962 0.928 0.910

Lat 49 0.352 0.118 0.349 0.235 0.390 -0.773 0.915 0.897 0.953

Long 50 -0.510 0.257 -0.224 -0.386 -0.421 0.511 -0.478 -0.433 -0.286

pH_H2O 51 -0.505 -0.276 -0.537 -0.412 -0.556 0.735 -0.838 -0.832 -0.874

P 52 0.185 -0.217 -0.076 0.202 0.139 0.266 -0.423 -0.468 -0.561

K 53 -0.391 -0.070 -0.159 -0.324 -0.328 0.457 -0.490 -0.490 -0.435

Ca 54 -0.461 -0.098 -0.452 -0.347 -0.461 0.714 -0.864 -0.877 -0.878

Mg 55 -0.414 -0.586 -0.624 -0.356 -0.461 0.444 -0.642 -0.634 -0.700

Resist 56 0.058 -0.023 -0.021 -0.042 0.012 -0.277 0.402 0.466 0.473

APP_N 57 0.578 0.840 0.834 0.619 0.587 0.029 0.113 0.097 0.124

1 2 3 4 5 6 7 8 9

DL1 10 1.000

rain2 11 -0.465 1.000

Tx2 12 0.892 -0.513 1.000

Tn2 13 0.803 -0.424 0.919 1.000

HU0_2 14 0.883 -0.494 0.994 0.958 1.000

HU5_2 15 0.883 -0.494 0.994 0.957 1.000 1.000

HU10_2 16 0.874 -0.502 0.994 0.955 0.999 0.999 1.000

HU15_2 17 0.799 -0.537 0.974 0.940 0.980 0.980 0.986 1.000

Rad2 18 0.075 0.025 -0.110 -0.315 -0.170 -0.170 -0.186 -0.278 1.000

DL2 19 0.994 -0.406 0.874 0.791 0.867 0.867 0.857 0.776 0.053

rain3 20 -0.572 0.107 -0.443 -0.271 -0.405 -0.405 -0.400 -0.340 -0.122

Tave3 21 0.919 -0.458 0.954 0.879 0.950 0.950 0.950 0.920 -0.194

HU0_3 22 0.926 -0.461 0.954 0.883 0.951 0.951 0.951 0.918 -0.188

HU5_3 23 0.925 -0.461 0.954 0.882 0.950 0.950 0.950 0.918 -0.188

HU10_3 24 0.925 -0.460 0.953 0.881 0.950 0.950 0.950 0.918 -0.190

HU15_3 25 0.916 -0.468 0.952 0.876 0.947 0.947 0.949 0.921 -0.200

WS3 26 -0.934 0.315 -0.925 -0.858 -0.923 -0.923 -0.914 -0.849 0.031

rad3 27 -0.059 0.276 -0.338 -0.458 -0.376 -0.377 -0.396 -0.505 0.864

DL3 28 -0.973 0.572 -0.923 -0.837 -0.915 -0.915 -0.909 -0.854 -0.059

rain4 29 -0.655 0.365 -0.550 -0.366 -0.510 -0.510 -0.507 -0.461 -0.105

Tx4 30 0.925 -0.492 0.980 0.887 0.971 0.971 0.971 0.943 -0.133

Tn4 31 0.888 -0.443 0.960 0.946 0.973 0.973 0.973 0.951 -0.283

WS4 32 -0.901 0.324 -0.908 -0.786 -0.890 -0.890 -0.884 -0.824 0.018

RHx4 33 -0.308 0.515 -0.236 -0.220 -0.235 -0.234 -0.226 -0.230 -0.053

RHn4 34 -0.552 0.558 -0.544 -0.376 -0.505 -0.505 -0.499 -0.487 -0.096

rad4 35 -0.017 0.189 -0.279 -0.434 -0.327 -0.327 -0.345 -0.450 0.927

ETx4 36 0.883 -0.460 0.945 0.878 0.942 0.942 0.941 0.917 -0.201

ETn4 37 0.640 -0.308 0.698 0.797 0.739 0.738 0.732 0.704 -0.066

frost4 38 -0.537 0.076 -0.494 -0.535 -0.514 -0.513 -0.493 -0.424 -0.094

HU0_4 39 0.922 -0.478 0.979 0.917 0.978 0.979 0.978 0.950 -0.183

HU5_4 40 0.922 -0.478 0.979 0.916 0.978 0.978 0.978 0.950 -0.183

HU10_4 41 0.919 -0.479 0.978 0.914 0.977 0.977 0.977 0.951 -0.189

HU15_4 42 0.902 -0.491 0.972 0.903 0.969 0.969 0.972 0.953 -0.220

RC4 43 -0.954 0.463 -0.971 -0.922 -0.974 -0.974 -0.971 -0.926 0.117

IC4 44 -0.945 0.454 -0.969 -0.935 -0.977 -0.976 -0.970 -0.919 0.080

PC4 45 -0.959 0.404 -0.943 -0.894 -0.946 -0.946 -0.935 -0.865 -0.018

Eto4 46 0.503 -0.327 0.352 0.102 0.289 0.289 0.279 0.216 0.470

DL4 47 -0.311 0.652 -0.482 -0.523 -0.498 -0.498 -0.506 -0.555 0.073

Alt 48 -0.879 0.444 -0.966 -0.907 -0.966 -0.966 -0.969 -0.953 0.262

Lat 49 -0.995 0.435 -0.905 -0.815 -0.897 -0.896 -0.889 -0.817 -0.031

Long 50 0.131 -0.198 0.505 0.541 0.522 0.523 0.544 0.645 -0.667

pH_H2O 51 0.936 -0.545 0.814 0.771 0.817 0.817 0.808 0.740 0.003

P 52 0.687 -0.426 0.431 0.295 0.401 0.400 0.385 0.288 0.568

K 53 0.385 -0.178 0.513 0.497 0.518 0.519 0.526 0.543 -0.312

Ca 54 0.859 -0.490 0.891 0.774 0.874 0.874 0.868 0.828 -0.025

Mg 55 0.827 -0.593 0.676 0.514 0.643 0.643 0.635 0.580 0.084

Resist 56 -0.448 0.085 -0.434 -0.296 -0.404 -0.404 -0.395 -0.337 -0.151

APP_N 57 -0.253 0.509 -0.171 -0.052 -0.140 -0.141 -0.143 -0.154 -0.019

10 11 12 13 14 15 16 17 18

DL2 19 1.000

rain3 20 -0.590 1.000

Tave3 21 0.917 -0.550 1.000

HU0_3 22 0.923 -0.543 1.000 1.000

HU5_3 23 0.923 -0.545 1.000 1.000 1.000

HU10_3 24 0.922 -0.546 1.000 1.000 1.000 1.000

HU15_3 25 0.914 -0.545 0.999 0.999 0.999 0.999 1.000

WS3 26 -0.937 0.515 -0.935 -0.938 -0.938 -0.938 -0.930 1.000

rad3 27 -0.060 -0.043 -0.338 -0.331 -0.331 -0.332 -0.346 0.161 1.000

DL3 28 -0.952 0.468 -0.917 -0.923 -0.922 -0.921 -0.915 0.910 0.126

rain4 29 -0.657 0.965 -0.635 -0.630 -0.632 -0.632 -0.633 0.564 0.035

Tx4 30 0.917 -0.539 0.992 0.991 0.991 0.991 0.991 -0.938 -0.319

Tn4 31 0.884 -0.451 0.984 0.984 0.984 0.984 0.982 -0.927 -0.419

WS4 32 -0.906 0.524 -0.916 -0.916 -0.916 -0.916 -0.911 0.960 0.165

RHx4 33 -0.251 0.421 -0.227 -0.228 -0.229 -0.227 -0.220 0.165 0.068

RHn4 34 -0.513 0.536 -0.538 -0.534 -0.534 -0.533 -0.529 0.473 0.118

rad4 35 -0.026 -0.076 -0.305 -0.299 -0.299 -0.300 -0.312 0.135 0.987

ETx4 36 0.872 -0.509 0.980 0.980 0.980 0.980 0.978 -0.928 -0.362

ETn4 37 0.627 -0.129 0.670 0.676 0.674 0.673 0.668 -0.667 -0.229

frost4 38 -0.537 0.131 -0.477 -0.478 -0.478 -0.477 -0.470 0.559 -0.072

HU0_4 39 0.915 -0.504 0.994 0.994 0.994 0.994 0.993 -0.943 -0.349

HU5_4 40 0.915 -0.506 0.994 0.994 0.994 0.994 0.993 -0.943 -0.350

HU10_4 41 0.912 -0.507 0.994 0.994 0.994 0.994 0.994 -0.940 -0.356

HU15_4 42 0.895 -0.507 0.995 0.994 0.994 0.994 0.995 -0.924 -0.388

RC4 43 -0.949 0.508 -0.978 -0.981 -0.981 -0.980 -0.976 0.963 0.272

IC4 44 -0.936 0.459 -0.945 -0.949 -0.949 -0.948 -0.940 0.958 0.242

PC4 45 -0.955 0.510 -0.927 -0.932 -0.932 -0.931 -0.920 0.969 0.138

Eto4 46 0.488 -0.599 0.378 0.377 0.378 0.377 0.371 -0.407 0.312

DL4 47 -0.255 -0.248 -0.396 -0.400 -0.398 -0.397 -0.406 0.279 0.308

Alt 48 -0.878 0.441 -0.980 -0.979 -0.979 -0.979 -0.980 0.925 0.429

Lat 49 -0.996 0.571 -0.937 -0.943 -0.943 -0.942 -0.935 0.950 0.099

Long 50 0.130 0.071 0.476 0.464 0.464 0.466 0.482 -0.325 -0.805

pH_H2O 51 0.921 -0.404 0.853 0.863 0.862 0.861 0.852 -0.846 -0.108

P 52 0.655 -0.364 0.398 0.410 0.409 0.408 0.394 -0.522 0.457

K 53 0.401 -0.195 0.510 0.500 0.500 0.501 0.511 -0.408 -0.271

Ca 54 0.844 -0.360 0.856 0.857 0.857 0.856 0.851 -0.871 -0.238

Mg 55 0.808 -0.507 0.719 0.724 0.724 0.722 0.715 -0.683 -0.033

Resist 56 -0.459 0.050 -0.402 -0.400 -0.399 -0.399 -0.393 0.501 -0.185

APP_N 57 -0.230 0.181 -0.204 -0.208 -0.207 -0.205 -0.206 0.089 0.093

19 20 21 22 23 24 25 26 27

DL3 28 1.000

rain4 29 0.588 1.000

Tx4 30 -0.932 -0.634 1.000

Tn4 31 -0.897 -0.539 0.976 1.000

WS4 32 0.892 0.574 -0.925 -0.890 1.000

RHx4 33 0.310 0.533 -0.241 -0.207 0.104 1.000

RHn4 34 0.564 0.650 -0.564 -0.476 0.547 0.728 1.000

rad4 35 0.069 -0.018 -0.272 -0.394 0.132 0.013 0.050 1.000

ETx4 36 -0.893 -0.598 0.974 0.967 -0.892 -0.272 -0.566 -0.327 1.000

ETn4 37 -0.720 -0.203 0.667 0.731 -0.594 -0.046 -0.092 -0.197 0.649

frost4 38 0.553 0.141 -0.484 -0.496 0.558 0.089 0.160 -0.077 -0.456

HU0_4 39 -0.930 -0.598 0.996 0.990 -0.919 -0.231 -0.532 -0.310 0.976

HU5_4 40 -0.930 -0.599 0.996 0.990 -0.919 -0.231 -0.532 -0.311 0.976

HU10_4 41 -0.927 -0.601 0.997 0.990 -0.917 -0.227 -0.530 -0.317 0.976

HU15_4 42 -0.913 -0.604 0.995 0.988 -0.906 -0.225 -0.531 -0.348 0.976

RC4 43 0.952 0.597 -0.983 -0.978 0.923 0.249 0.521 0.235 -0.959

IC4 44 0.946 0.549 -0.960 -0.959 0.914 0.254 0.517 0.204 -0.928

PC4 45 0.946 0.583 -0.942 -0.928 0.924 0.263 0.527 0.100 -0.913

Eto4 46 -0.452 -0.645 0.402 0.272 -0.507 -0.477 -0.823 0.366 0.353

DL4 47 0.461 -0.059 -0.427 -0.439 0.278 0.222 0.301 0.244 -0.435

Alt 48 0.893 0.529 -0.981 -0.983 0.923 0.141 0.498 0.394 -0.959

Lat 49 0.967 0.647 -0.941 -0.907 0.923 0.258 0.531 0.060 -0.901

Long 50 -0.219 0.011 0.473 0.542 -0.371 0.166 -0.139 -0.797 0.498

pH_H2O 51 -0.944 -0.520 0.850 0.832 -0.827 -0.281 -0.539 -0.075 0.838

P 52 -0.651 -0.450 0.431 0.341 -0.487 -0.456 -0.442 0.516 0.355

K 53 -0.393 -0.228 0.527 0.515 -0.448 -0.021 -0.303 -0.278 0.463

Ca 54 -0.894 -0.465 0.878 0.847 -0.938 -0.164 -0.620 -0.187 0.830

Mg 55 -0.818 -0.629 0.726 0.649 -0.744 -0.461 -0.789 0.016 0.695

Resist 56 0.449 0.067 -0.414 -0.386 0.623 -0.234 0.206 -0.175 -0.321

APP_N 57 0.305 0.302 -0.216 -0.140 0.210 0.426 0.706 0.044 -0.221

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 -0.640 1.000

HU0_4 39 0.699 -0.497 1.000

HU5_4 40 0.697 -0.496 1.000 1.000

HU10_4 41 0.693 -0.487 1.000 1.000 1.000

HU15_4 42 0.681 -0.466 0.997 0.997 0.998 1.000

RC4 43 -0.710 0.517 -0.990 -0.990 -0.988 -0.978 1.000

IC4 44 -0.717 0.529 -0.969 -0.969 -0.965 -0.949 0.989 1.000

PC4 45 -0.702 0.571 -0.947 -0.947 -0.942 -0.920 0.977 0.989 1.000

Eto4 46 -0.034 -0.103 0.356 0.356 0.355 0.346 -0.373 -0.366 -0.420

DL4 47 -0.535 0.293 -0.436 -0.435 -0.436 -0.447 0.401 0.400 0.343

Alt 48 -0.679 0.466 -0.987 -0.987 -0.988 -0.989 0.966 0.941 0.909

Lat 49 -0.646 0.537 -0.938 -0.938 -0.936 -0.921 0.965 0.951 0.964

Long 50 0.336 -0.052 0.490 0.490 0.498 0.529 -0.392 -0.362 -0.262

pH_H2O 51 0.639 -0.499 0.856 0.856 0.852 0.837 -0.883 -0.878 -0.887

P 52 0.286 -0.373 0.412 0.412 0.406 0.375 -0.493 -0.520 -0.573

K 53 0.162 -0.239 0.523 0.523 0.526 0.536 -0.476 -0.472 -0.426

Ca 54 0.596 -0.499 0.874 0.874 0.871 0.860 -0.876 -0.887 -0.878

Mg 55 0.277 -0.280 0.706 0.706 0.704 0.695 -0.727 -0.714 -0.729

Resist 56 -0.228 0.369 -0.409 -0.409 -0.405 -0.389 0.416 0.455 0.464

APP_N 57 0.107 -0.183 -0.190 -0.189 -0.190 -0.201 0.179 0.157 0.152

37 38 39 40 41 42 43 44 45

Eto4 46 1.000

DL4 47 -0.038 1.000

Alt 48 -0.319 0.445 1.000

Lat 49 -0.477 0.295 0.905 1.000

Long 50 -0.174 -0.466 -0.584 -0.185 1.000

pH_H2O 51 0.429 -0.428 -0.823 -0.925 0.136 1.000

P 52 0.609 -0.163 -0.328 -0.639 -0.462 0.602 1.000

K 53 0.106 -0.293 -0.547 -0.402 0.497 0.359 -0.039 1.000

Ca 54 0.530 -0.409 -0.888 -0.869 0.394 0.842 0.507 0.394 1.000

Mg 55 0.706 -0.246 -0.680 -0.815 0.015 0.850 0.653 0.325 0.800

Resist 56 -0.375 0.058 0.446 0.467 -0.140 -0.391 -0.405 -0.366 -0.654

APP_N 57 -0.568 0.304 0.209 0.241 -0.023 -0.415 -0.198 -0.215 -0.352

46 47 48 49 50 51 52 53 54

Mg 55 1.000

Resist 56 -0.453 1.000

APP_N 57 -0.688 0.073 1.000

55 56 57

===== Correlations for Cultivar 7 =====

*** Degrees of freedom ***

Correlations: 17

*** Correlation matrix ***

fyield 1 1.000

Tcllefprun 2 0.369 1.000

Tfertclad 3 0.924 0.265 1.000

Tftotal 4 0.278 0.665 0.209 1.000

Tfnoat 5 0.975 0.303 0.968 0.249 1.000

Tn1 6 -0.105 0.131 -0.135 0.033 -0.155 1.000

RC1 7 0.039 -0.034 0.071 0.080 0.086 -0.933 1.000

IC1 8 0.001 -0.080 0.036 0.026 0.056 -0.929 0.986 1.000

C1 9 -0.147 -0.034 -0.135 0.097 -0.115 -0.845 0.960 0.964 1.000

DL1 10 0.219 -0.143 0.240 -0.203 0.198 0.718 -0.877 -0.862 -0.937

rain2 11 0.361 0.445 0.277 0.146 0.375 -0.504 0.551 0.558 0.497

Tx2 12 -0.082 -0.011 -0.135 -0.093 -0.137 0.860 -0.980 -0.964 -0.943

Tn2 13 -0.133 0.095 -0.178 -0.033 -0.189 0.987 -0.963 -0.956 -0.883

HU0_2 14 -0.095 0.018 -0.146 -0.079 -0.150 0.912 -0.993 -0.979 -0.944

HU5_2 15 -0.095 0.017 -0.147 -0.079 -0.151 0.912 -0.993 -0.979 -0.944

HU10_2 16 -0.115 0.017 -0.170 -0.081 -0.173 0.911 -0.991 -0.973 -0.932

HU15_2 17 -0.234 -0.002 -0.304 -0.074 -0.300 0.900 -0.960 -0.935 -0.860

Rad2 18 0.580 0.221 0.619 0.197 0.572 -0.387 0.202 0.142 -0.012

DL2 19 0.263 -0.119 0.275 -0.207 0.247 0.705 -0.862 -0.844 -0.929

rain3 20 -0.212 0.295 -0.284 0.236 -0.276 -0.168 0.339 0.271 0.425

Tave3 21 -0.063 -0.153 -0.068 -0.246 -0.086 0.823 -0.948 -0.897 -0.913

HU0_3 22 -0.050 -0.147 -0.053 -0.245 -0.073 0.828 -0.951 -0.902 -0.919

HU5_3 23 -0.050 -0.147 -0.053 -0.245 -0.073 0.827 -0.951 -0.901 -0.918

HU10_3 24 -0.053 -0.148 -0.056 -0.246 -0.076 0.826 -0.950 -0.900 -0.916

HU15_3 25 -0.074 -0.154 -0.079 -0.246 -0.098 0.821 -0.946 -0.893 -0.906

WS3 26 -0.152 -0.025 -0.111 0.198 -0.112 -0.785 0.928 0.904 0.957

rad3 27 0.662 0.100 0.729 0.107 0.691 -0.563 0.445 0.393 0.232

DL3 28 -0.125 0.138 -0.128 0.162 -0.083 -0.768 0.910 0.904 0.943

rain4 29 -0.096 0.410 -0.191 0.266 -0.155 -0.305 0.481 0.417 0.547

Tx4 30 -0.061 -0.115 -0.083 -0.203 -0.096 0.825 -0.965 -0.926 -0.937

Tn4 31 -0.107 -0.074 -0.132 -0.186 -0.144 0.909 -0.977 -0.936 -0.913

WS4 32 -0.103 0.100 -0.045 0.320 -0.059 -0.670 0.865 0.851 0.902

RHx4 33 0.175 0.470 0.013 0.213 0.124 -0.201 0.226 0.215 0.253

RHn4 34 0.174 0.536 0.089 0.578 0.156 -0.313 0.504 0.492 0.559

rad4 35 0.653 0.114 0.712 0.143 0.671 -0.526 0.383 0.327 0.165

ETx4 36 -0.134 -0.147 -0.124 -0.281 -0.148 0.816 -0.936 -0.877 -0.898

ETn4 37 0.130 0.286 0.060 0.244 0.037 0.796 -0.747 -0.747 -0.700

frost4 38 -0.144 -0.015 -0.156 -0.111 -0.120 -0.393 0.513 0.538 0.599

HU0_4 39 -0.069 -0.096 -0.091 -0.196 -0.105 0.864 -0.978 -0.940 -0.939

HU5_4 40 -0.069 -0.096 -0.092 -0.197 -0.105 0.864 -0.977 -0.939 -0.938

HU10_4 41 -0.076 -0.098 -0.099 -0.199 -0.113 0.861 -0.975 -0.935 -0.933

HU15_4 42 -0.115 -0.121 -0.138 -0.213 -0.151 0.852 -0.965 -0.919 -0.911

RC4 43 -0.043 0.052 -0.026 0.168 -0.010 -0.873 0.981 0.954 0.969

IC4 44 -0.071 -0.004 -0.045 0.117 -0.029 -0.889 0.983 0.980 0.985

PC4 45 -0.166 -0.004 -0.152 0.124 -0.135 -0.831 0.952 0.951 0.996

Eto4 46 0.196 -0.403 0.270 -0.557 0.208 -0.023 -0.240 -0.244 -0.386

DL4 47 0.426 0.015 0.373 0.077 0.477 -0.596 0.568 0.585 0.481

Alt 48 0.113 0.085 0.174 0.235 0.163 -0.849 0.957 0.918 0.900

Lat 49 -0.220 0.128 -0.216 0.204 -0.194 -0.732 0.892 0.870 0.943

Long 50 -0.615 0.037 -0.737 -0.153 -0.678 0.562 -0.519 -0.471 -0.309

pH_H2O 51 0.090 -0.273 0.121 -0.351 0.058 0.701 -0.816 -0.810 -0.867

P 52 0.469 -0.094 0.570 0.032 0.465 0.150 -0.308 -0.364 -0.473

K 53 -0.229 -0.160 -0.283 -0.229 -0.255 0.469 -0.514 -0.515 -0.462

Ca 54 -0.015 -0.173 -0.071 -0.318 -0.075 0.666 -0.838 -0.854 -0.859

Mg 55 0.119 -0.527 0.164 -0.509 0.119 0.450 -0.654 -0.648 -0.739

Resist 56 -0.260 0.077 -0.154 0.103 -0.203 -0.135 0.286 0.360 0.360

APP_N 57 0.090 0.697 0.065 0.776 0.102 -0.236 0.384 0.376 0.446

1 2 3 4 5 6 7 8 9

DL1 10 1.000

rain2 11 -0.533 1.000

Tx2 12 0.866 -0.576 1.000

Tn2 13 0.763 -0.541 0.915 1.000

HU0_2 14 0.854 -0.574 0.993 0.955 1.000

HU5_2 15 0.854 -0.574 0.993 0.955 1.000 1.000

HU10_2 16 0.844 -0.573 0.993 0.954 0.999 0.999 1.000

HU15_2 17 0.763 -0.593 0.971 0.945 0.980 0.980 0.986 1.000

Rad2 18 0.068 0.081 -0.142 -0.353 -0.204 -0.205 -0.223 -0.318 1.000

DL2 19 0.992 -0.463 0.843 0.748 0.834 0.834 0.823 0.735 0.043

rain3 20 -0.515 -0.006 -0.352 -0.194 -0.318 -0.318 -0.309 -0.248 -0.083

Tave3 21 0.901 -0.515 0.944 0.863 0.939 0.939 0.939 0.907 -0.233

HU0_3 22 0.909 -0.519 0.944 0.868 0.940 0.940 0.940 0.905 -0.226

HU5_3 23 0.908 -0.517 0.943 0.867 0.940 0.940 0.939 0.905 -0.227

HU10_3 24 0.907 -0.516 0.943 0.866 0.939 0.939 0.939 0.905 -0.229

HU15_3 25 0.898 -0.521 0.942 0.862 0.937 0.937 0.938 0.908 -0.241

WS3 26 -0.924 0.385 -0.920 -0.834 -0.913 -0.913 -0.905 -0.840 0.061

rad3 27 -0.119 0.299 -0.426 -0.568 -0.472 -0.472 -0.489 -0.587 0.875

DL3 28 -0.970 0.645 -0.908 -0.813 -0.899 -0.899 -0.891 -0.830 -0.050

rain4 29 -0.642 0.278 -0.501 -0.340 -0.468 -0.467 -0.459 -0.406 -0.054

Tx4 30 0.908 -0.544 0.976 0.877 0.966 0.966 0.966 0.934 -0.169

Tn4 31 0.861 -0.526 0.954 0.936 0.966 0.967 0.968 0.947 -0.327

WS4 32 -0.874 0.379 -0.889 -0.737 -0.864 -0.864 -0.857 -0.799 0.044

RHx4 33 -0.316 0.539 -0.233 -0.222 -0.233 -0.233 -0.222 -0.223 -0.048

RHn4 34 -0.582 0.562 -0.565 -0.398 -0.528 -0.527 -0.517 -0.493 -0.082

rad4 35 -0.058 0.224 -0.348 -0.518 -0.401 -0.401 -0.419 -0.516 0.932

ETx4 36 0.858 -0.517 0.934 0.861 0.930 0.930 0.929 0.903 -0.236

ETn4 37 0.604 -0.439 0.682 0.765 0.718 0.718 0.714 0.690 -0.049

frost4 38 -0.571 0.493 -0.531 -0.429 -0.512 -0.511 -0.497 -0.438 -0.279

HU0_4 39 0.903 -0.545 0.975 0.908 0.974 0.974 0.973 0.944 -0.221

HU5_4 40 0.903 -0.544 0.974 0.907 0.973 0.973 0.973 0.944 -0.221

HU10_4 41 0.900 -0.542 0.973 0.905 0.972 0.972 0.972 0.945 -0.229

HU15_4 42 0.881 -0.546 0.966 0.896 0.964 0.964 0.966 0.946 -0.262

RC4 43 -0.942 0.537 -0.965 -0.913 -0.969 -0.969 -0.965 -0.918 0.151

IC4 44 -0.930 0.538 -0.964 -0.926 -0.971 -0.971 -0.964 -0.911 0.106

PC4 45 -0.950 0.491 -0.934 -0.872 -0.935 -0.934 -0.922 -0.847 -0.008

Eto4 46 0.492 -0.268 0.310 0.062 0.247 0.247 0.233 0.163 0.457

DL4 47 -0.380 0.702 -0.563 -0.617 -0.585 -0.584 -0.590 -0.621 0.072

Alt 48 -0.854 0.496 -0.960 -0.899 -0.960 -0.960 -0.963 -0.946 0.303

Lat 49 -0.994 0.497 -0.883 -0.779 -0.871 -0.871 -0.862 -0.784 -0.018

Long 50 0.125 -0.209 0.540 0.587 0.560 0.561 0.582 0.677 -0.676

pH_H2O 51 0.933 -0.613 0.786 0.739 0.789 0.789 0.779 0.703 -0.005

P 52 0.630 -0.429 0.322 0.181 0.289 0.288 0.270 0.173 0.593

K 53 0.395 -0.214 0.536 0.511 0.540 0.540 0.548 0.557 -0.310

Ca 54 0.832 -0.558 0.871 0.734 0.849 0.849 0.843 0.800 -0.038

Mg 55 0.859 -0.603 0.679 0.518 0.648 0.648 0.636 0.567 0.067

Resist 56 -0.346 0.103 -0.337 -0.163 -0.297 -0.297 -0.289 -0.240 -0.159

APP_N 57 -0.541 0.538 -0.414 -0.314 -0.394 -0.394 -0.385 -0.354 -0.002

10 11 12 13 14 15 16 17 18

DL2 19 1.000

rain3 20 -0.538 1.000

Tave3 21 0.897 -0.491 1.000

HU0_3 22 0.905 -0.483 1.000 1.000

HU5_3 23 0.905 -0.485 1.000 1.000 1.000

HU10_3 24 0.904 -0.486 1.000 1.000 1.000 1.000

HU15_3 25 0.894 -0.482 0.999 0.999 0.999 0.999 1.000

WS3 26 -0.928 0.430 -0.935 -0.940 -0.940 -0.939 -0.929 1.000

rad3 27 -0.120 -0.011 -0.422 -0.414 -0.415 -0.417 -0.430 0.272 1.000

DL3 28 -0.943 0.398 -0.900 -0.907 -0.906 -0.905 -0.898 0.909 0.183

rain4 29 -0.644 0.959 -0.617 -0.610 -0.612 -0.612 -0.609 0.520 0.077

Tx4 30 0.898 -0.470 0.991 0.990 0.990 0.990 0.989 -0.941 -0.402

Tn4 31 0.856 -0.386 0.982 0.983 0.982 0.982 0.981 -0.920 -0.520

WS4 32 -0.881 0.442 -0.901 -0.901 -0.901 -0.901 -0.895 0.944 0.262

RHx4 33 -0.252 0.439 -0.223 -0.224 -0.225 -0.223 -0.214 0.161 0.074

RHn4 34 -0.538 0.542 -0.558 -0.554 -0.554 -0.553 -0.546 0.528 0.128

rad4 35 -0.068 -0.042 -0.373 -0.366 -0.366 -0.368 -0.381 0.219 0.989

ETx4 36 0.845 -0.447 0.976 0.976 0.976 0.976 0.974 -0.931 -0.444

ETn4 37 0.587 -0.094 0.643 0.650 0.649 0.647 0.645 -0.637 -0.289

frost4 38 -0.571 0.214 -0.488 -0.491 -0.490 -0.489 -0.492 0.514 -0.024

HU0_4 39 0.895 -0.435 0.992 0.993 0.993 0.992 0.991 -0.943 -0.440

HU5_4 40 0.895 -0.437 0.992 0.993 0.993 0.993 0.992 -0.942 -0.440

HU10_4 41 0.891 -0.436 0.993 0.993 0.993 0.993 0.993 -0.939 -0.446

HU15_4 42 0.872 -0.436 0.994 0.993 0.993 0.993 0.994 -0.924 -0.475

RC4 43 -0.935 0.435 -0.974 -0.978 -0.978 -0.977 -0.972 0.961 0.364

IC4 44 -0.918 0.378 -0.934 -0.940 -0.939 -0.938 -0.929 0.952 0.334

PC4 45 -0.944 0.445 -0.914 -0.920 -0.920 -0.918 -0.906 0.962 0.222

Eto4 46 0.474 -0.552 0.345 0.343 0.343 0.342 0.333 -0.388 0.309

DL4 47 -0.318 -0.254 -0.465 -0.469 -0.468 -0.467 -0.475 0.387 0.304

Alt 48 -0.853 0.366 -0.976 -0.975 -0.975 -0.975 -0.977 0.930 0.514

Lat 49 -0.994 0.514 -0.923 -0.930 -0.930 -0.929 -0.920 0.946 0.164

Long 50 0.123 0.096 0.506 0.492 0.492 0.495 0.512 -0.368 -0.815

pH_H2O 51 0.915 -0.344 0.832 0.843 0.842 0.841 0.831 -0.846 -0.154

P 52 0.591 -0.244 0.286 0.300 0.300 0.297 0.281 -0.408 0.459

K 53 0.412 -0.208 0.530 0.519 0.519 0.520 0.531 -0.447 -0.283

Ca 54 0.814 -0.276 0.828 0.830 0.829 0.829 0.823 -0.859 -0.304

Mg 55 0.838 -0.481 0.727 0.733 0.733 0.732 0.721 -0.735 -0.050

Resist 56 -0.360 -0.068 -0.300 -0.297 -0.297 -0.296 -0.291 0.390 -0.160

APP_N 57 -0.512 0.322 -0.453 -0.457 -0.457 -0.455 -0.449 0.438 0.058

19 20 21 22 23 24 25 26 27

DL3 28 1.000

rain4 29 0.563 1.000

Tx4 30 -0.920 -0.605 1.000

Tn4 31 -0.877 -0.519 0.974 1.000

WS4 32 0.876 0.529 -0.914 -0.865 1.000

RHx4 33 0.313 0.578 -0.238 -0.204 0.086 1.000

RHn4 34 0.583 0.680 -0.586 -0.498 0.601 0.728 1.000

rad4 35 0.108 0.026 -0.338 -0.475 0.205 0.019 0.061 1.000

ETx4 36 -0.873 -0.576 0.969 0.962 -0.874 -0.272 -0.588 -0.393 1.000

ETn4 37 -0.703 -0.215 0.647 0.702 -0.543 -0.035 -0.095 -0.231 0.616

frost4 38 0.641 0.342 -0.530 -0.446 0.557 0.126 0.298 -0.111 -0.450

HU0_4 39 -0.916 -0.571 0.996 0.990 -0.903 -0.228 -0.555 -0.382 0.971

HU5_4 40 -0.916 -0.572 0.996 0.989 -0.903 -0.228 -0.555 -0.382 0.971

HU10_4 41 -0.912 -0.572 0.996 0.990 -0.900 -0.223 -0.552 -0.389 0.971

HU15_4 42 -0.896 -0.573 0.994 0.989 -0.890 -0.220 -0.548 -0.419 0.971

RC4 43 0.944 0.568 -0.982 -0.974 0.901 0.250 0.550 0.306 -0.952

IC4 44 0.938 0.514 -0.954 -0.950 0.888 0.258 0.551 0.273 -0.915

PC4 45 0.942 0.564 -0.934 -0.910 0.898 0.272 0.572 0.158 -0.898

Eto4 46 -0.431 -0.604 0.366 0.235 -0.505 -0.482 -0.829 0.359 0.318

DL4 47 0.530 -0.045 -0.500 -0.519 0.369 0.227 0.309 0.241 -0.503

Alt 48 0.873 0.490 -0.978 -0.982 0.917 0.128 0.511 0.463 -0.951

Lat 49 0.962 0.630 -0.928 -0.885 0.904 0.260 0.558 0.107 -0.880

Long 50 -0.220 0.030 0.502 0.583 -0.413 0.169 -0.136 -0.804 0.526

pH_H2O 51 -0.937 -0.500 0.830 0.807 -0.811 -0.279 -0.550 -0.106 0.814

P 52 -0.594 -0.351 0.323 0.221 -0.368 -0.469 -0.438 0.527 0.241

K 53 -0.397 -0.258 0.550 0.535 -0.484 -0.018 -0.307 -0.283 0.474

Ca 54 -0.874 -0.421 0.856 0.818 -0.939 -0.154 -0.646 -0.234 0.798

Mg 55 -0.834 -0.629 0.733 0.659 -0.790 -0.458 -0.787 -0.001 0.699

Resist 56 0.361 -0.039 -0.316 -0.273 0.551 -0.272 0.197 -0.163 -0.208

APP_N 57 0.562 0.459 -0.461 -0.400 0.556 0.497 0.809 0.028 -0.465

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 -0.606 1.000

HU0_4 39 0.675 -0.507 1.000

HU5_4 40 0.674 -0.506 1.000 1.000

HU10_4 41 0.671 -0.501 1.000 1.000 1.000

HU15_4 42 0.661 -0.492 0.997 0.997 0.998 1.000

RC4 43 -0.688 0.517 -0.988 -0.988 -0.986 -0.975 1.000

IC4 44 -0.691 0.506 -0.963 -0.962 -0.959 -0.941 0.986 1.000

PC4 45 -0.669 0.553 -0.937 -0.936 -0.931 -0.908 0.971 0.987 1.000

Eto4 46 -0.048 -0.255 0.320 0.320 0.316 0.304 -0.340 -0.338 -0.407

DL4 47 -0.605 0.556 -0.514 -0.513 -0.512 -0.518 0.486 0.489 0.433

Alt 48 -0.654 0.480 -0.985 -0.985 -0.986 -0.987 0.962 0.933 0.896

Lat 49 -0.611 0.571 -0.924 -0.923 -0.920 -0.904 0.956 0.938 0.956

Long 50 0.352 -0.049 0.524 0.524 0.531 0.562 -0.420 -0.389 -0.279

pH_H2O 51 0.606 -0.550 0.836 0.835 0.831 0.813 -0.870 -0.865 -0.879

P 52 0.226 -0.458 0.301 0.300 0.293 0.260 -0.391 -0.426 -0.490

K 53 0.132 -0.266 0.545 0.546 0.549 0.557 -0.499 -0.495 -0.447

Ca 54 0.551 -0.519 0.850 0.849 0.846 0.834 -0.852 -0.866 -0.856

Mg 55 0.271 -0.432 0.716 0.716 0.712 0.698 -0.749 -0.739 -0.766

Resist 56 -0.117 0.270 -0.305 -0.304 -0.301 -0.288 0.305 0.348 0.353

APP_N 57 -0.087 0.304 -0.446 -0.446 -0.443 -0.439 0.458 0.445 0.464

37 38 39 40 41 42 43 44 45

Eto4 46 1.000

DL4 47 -0.051 1.000

Alt 48 -0.279 0.511 1.000

Lat 49 -0.461 0.362 0.887 1.000

Long 50 -0.191 -0.470 -0.618 -0.185 1.000

pH_H2O 51 0.413 -0.479 -0.796 -0.920 0.129 1.000

P 52 0.584 -0.201 -0.212 -0.571 -0.521 0.551 1.000

K 53 0.112 -0.299 -0.565 -0.414 0.497 0.354 -0.066 1.000

Ca 54 0.526 -0.471 -0.868 -0.843 0.410 0.819 0.428 0.395 1.000

Mg 55 0.696 -0.261 -0.680 -0.846 0.008 0.862 0.642 0.325 0.815

Resist 56 -0.361 0.085 0.358 0.369 -0.134 -0.307 -0.326 -0.360 -0.599

APP_N 57 -0.689 0.315 0.442 0.526 -0.045 -0.661 -0.387 -0.293 -0.618

46 47 48 49 50 51 52 53 54

Mg 55 1.000

Resist 56 -0.436 1.000

APP_N 57 -0.835 0.266 1.000

55 56 57

===== Correlations for Cultivar 8 =====

*** Degrees of freedom ***

Correlations: 19

*** Correlation matrix ***

fyield 1 1.000

Tclleftprun 2 0.485 1.000

Tfertclad 3 0.872 0.735 1.000

Tftotal 4 0.922 0.449 0.847 1.000

Tfnoat 5 0.953 0.525 0.911 0.909 1.000

Tn1 6 0.490 0.667 0.699 0.403 0.628 1.000

RC1 7 -0.554 -0.606 -0.766 -0.487 -0.715 -0.935 1.000

IC1 8 -0.598 -0.628 -0.803 -0.527 -0.738 -0.935 0.989 1.000

C1 9 -0.619 -0.585 -0.815 -0.569 -0.769 -0.871 0.968 0.972 1.000

DL1 10 0.664 0.415 0.772 0.598 0.816 0.762 -0.903 -0.891 -0.948

rain2 11 -0.276 0.133 -0.230 -0.240 -0.358 -0.367 0.465 0.462 0.401

Tx2 12 0.540 0.549 0.745 0.482 0.703 0.868 -0.982 -0.968 -0.948

Tn2 13 0.486 0.646 0.698 0.386 0.636 0.989 -0.965 -0.961 -0.903

HU0_2 14 0.535 0.586 0.745 0.464 0.697 0.917 -0.994 -0.982 -0.952

HU5_2 15 0.535 0.586 0.745 0.464 0.697 0.917 -0.994 -0.982 -0.952

HU10_2 16 0.526 0.583 0.736 0.452 0.688 0.913 -0.991 -0.977 -0.941

HU15_2 17 0.457 0.549 0.660 0.374 0.618 0.894 -0.960 -0.937 -0.872

Rad2 18 0.415 -0.020 0.277 0.453 0.290 -0.347 0.165 0.114 -0.020

DL2 19 0.642 0.430 0.765 0.577 0.796 0.752 -0.891 -0.877 -0.942

rain3 20 -0.340 -0.057 -0.310 -0.378 -0.450 -0.238 0.425 0.368 0.495

Tave3 21 0.472 0.458 0.676 0.436 0.667 0.840 -0.957 -0.915 -0.925

HU0_3 22 0.478 0.461 0.681 0.438 0.672 0.844 -0.959 -0.918 -0.929

HU5_3 23 0.478 0.461 0.681 0.438 0.672 0.843 -0.959 -0.918 -0.928

HU10_3 24 0.477 0.461 0.680 0.437 0.671 0.843 -0.958 -0.917 -0.927

HU15_3 25 0.466 0.456 0.672 0.428 0.662 0.836 -0.954 -0.910 -0.918

WS3 26 -0.540 -0.589 -0.764 -0.508 -0.716 -0.820 0.940 0.923 0.967

rad3 27 0.317 -0.143 0.177 0.395 0.181 -0.445 0.342 0.293 0.142

DL3 28 -0.644 -0.407 -0.758 -0.561 -0.785 -0.794 0.924 0.918 0.944

rain4 29 -0.390 -0.017 -0.349 -0.417 -0.514 -0.321 0.521 0.467 0.568

Tx4 30 0.507 0.479 0.708 0.460 0.692 0.837 -0.969 -0.936 -0.941

Tn4 31 0.469 0.539 0.686 0.415 0.655 0.919 -0.981 -0.949 -0.929

WS4 32 -0.455 -0.474 -0.685 -0.438 -0.633 -0.734 0.896 0.886 0.929

RHx4 33 -0.293 0.258 -0.046 -0.253 -0.356 -0.197 0.227 0.216 0.245

RHn4 34 -0.215 0.218 -0.141 -0.175 -0.331 -0.292 0.477 0.464 0.511

rad4 35 0.365 -0.133 0.212 0.429 0.229 -0.435 0.303 0.252 0.103

ETx4 36 0.387 0.443 0.615 0.350 0.592 0.834 -0.945 -0.897 -0.911

ETn4 37 0.527 0.666 0.668 0.455 0.601 0.827 -0.763 -0.767 -0.728

frost4 38 -0.383 -0.461 -0.566 -0.462 -0.525 -0.550 0.532 0.558 0.605

HU0_4 39 0.504 0.508 0.711 0.452 0.689 0.875 -0.981 -0.950 -0.947

HU5_4 40 0.504 0.508 0.711 0.451 0.689 0.875 -0.981 -0.949 -0.946

HU10_4 41 0.499 0.505 0.706 0.446 0.685 0.871 -0.978 -0.946 -0.941

HU15_4 42 0.471 0.484 0.679 0.420 0.662 0.859 -0.968 -0.930 -0.920

RC4 43 -0.572 -0.533 -0.759 -0.506 -0.741 -0.884 0.985 0.963 0.973

IC4 44 -0.609 -0.567 -0.791 -0.537 -0.758 -0.901 0.987 0.985 0.987

PC4 45 -0.622 -0.554 -0.801 -0.566 -0.772 -0.860 0.962 0.963 0.997

Eto4 46 0.338 -0.196 0.210 0.345 0.387 0.021 -0.283 -0.282 -0.400

DL4 47 -0.162 -0.213 -0.272 -0.039 -0.236 -0.495 0.472 0.484 0.377

Alt 48 -0.423 -0.506 -0.652 -0.355 -0.613 -0.859 0.962 0.928 0.910

Lat 49 -0.628 -0.434 -0.763 -0.565 -0.790 -0.773 0.915 0.897 0.953

Long 50 -0.222 0.342 0.051 -0.258 -0.090 0.511 -0.478 -0.433 -0.286

pH_H2O 51 0.490 0.261 0.610 0.395 0.645 0.735 -0.838 -0.832 -0.874

P 52 0.783 0.154 0.650 0.753 0.807 0.266 -0.423 -0.468 -0.561

K 53 0.189 0.188 0.363 0.095 0.280 0.457 -0.490 -0.490 -0.435

Ca 54 0.450 0.362 0.610 0.403 0.596 0.714 -0.864 -0.877 -0.878

Mg 55 0.411 -0.118 0.396 0.336 0.541 0.444 -0.642 -0.634 -0.700

Resist 56 -0.389 -0.222 -0.518 -0.453 -0.424 -0.277 0.402 0.466 0.473

APP_N 57 0.101 0.598 0.244 0.276 0.068 0.029 0.113 0.097 0.124

1 2 3 4 5 6 7 8 9

DL1 10 1.000

rain2 11 -0.465 1.000

Tx2 12 0.892 -0.513 1.000

Tn2 13 0.803 -0.424 0.919 1.000

HU0_2 14 0.883 -0.494 0.994 0.958 1.000

HU5_2 15 0.883 -0.494 0.994 0.957 1.000 1.000

HU10_2 16 0.874 -0.502 0.994 0.955 0.999 0.999 1.000

HU15_2 17 0.799 -0.537 0.974 0.940 0.980 0.980 0.986 1.000

Rad2 18 0.075 0.025 -0.110 -0.315 -0.170 -0.170 -0.186 -0.278 1.000

DL2 19 0.994 -0.406 0.874 0.791 0.867 0.867 0.857 0.776 0.053

rain3 20 -0.572 0.107 -0.443 -0.271 -0.405 -0.405 -0.400 -0.340 -0.122

Tave3 21 0.919 -0.458 0.954 0.879 0.950 0.950 0.950 0.920 -0.194

HU0_3 22 0.926 -0.461 0.954 0.883 0.951 0.951 0.951 0.918 -0.188

HU5_3 23 0.925 -0.461 0.954 0.882 0.950 0.950 0.950 0.918 -0.188

HU10_3 24 0.925 -0.460 0.953 0.881 0.950 0.950 0.950 0.918 -0.190

HU15_3 25 0.916 -0.468 0.952 0.876 0.947 0.947 0.949 0.921 -0.200

WS3 26 -0.934 0.315 -0.925 -0.858 -0.923 -0.923 -0.914 -0.849 0.031

rad3 27 -0.059 0.276 -0.338 -0.458 -0.376 -0.377 -0.396 -0.505 0.864

DL3 28 -0.973 0.572 -0.923 -0.837 -0.915 -0.915 -0.909 -0.854 -0.059

rain4 29 -0.655 0.365 -0.550 -0.366 -0.510 -0.510 -0.507 -0.461 -0.105

Tx4 30 0.925 -0.492 0.980 0.887 0.971 0.971 0.971 0.943 -0.133

Tn4 31 0.888 -0.443 0.960 0.946 0.973 0.973 0.973 0.951 -0.283

WS4 32 -0.901 0.324 -0.908 -0.786 -0.890 -0.890 -0.884 -0.824 0.018

RHx4 33 -0.308 0.515 -0.236 -0.220 -0.235 -0.234 -0.226 -0.230 -0.053

RHn4 34 -0.552 0.558 -0.544 -0.376 -0.505 -0.505 -0.499 -0.487 -0.096

rad4 35 -0.017 0.189 -0.279 -0.434 -0.327 -0.327 -0.345 -0.450 0.927

ETx4 36 0.883 -0.460 0.945 0.878 0.942 0.942 0.941 0.917 -0.201

ETn4 37 0.640 -0.308 0.698 0.797 0.739 0.738 0.732 0.704 -0.066

frost4 38 -0.537 0.076 -0.494 -0.535 -0.514 -0.513 -0.493 -0.424 -0.094

HU0_4 39 0.922 -0.478 0.979 0.917 0.978 0.979 0.978 0.950 -0.183

HU5_4 40 0.922 -0.478 0.979 0.916 0.978 0.978 0.978 0.950 -0.183

HU10_4 41 0.919 -0.479 0.978 0.914 0.977 0.977 0.977 0.951 -0.189

HU15_4 42 0.902 -0.491 0.972 0.903 0.969 0.969 0.972 0.953 -0.220

RC4 43 -0.954 0.463 -0.971 -0.922 -0.974 -0.974 -0.971 -0.926 0.117

IC4 44 -0.945 0.454 -0.969 -0.935 -0.977 -0.976 -0.970 -0.919 0.080

PC4 45 -0.959 0.404 -0.943 -0.894 -0.946 -0.946 -0.935 -0.865 -0.018

Eto4 46 0.503 -0.327 0.352 0.102 0.289 0.289 0.279 0.216 0.470

DL4 47 -0.311 0.652 -0.482 -0.523 -0.498 -0.498 -0.506 -0.555 0.073

Alt 48 -0.879 0.444 -0.966 -0.907 -0.966 -0.966 -0.969 -0.953 0.262

Lat 49 -0.995 0.435 -0.905 -0.815 -0.897 -0.896 -0.889 -0.817 -0.031

Long 50 0.131 -0.198 0.505 0.541 0.522 0.523 0.544 0.645 -0.667

pH_H2O 51 0.936 -0.545 0.814 0.771 0.817 0.817 0.808 0.740 0.003

P 52 0.687 -0.426 0.431 0.295 0.401 0.400 0.385 0.288 0.568

K 53 0.385 -0.178 0.513 0.497 0.518 0.519 0.526 0.543 -0.312

Ca 54 0.859 -0.490 0.891 0.774 0.874 0.874 0.868 0.828 -0.025

Mg 55 0.827 -0.593 0.676 0.514 0.643 0.643 0.635 0.580 0.084

Resist 56 -0.448 0.085 -0.434 -0.296 -0.404 -0.404 -0.395 -0.337 -0.151

APP_N 57 -0.253 0.509 -0.171 -0.052 -0.140 -0.141 -0.143 -0.154 -0.019

10 11 12 13 14 15 16 17 18

DL2 19 1.000

rain3 20 -0.590 1.000

Tave3 21 0.917 -0.550 1.000

HU0_3 22 0.923 -0.543 1.000 1.000

HU5_3 23 0.923 -0.545 1.000 1.000 1.000

HU10_3 24 0.922 -0.546 1.000 1.000 1.000 1.000

HU15_3 25 0.914 -0.545 0.999 0.999 0.999 0.999 1.000

WS3 26 -0.937 0.515 -0.935 -0.938 -0.938 -0.938 -0.930 1.000

rad3 27 -0.060 -0.043 -0.338 -0.331 -0.331 -0.332 -0.346 0.161 1.000

DL3 28 -0.952 0.468 -0.917 -0.923 -0.922 -0.921 -0.915 0.910 0.126

rain4 29 -0.657 0.965 -0.635 -0.630 -0.632 -0.632 -0.633 0.564 0.035

Tx4 30 0.917 -0.539 0.992 0.991 0.991 0.991 0.991 -0.938 -0.319

Tn4 31 0.884 -0.451 0.984 0.984 0.984 0.984 0.982 -0.927 -0.419

WS4 32 -0.906 0.524 -0.916 -0.916 -0.916 -0.916 -0.911 0.960 0.165

RHx4 33 -0.251 0.421 -0.227 -0.228 -0.229 -0.227 -0.220 0.165 0.068

RHn4 34 -0.513 0.536 -0.538 -0.534 -0.534 -0.533 -0.529 0.473 0.118

rad4 35 -0.026 -0.076 -0.305 -0.299 -0.299 -0.300 -0.312 0.135 0.987

ETx4 36 0.872 -0.509 0.980 0.980 0.980 0.980 0.978 -0.928 -0.362

ETn4 37 0.627 -0.129 0.670 0.676 0.674 0.673 0.668 -0.667 -0.229

frost4 38 -0.537 0.131 -0.477 -0.478 -0.478 -0.477 -0.470 0.559 -0.072

HU0_4 39 0.915 -0.504 0.994 0.994 0.994 0.994 0.993 -0.943 -0.349

HU5_4 40 0.915 -0.506 0.994 0.994 0.994 0.994 0.993 -0.943 -0.350

HU10_4 41 0.912 -0.507 0.994 0.994 0.994 0.994 0.994 -0.940 -0.356

HU15_4 42 0.895 -0.507 0.995 0.994 0.994 0.994 0.995 -0.924 -0.388

RC4 43 -0.949 0.508 -0.978 -0.981 -0.981 -0.980 -0.976 0.963 0.272

IC4 44 -0.936 0.459 -0.945 -0.949 -0.949 -0.948 -0.940 0.958 0.242

PC4 45 -0.955 0.510 -0.927 -0.932 -0.932 -0.931 -0.920 0.969 0.138

Eto4 46 0.488 -0.599 0.378 0.377 0.378 0.377 0.371 -0.407 0.312

DL4 47 -0.255 -0.248 -0.396 -0.400 -0.398 -0.397 -0.406 0.279 0.308

Alt 48 -0.878 0.441 -0.980 -0.979 -0.979 -0.979 -0.980 0.925 0.429

Lat 49 -0.996 0.571 -0.937 -0.943 -0.943 -0.942 -0.935 0.950 0.099

Long 50 0.130 0.071 0.476 0.464 0.464 0.466 0.482 -0.325 -0.805

pH_H2O 51 0.921 -0.404 0.853 0.863 0.862 0.861 0.852 -0.846 -0.108

P 52 0.655 -0.364 0.398 0.410 0.409 0.408 0.394 -0.522 0.457

K 53 0.401 -0.195 0.510 0.500 0.500 0.501 0.511 -0.408 -0.271

Ca 54 0.844 -0.360 0.856 0.857 0.857 0.856 0.851 -0.871 -0.238

Mg 55 0.808 -0.507 0.719 0.724 0.724 0.722 0.715 -0.683 -0.033

Resist 56 -0.459 0.050 -0.402 -0.400 -0.399 -0.399 -0.393 0.501 -0.185

APP_N 57 -0.230 0.181 -0.204 -0.208 -0.207 -0.205 -0.206 0.089 0.093

	19	20	21	22	23	24	25	26	27
DL3	28	1.000							
rain4	29	0.588	1.000						
Tx4	30	-0.932	-0.634	1.000					
Tn4	31	-0.897	-0.539	0.976	1.000				
WS4	32	0.892	0.574	-0.925	-0.890	1.000			
RHx4	33	0.310	0.533	-0.241	-0.207	0.104	1.000		
RHn4	34	0.564	0.650	-0.564	-0.476	0.547	0.728	1.000	
rad4	35	0.069	-0.018	-0.272	-0.394	0.132	0.013	0.050	1.000

ETx4 36 -0.893 -0.598 0.974 0.967 -0.892 -0.272 -0.566 -0.327 1.000

ETn4 37 -0.720 -0.203 0.667 0.731 -0.594 -0.046 -0.092 -0.197 0.649

frost4 38 0.553 0.141 -0.484 -0.496 0.558 0.089 0.160 -0.077 -0.456

HU0_4 39 -0.930 -0.598 0.996 0.990 -0.919 -0.231 -0.532 -0.310 0.976

HU5_4 40 -0.930 -0.599 0.996 0.990 -0.919 -0.231 -0.532 -0.311 0.976

HU10_4 41 -0.927 -0.601 0.997 0.990 -0.917 -0.227 -0.530 -0.317 0.976

HU15_4 42 -0.913 -0.604 0.995 0.988 -0.906 -0.225 -0.531 -0.348 0.976

RC4 43 0.952 0.597 -0.983 -0.978 0.923 0.249 0.521 0.235 -0.959

IC4 44 0.946 0.549 -0.960 -0.959 0.914 0.254 0.517 0.204 -0.928

PC4 45 0.946 0.583 -0.942 -0.928 0.924 0.263 0.527 0.100 -0.913

Eto4 46 -0.452 -0.645 0.402 0.272 -0.507 -0.477 -0.823 0.366 0.353

DL4 47 0.461 -0.059 -0.427 -0.439 0.278 0.222 0.301 0.244 -0.435

Alt 48 0.893 0.529 -0.981 -0.983 0.923 0.141 0.498 0.394 -0.959

Lat 49 0.967 0.647 -0.941 -0.907 0.923 0.258 0.531 0.060 -0.901

Long 50 -0.219 0.011 0.473 0.542 -0.371 0.166 -0.139 -0.797 0.498

pH_H2O 51 -0.944 -0.520 0.850 0.832 -0.827 -0.281 -0.539 -0.075 0.838

P 52 -0.651 -0.450 0.431 0.341 -0.487 -0.456 -0.442 0.516 0.355

K 53 -0.393 -0.228 0.527 0.515 -0.448 -0.021 -0.303 -0.278 0.463

Ca 54 -0.894 -0.465 0.878 0.847 -0.938 -0.164 -0.620 -0.187 0.830

Mg 55 -0.818 -0.629 0.726 0.649 -0.744 -0.461 -0.789 0.016 0.695

Resist 56 0.449 0.067 -0.414 -0.386 0.623 -0.234 0.206 -0.175 -0.321

APP_N 57 0.305 0.302 -0.216 -0.140 0.210 0.426 0.706 0.044 -0.221

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 -0.640 1.000

HU0_4 39 0.699 -0.497 1.000

HU5_4 40 0.697 -0.496 1.000 1.000

HU10_4 41 0.693 -0.487 1.000 1.000 1.000

HU15_4 42 0.681 -0.466 0.997 0.997 0.998 1.000

RC4 43 -0.710 0.517 -0.990 -0.990 -0.988 -0.978 1.000

IC4 44 -0.717 0.529 -0.969 -0.969 -0.965 -0.949 0.989 1.000

PC4 45 -0.702 0.571 -0.947 -0.947 -0.942 -0.920 0.977 0.989 1.000

Eto4 46 -0.034 -0.103 0.356 0.356 0.355 0.346 -0.373 -0.366 -0.420

DL4 47 -0.535 0.293 -0.436 -0.435 -0.436 -0.447 0.401 0.400 0.343

Alt 48 -0.679 0.466 -0.987 -0.987 -0.988 -0.989 0.966 0.941 0.909

Lat 49 -0.646 0.537 -0.938 -0.938 -0.936 -0.921 0.965 0.951 0.964

Long 50 0.336 -0.052 0.490 0.490 0.498 0.529 -0.392 -0.362 -0.262

pH_H2O 51 0.639 -0.499 0.856 0.856 0.852 0.837 -0.883 -0.878 -0.887

P 52 0.286 -0.373 0.412 0.412 0.406 0.375 -0.493 -0.520 -0.573

K 53 0.162 -0.239 0.523 0.523 0.526 0.536 -0.476 -0.472 -0.426

Ca 54 0.596 -0.499 0.874 0.874 0.871 0.860 -0.876 -0.887 -0.878

Mg 55 0.277 -0.280 0.706 0.706 0.704 0.695 -0.727 -0.714 -0.729

Resist 56 -0.228 0.369 -0.409 -0.409 -0.405 -0.389 0.416 0.455 0.464

APP_N 57 0.107 -0.183 -0.190 -0.189 -0.190 -0.201 0.179 0.157 0.152

37 38 39 40 41 42 43 44 45

Eto4 46 1.000

DL4 47 -0.038 1.000

Alt 48 -0.319 0.445 1.000

Lat 49 -0.477 0.295 0.905 1.000

Long 50 -0.174 -0.466 -0.584 -0.185 1.000

pH_H2O 51 0.429 -0.428 -0.823 -0.925 0.136 1.000

P 52 0.609 -0.163 -0.328 -0.639 -0.462 0.602 1.000

K 53 0.106 -0.293 -0.547 -0.402 0.497 0.359 -0.039 1.000

Ca 54 0.530 -0.409 -0.888 -0.869 0.394 0.842 0.507 0.394 1.000

Mg 55 0.706 -0.246 -0.680 -0.815 0.015 0.850 0.653 0.325 0.800

Resist 56 -0.375 0.058 0.446 0.467 -0.140 -0.391 -0.405 -0.366 -0.654

APP_N 57 -0.568 0.304 0.209 0.241 -0.023 -0.415 -0.198 -0.215 -0.352

46 47 48 49 50 51 52 53 54

Mg 55 1.000

Resist 56 -0.453 1.000

APP_N 57 -0.688 0.073 1.000

55 56 57

===== Correlations for Cultivar 10 =====

*** Degrees of freedom ***

Correlations: 19

*** Correlation matrix ***

fyield 1 1.000

Tcllefprun 2 0.534 1.000

Tfertclad 3 0.803 0.842 1.000

Tftotal 4 0.925 0.433 0.691 1.000

Tfnoat 5 0.984 0.606 0.825 0.921 1.000

Tn1 6 -0.105 0.066 -0.045 -0.193 -0.101 1.000

RC1 7 0.134 0.125 0.146 0.222 0.167 -0.935 1.000

IC1 8 0.118 0.092 0.118 0.212 0.157 -0.935 0.989 1.000

C1 9 0.046 0.162 0.123 0.149 0.093 -0.871 0.968 0.972 1.000

DL1 10 -0.074 -0.382 -0.258 -0.138 -0.133 0.762 -0.903 -0.891 -0.948

rain2 11 0.359 0.493 0.541 0.309 0.406 -0.367 0.465 0.462 0.401

Tx2 12 -0.189 -0.189 -0.198 -0.271 -0.236 0.868 -0.982 -0.968 -0.948

Tn2 13 -0.188 -0.009 -0.123 -0.275 -0.192 0.989 -0.965 -0.961 -0.903

HU0_2 14 -0.191 -0.142 -0.179 -0.275 -0.225 0.917 -0.994 -0.982 -0.952

HU5_2 15 -0.192 -0.143 -0.180 -0.276 -0.226 0.917 -0.994 -0.982 -0.952

HU10_2 16 -0.203 -0.145 -0.182 -0.285 -0.237 0.913 -0.991 -0.977 -0.941

HU15_2 17 -0.268 -0.131 -0.207 -0.340 -0.294 0.894 -0.960 -0.937 -0.872

Rad2 18 0.404 -0.111 0.172 0.295 0.296 -0.347 0.165 0.114 -0.020

DL2 19 -0.074 -0.370 -0.240 -0.129 -0.127 0.752 -0.891 -0.877 -0.942

rain3 20 -0.191 0.317 0.092 -0.203 -0.168 -0.238 0.425 0.368 0.495

Tave3 21 -0.154 -0.278 -0.243 -0.212 -0.191 0.840 -0.957 -0.915 -0.925

HU0_3 22 -0.154 -0.282 -0.247 -0.213 -0.191 0.844 -0.959 -0.918 -0.929

HU5_3 23 -0.153 -0.282 -0.246 -0.212 -0.190 0.843 -0.959 -0.918 -0.928

HU10_3 24 -0.154 -0.281 -0.246 -0.212 -0.191 0.843 -0.958 -0.917 -0.927

HU15_3 25 -0.163 -0.283 -0.248 -0.220 -0.199 0.836 -0.954 -0.910 -0.918

WS3 26 0.035 0.139 0.096 0.134 0.069 -0.820 0.940 0.923 0.967

rad3 27 0.544 -0.057 0.300 0.506 0.461 -0.445 0.342 0.293 0.142

DL3 28 0.151 0.388 0.292 0.245 0.215 -0.794 0.924 0.918 0.944

rain4 29 -0.087 0.424 0.226 -0.111 -0.053 -0.321 0.521 0.467 0.568

Tx4 30 -0.178 -0.278 -0.245 -0.245 -0.223 0.837 -0.969 -0.936 -0.941

Tn4 31 -0.172 -0.172 -0.200 -0.233 -0.192 0.919 -0.981 -0.949 -0.929

WS4 32 0.134 0.245 0.179 0.232 0.180 -0.734 0.896 0.886 0.929

RHx4 33 -0.014 0.362 0.384 -0.045 -0.018 -0.197 0.227 0.216 0.245

RHn4 34 0.295 0.607 0.612 0.288 0.339 -0.292 0.477 0.464 0.511

rad4 35 0.507 -0.102 0.254 0.452 0.412 -0.435 0.303 0.252 0.103

ETx4 36 -0.170 -0.250 -0.262 -0.252 -0.204 0.834 -0.945 -0.897 -0.911

ETn4 37 0.028 0.113 0.072 -0.154 0.021 0.827 -0.763 -0.767 -0.728

frost4 38 -0.140 -0.105 -0.141 0.040 -0.130 -0.550 0.532 0.558 0.605

HU0_4 39 -0.176 -0.241 -0.230 -0.243 -0.213 0.875 -0.981 -0.950 -0.947

HU5_4 40 -0.176 -0.242 -0.230 -0.242 -0.212 0.875 -0.981 -0.949 -0.946

HU10_4 41 -0.179 -0.244 -0.231 -0.244 -0.216 0.871 -0.978 -0.946 -0.941

HU15_4 42 -0.196 -0.254 -0.244 -0.257 -0.231 0.859 -0.968 -0.930 -0.920

RC4 43 0.133 0.238 0.205 0.202 0.173 -0.884 0.985 0.963 0.973

IC4 44 0.125 0.191 0.183 0.195 0.167 -0.901 0.987 0.985 0.987

PC4 45 0.068 0.202 0.164 0.150 0.114 -0.860 0.962 0.963 0.997

Eto4 46 -0.021 -0.565 -0.388 -0.017 -0.086 0.021 -0.283 -0.282 -0.400

DL4 47 0.312 0.138 0.276 0.485 0.347 -0.495 0.472 0.484 0.377

Alt 48 0.268 0.237 0.256 0.333 0.294 -0.859 0.962 0.928 0.910

Lat 49 0.100 0.369 0.255 0.160 0.154 -0.773 0.915 0.897 0.953

Long	50	-0.429	0.158	-0.105	-0.466	-0.385	0.511	-0.478	-0.433	-0.286
pH_H2O	51	-0.274	-0.493	-0.452	-0.339	-0.327	0.735	-0.838	-0.832	-0.874
P	52	0.257	-0.347	-0.097	0.202	0.174	0.266	-0.423	-0.468	-0.561
K	53	-0.342	-0.202	-0.155	-0.317	-0.358	0.457	-0.490	-0.490	-0.435
Ca	54	-0.298	-0.340	-0.344	-0.371	-0.345	0.714	-0.864	-0.877	-0.878
Mg	55	-0.346	-0.770	-0.652	-0.313	-0.420	0.444	-0.642	-0.634	-0.700
Resist	56	-0.017	0.122	-0.041	-0.022	0.035	-0.277	0.402	0.466	0.473
APP_N	57	0.665	0.894	0.885	0.614	0.710	0.029	0.113	0.097	0.124

		1	2	3	4	5	6	7	8	9
DL1	10	1.000								
rain2	11	-0.465	1.000							
Tx2	12	0.892	-0.513	1.000						
Tn2	13	0.803	-0.424	0.919	1.000					
HU0_2	14	0.883	-0.494	0.994	0.958	1.000				
HU5_2	15	0.883	-0.494	0.994	0.957	1.000	1.000			
HU10_2	16	0.874	-0.502	0.994	0.955	0.999	0.999	1.000		
HU15_2	17	0.799	-0.537	0.974	0.940	0.980	0.980	0.986	1.000	
Rad2	18	0.075	0.025	-0.110	-0.315	-0.170	-0.170	-0.186	-0.278	1.000
DL2	19	0.994	-0.406	0.874	0.791	0.867	0.867	0.857	0.776	0.053
rain3	20	-0.572	0.107	-0.443	-0.271	-0.405	-0.405	-0.400	-0.340	-0.122
Tave3	21	0.919	-0.458	0.954	0.879	0.950	0.950	0.950	0.920	-0.194
HU0_3	22	0.926	-0.461	0.954	0.883	0.951	0.951	0.951	0.918	-0.188
HU5_3	23	0.925	-0.461	0.954	0.882	0.950	0.950	0.950	0.918	-0.188
HU10_3	24	0.925	-0.460	0.953	0.881	0.950	0.950	0.950	0.918	-0.190
HU15_3	25	0.916	-0.468	0.952	0.876	0.947	0.947	0.949	0.921	-0.200
WS3	26	-0.934	0.315	-0.925	-0.858	-0.923	-0.923	-0.914	-0.849	0.031
rad3	27	-0.059	0.276	-0.338	-0.458	-0.376	-0.377	-0.396	-0.505	0.864
DL3	28	-0.973	0.572	-0.923	-0.837	-0.915	-0.915	-0.909	-0.854	-0.059
rain4	29	-0.655	0.365	-0.550	-0.366	-0.510	-0.510	-0.507	-0.461	-0.105
Tx4	30	0.925	-0.492	0.980	0.887	0.971	0.971	0.971	0.943	-0.133

Tn4 31 0.888 -0.443 0.960 0.946 0.973 0.973 0.973 0.951 -0.283

WS4 32 -0.901 0.324 -0.908 -0.786 -0.890 -0.890 -0.884 -0.824 0.018

RHx4 33 -0.308 0.515 -0.236 -0.220 -0.235 -0.234 -0.226 -0.230 -0.053

RHn4 34 -0.552 0.558 -0.544 -0.376 -0.505 -0.505 -0.499 -0.487 -0.096

rad4 35 -0.017 0.189 -0.279 -0.434 -0.327 -0.327 -0.345 -0.450 0.927

ETx4 36 0.883 -0.460 0.945 0.878 0.942 0.942 0.941 0.917 -0.201

ETn4 37 0.640 -0.308 0.698 0.797 0.739 0.738 0.732 0.704 -0.066

frost4 38 -0.537 0.076 -0.494 -0.535 -0.514 -0.513 -0.493 -0.424 -0.094

HU0_4 39 0.922 -0.478 0.979 0.917 0.978 0.979 0.978 0.950 -0.183

HU5_4 40 0.922 -0.478 0.979 0.916 0.978 0.978 0.978 0.950 -0.183

HU10_4 41 0.919 -0.479 0.978 0.914 0.977 0.977 0.977 0.951 -0.189

HU15_4 42 0.902 -0.491 0.972 0.903 0.969 0.969 0.972 0.953 -0.220

RC4 43 -0.954 0.463 -0.971 -0.922 -0.974 -0.974 -0.971 -0.926 0.117

IC4 44 -0.945 0.454 -0.969 -0.935 -0.977 -0.976 -0.970 -0.919 0.080

PC4 45 -0.959 0.404 -0.943 -0.894 -0.946 -0.946 -0.935 -0.865 -0.018

Eto4 46 0.503 -0.327 0.352 0.102 0.289 0.289 0.279 0.216 0.470

DL4 47 -0.311 0.652 -0.482 -0.523 -0.498 -0.498 -0.506 -0.555 0.073

Alt 48 -0.879 0.444 -0.966 -0.907 -0.966 -0.966 -0.969 -0.953 0.262

Lat 49 -0.995 0.435 -0.905 -0.815 -0.897 -0.896 -0.889 -0.817 -0.031

Long 50 0.131 -0.198 0.505 0.541 0.522 0.523 0.544 0.645 -0.667

pH_H2O 51 0.936 -0.545 0.814 0.771 0.817 0.817 0.808 0.740 0.003

P 52 0.687 -0.426 0.431 0.295 0.401 0.400 0.385 0.288 0.568

K 53 0.385 -0.178 0.513 0.497 0.518 0.519 0.526 0.543 -0.312

Ca 54 0.859 -0.490 0.891 0.774 0.874 0.874 0.868 0.828 -0.025

Mg 55 0.827 -0.593 0.676 0.514 0.643 0.643 0.635 0.580 0.084

Resist 56 -0.448 0.085 -0.434 -0.296 -0.404 -0.404 -0.395 -0.337 -0.151

APP_N 57 -0.253 0.509 -0.171 -0.052 -0.140 -0.141 -0.143 -0.154 -0.019

10 11 12 13 14 15 16 17 18

DL2 19 1.000

rain3 20 -0.590 1.000

Tave3 21 0.917 -0.550 1.000

HU0_3 22 0.923 -0.543 1.000 1.000

HU5_3 23 0.923 -0.545 1.000 1.000 1.000

HU10_3 24 0.922 -0.546 1.000 1.000 1.000 1.000

HU15_3 25 0.914 -0.545 0.999 0.999 0.999 0.999 1.000

WS3 26 -0.937 0.515 -0.935 -0.938 -0.938 -0.938 -0.930 1.000

rad3 27 -0.060 -0.043 -0.338 -0.331 -0.331 -0.332 -0.346 0.161 1.000

DL3 28 -0.952 0.468 -0.917 -0.923 -0.922 -0.921 -0.915 0.910 0.126

rain4 29 -0.657 0.965 -0.635 -0.630 -0.632 -0.632 -0.633 0.564 0.035

Tx4 30 0.917 -0.539 0.992 0.991 0.991 0.991 0.991 -0.938 -0.319

Tn4 31 0.884 -0.451 0.984 0.984 0.984 0.984 0.982 -0.927 -0.419

WS4 32 -0.906 0.524 -0.916 -0.916 -0.916 -0.916 -0.911 0.960 0.165

RHx4 33 -0.251 0.421 -0.227 -0.228 -0.229 -0.227 -0.220 0.165 0.068

RHn4 34 -0.513 0.536 -0.538 -0.534 -0.534 -0.533 -0.529 0.473 0.118

rad4 35 -0.026 -0.076 -0.305 -0.299 -0.299 -0.300 -0.312 0.135 0.987

ETx4 36 0.872 -0.509 0.980 0.980 0.980 0.980 0.978 -0.928 -0.362

ETn4 37 0.627 -0.129 0.670 0.676 0.674 0.673 0.668 -0.667 -0.229

frost4 38 -0.537 0.131 -0.477 -0.478 -0.478 -0.477 -0.470 0.559 -0.072

HU0_4 39 0.915 -0.504 0.994 0.994 0.994 0.994 0.993 -0.943 -0.349

HU5_4 40 0.915 -0.506 0.994 0.994 0.994 0.994 0.993 -0.943 -0.350

HU10_4 41 0.912 -0.507 0.994 0.994 0.994 0.994 0.994 -0.940 -0.356

HU15_4 42 0.895 -0.507 0.995 0.994 0.994 0.994 0.995 -0.924 -0.388

RC4 43 -0.949 0.508 -0.978 -0.981 -0.981 -0.980 -0.976 0.963 0.272

IC4 44 -0.936 0.459 -0.945 -0.949 -0.949 -0.948 -0.940 0.958 0.242

PC4 45 -0.955 0.510 -0.927 -0.932 -0.932 -0.931 -0.920 0.969 0.138

Eto4 46 0.488 -0.599 0.378 0.377 0.378 0.377 0.371 -0.407 0.312

DL4 47 -0.255 -0.248 -0.396 -0.400 -0.398 -0.397 -0.406 0.279 0.308

Alt 48 -0.878 0.441 -0.980 -0.979 -0.979 -0.979 -0.980 0.925 0.429

Lat 49 -0.996 0.571 -0.937 -0.943 -0.943 -0.942 -0.935 0.950 0.099

Long 50 0.130 0.071 0.476 0.464 0.464 0.466 0.482 -0.325 -0.805

pH_H2O 51 0.921 -0.404 0.853 0.863 0.862 0.861 0.852 -0.846 -0.108

P 52 0.655 -0.364 0.398 0.410 0.409 0.408 0.394 -0.522 0.457

K	53	0.401	-0.195	0.510	0.500	0.500	0.501	0.511	-0.408	-0.271
Ca	54	0.844	-0.360	0.856	0.857	0.857	0.856	0.851	-0.871	-0.238
Mg	55	0.808	-0.507	0.719	0.724	0.724	0.722	0.715	-0.683	-0.033
Resist	56	-0.459	0.050	-0.402	-0.400	-0.399	-0.399	-0.393	0.501	-0.185
APP_N	57	-0.230	0.181	-0.204	-0.208	-0.207	-0.205	-0.206	0.089	0.093

	19	20	21	22	23	24	25	26	27
DL3	28	1.000							
rain4	29	0.588	1.000						
Tx4	30	-0.932	-0.634	1.000					
Tn4	31	-0.897	-0.539	0.976	1.000				
WS4	32	0.892	0.574	-0.925	-0.890	1.000			
RHx4	33	0.310	0.533	-0.241	-0.207	0.104	1.000		
RHn4	34	0.564	0.650	-0.564	-0.476	0.547	0.728	1.000	
rad4	35	0.069	-0.018	-0.272	-0.394	0.132	0.013	0.050	1.000
ETx4	36	-0.893	-0.598	0.974	0.967	-0.892	-0.272	-0.566	-0.327	1.000
ETn4	37	-0.720	-0.203	0.667	0.731	-0.594	-0.046	-0.092	-0.197	0.649
frost4	38	0.553	0.141	-0.484	-0.496	0.558	0.089	0.160	-0.077	-0.456
HU0_4	39	-0.930	-0.598	0.996	0.990	-0.919	-0.231	-0.532	-0.310	0.976
HU5_4	40	-0.930	-0.599	0.996	0.990	-0.919	-0.231	-0.532	-0.311	0.976
HU10_4	41	-0.927	-0.601	0.997	0.990	-0.917	-0.227	-0.530	-0.317	0.976
HU15_4	42	-0.913	-0.604	0.995	0.988	-0.906	-0.225	-0.531	-0.348	0.976
RC4	43	0.952	0.597	-0.983	-0.978	0.923	0.249	0.521	0.235	-0.959
IC4	44	0.946	0.549	-0.960	-0.959	0.914	0.254	0.517	0.204	-0.928
PC4	45	0.946	0.583	-0.942	-0.928	0.924	0.263	0.527	0.100	-0.913
Eto4	46	-0.452	-0.645	0.402	0.272	-0.507	-0.477	-0.823	0.366	0.353
DL4	47	0.461	-0.059	-0.427	-0.439	0.278	0.222	0.301	0.244	-0.435
Alt	48	0.893	0.529	-0.981	-0.983	0.923	0.141	0.498	0.394	-0.959
Lat	49	0.967	0.647	-0.941	-0.907	0.923	0.258	0.531	0.060	-0.901
Long	50	-0.219	0.011	0.473	0.542	-0.371	0.166	-0.139	-0.797	0.498
pH_H2O	51	-0.944	-0.520	0.850	0.832	-0.827	-0.281	-0.539	-0.075	0.838

P 52 -0.651 -0.450 0.431 0.341 -0.487 -0.456 -0.442 0.516 0.355

K 53 -0.393 -0.228 0.527 0.515 -0.448 -0.021 -0.303 -0.278 0.463

Ca 54 -0.894 -0.465 0.878 0.847 -0.938 -0.164 -0.620 -0.187 0.830

Mg 55 -0.818 -0.629 0.726 0.649 -0.744 -0.461 -0.789 0.016 0.695

Resist 56 0.449 0.067 -0.414 -0.386 0.623 -0.234 0.206 -0.175 -0.321

APP_N 57 0.305 0.302 -0.216 -0.140 0.210 0.426 0.706 0.044 -0.221

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 -0.640 1.000

HU0_4 39 0.699 -0.497 1.000

HU5_4 40 0.697 -0.496 1.000 1.000

HU10_4 41 0.693 -0.487 1.000 1.000 1.000

HU15_4 42 0.681 -0.466 0.997 0.997 0.998 1.000

RC4 43 -0.710 0.517 -0.990 -0.990 -0.988 -0.978 1.000

IC4 44 -0.717 0.529 -0.969 -0.969 -0.965 -0.949 0.989 1.000

PC4 45 -0.702 0.571 -0.947 -0.947 -0.942 -0.920 0.977 0.989 1.000

Eto4 46 -0.034 -0.103 0.356 0.356 0.355 0.346 -0.373 -0.366 -0.420

DL4 47 -0.535 0.293 -0.436 -0.435 -0.436 -0.447 0.401 0.400 0.343

Alt 48 -0.679 0.466 -0.987 -0.987 -0.988 -0.989 0.966 0.941 0.909

Lat 49 -0.646 0.537 -0.938 -0.938 -0.936 -0.921 0.965 0.951 0.964

Long 50 0.336 -0.052 0.490 0.490 0.498 0.529 -0.392 -0.362 -0.262

pH_H2O 51 0.639 -0.499 0.856 0.856 0.852 0.837 -0.883 -0.878 -0.887

P 52 0.286 -0.373 0.412 0.412 0.406 0.375 -0.493 -0.520 -0.573

K 53 0.162 -0.239 0.523 0.523 0.526 0.536 -0.476 -0.472 -0.426

Ca 54 0.596 -0.499 0.874 0.874 0.871 0.860 -0.876 -0.887 -0.878

Mg 55 0.277 -0.280 0.706 0.706 0.704 0.695 -0.727 -0.714 -0.729

Resist 56 -0.228 0.369 -0.409 -0.409 -0.405 -0.389 0.416 0.455 0.464

APP_N 57 0.107 -0.183 -0.190 -0.189 -0.190 -0.201 0.179 0.157 0.152

37 38 39 40 41 42 43 44 45

Eto4 46 1.000

DL4 47 -0.038 1.000

Alt 48 -0.319 0.445 1.000

Lat 49 -0.477 0.295 0.905 1.000

Long 50 -0.174 -0.466 -0.584 -0.185 1.000

pH_H2O 51 0.429 -0.428 -0.823 -0.925 0.136 1.000

P 52 0.609 -0.163 -0.328 -0.639 -0.462 0.602 1.000

K 53 0.106 -0.293 -0.547 -0.402 0.497 0.359 -0.039 1.000

Ca 54 0.530 -0.409 -0.888 -0.869 0.394 0.842 0.507 0.394 1.000

Mg 55 0.706 -0.246 -0.680 -0.815 0.015 0.850 0.653 0.325 0.800

Resist 56 -0.375 0.058 0.446 0.467 -0.140 -0.391 -0.405 -0.366 -0.654

APP_N 57 -0.568 0.304 0.209 0.241 -0.023 -0.415 -0.198 -0.215 -0.352

46 47 48 49 50 51 52 53 54

Mg 55 1.000

Resist 56 -0.453 1.000

APP_N 57 -0.688 0.073 1.000

55 56 57

===== Correlations for Cultivar 11 =====

*** Degrees of freedom ***

Correlations: 19

*** Correlation matrix ***

fyield 1 1.000

Tclleftprun 2 0.466 1.000

Tfertclad 3 0.834 0.797 1.000

Tftotal 4 0.886 0.302 0.698 1.000

Tfnoat 5 0.954 0.514 0.849 0.905 1.000

Tn1 6 0.538 0.718 0.738 0.438 0.662 1.000

RC1 7 -0.620 -0.662 -0.784 -0.578 -0.759 -0.935 1.000

IC1 8 -0.658 -0.668 -0.804 -0.590 -0.773 -0.935 0.989 1.000

C1 9 -0.666 -0.604 -0.770 -0.658 -0.790 -0.871 0.968 0.972 1.000

DL1 10 0.713 0.436 0.726 0.729 0.833 0.762 -0.903 -0.891 -0.948

rain2 11 -0.347 0.060 -0.246 -0.295 -0.419 -0.367 0.465 0.462 0.401

Tx2 12 0.622 0.616 0.767 0.586 0.760 0.868 -0.982 -0.968 -0.948

Tn2 13 0.547 0.704 0.740 0.440 0.678 0.989 -0.965 -0.961 -0.903

HU0_2 14 0.612 0.651 0.773 0.556 0.750 0.917 -0.994 -0.982 -0.952

HU5_2 15 0.612 0.651 0.773 0.556 0.750 0.917 -0.994 -0.982 -0.952

HU10_2 16 0.605 0.652 0.772 0.545 0.743 0.913 -0.991 -0.977 -0.941

HU15_2 17 0.551 0.641 0.733 0.466 0.691 0.894 -0.960 -0.937 -0.872

Rad2 18 0.314 -0.168 0.045 0.365 0.175 -0.347 0.165 0.114 -0.020

DL2 19 0.686 0.449 0.724 0.715 0.811 0.752 -0.891 -0.877 -0.942

rain3 20 -0.337 -0.056 -0.223 -0.543 -0.450 -0.238 0.425 0.368 0.495

Tave3 21 0.550 0.537 0.705 0.597 0.730 0.840 -0.957 -0.915 -0.925

HU0_3 22 0.555 0.538 0.709 0.597 0.733 0.844 -0.959 -0.918 -0.929

HU5_3 23 0.555 0.538 0.709 0.598 0.733 0.843 -0.959 -0.918 -0.928

HU10_3 24 0.554 0.538 0.708 0.597 0.732 0.843 -0.958 -0.917 -0.927

HU15_3 25 0.544 0.536 0.705 0.588 0.725 0.836 -0.954 -0.910 -0.918

WS3 26 -0.607 -0.628 -0.743 -0.625 -0.752 -0.820 0.940 0.923 0.967

rad3 27 0.184 -0.313 -0.096 0.308 0.031 -0.445 0.342 0.293 0.142

DL3 28 -0.700 -0.439 -0.731 -0.674 -0.816 -0.794 0.924 0.918 0.944

rain4 29 -0.406 -0.037 -0.273 -0.586 -0.531 -0.321 0.521 0.467 0.568

Tx4 30 0.585 0.550 0.728 0.605 0.750 0.837 -0.969 -0.936 -0.941

Tn4 31 0.547 0.620 0.732 0.546 0.718 0.919 -0.981 -0.949 -0.929

WS4 32 -0.536 -0.520 -0.668 -0.589 -0.689 -0.734 0.896 0.886 0.929

RHx4 33 -0.340 0.227 0.028 -0.348 -0.401 -0.197 0.227 0.216 0.245

RHn4 34 -0.300 0.152 -0.078 -0.391 -0.420 -0.292 0.477 0.464 0.511

rad4 35 0.240 -0.300 -0.056 0.341 0.085 -0.435 0.303 0.252 0.103

ETx4 36 0.475 0.531 0.648 0.514 0.665 0.834 -0.945 -0.897 -0.911

ETn4 37 0.518 0.670 0.679 0.425 0.606 0.827 -0.763 -0.767 -0.728

frost4 38 -0.408 -0.415 -0.475 -0.458 -0.543 -0.550 0.532 0.558 0.605

HU0_4 39 0.582 0.581 0.738 0.590 0.748 0.875 -0.981 -0.950 -0.947

HU5_4 40 0.582 0.581 0.738 0.590 0.748 0.875 -0.981 -0.949 -0.946

HU10_4 41 0.578 0.580 0.737 0.586 0.744 0.871 -0.978 -0.946 -0.941

HU15_4 42 0.554 0.568 0.721 0.567 0.728 0.859 -0.968 -0.930 -0.920

RC4 43 -0.638 -0.587 -0.765 -0.632 -0.782 -0.884 0.985 0.963 0.973

IC4 44 -0.668 -0.608 -0.778 -0.635 -0.790 -0.901 0.987 0.985 0.987

PC4 45 -0.669 -0.576 -0.755 -0.666 -0.791 -0.860 0.962 0.963 0.997

Eto4 46 0.361 -0.202 0.064 0.528 0.409 0.021 -0.283 -0.282 -0.400

DL4 47 -0.210 -0.268 -0.329 -0.027 -0.283 -0.495 0.472 0.484 0.377

Alt 48 -0.516 -0.596 -0.714 -0.505 -0.687 -0.859 0.962 0.928 0.910

Lat 49 -0.683 -0.464 -0.731 -0.706 -0.813 -0.773 0.915 0.897 0.953

Long 50 -0.112 0.494 0.256 -0.181 0.037 0.511 -0.478 -0.433 -0.286

pH_H2O 51 0.526 0.283 0.554 0.522 0.656 0.735 -0.838 -0.832 -0.874

P 52 0.798 0.094 0.510 0.775 0.770 0.266 -0.423 -0.468 -0.561

K 53 0.232 0.234 0.372 0.167 0.309 0.457 -0.490 -0.490 -0.435

Ca 54 0.545 0.424 0.619 0.546 0.674 0.714 -0.864 -0.877 -0.878

Mg 55 0.488 -0.067 0.344 0.558 0.594 0.444 -0.642 -0.634 -0.700

Resist 56 -0.445 -0.230 -0.466 -0.509 -0.459 -0.277 0.402 0.466 0.473

APP_N 57 0.061 0.539 0.265 0.064 0.019 0.029 0.113 0.097 0.124

1 2 3 4 5 6 7 8 9

DL1 10 1.000

rain2 11 -0.465 1.000

Tx2 12 0.892 -0.513 1.000

Tn2 13 0.803 -0.424 0.919 1.000

HU0_2 14 0.883 -0.494 0.994 0.958 1.000

HU5_2 15 0.883 -0.494 0.994 0.957 1.000 1.000

HU10_2 16 0.874 -0.502 0.994 0.955 0.999 0.999 1.000

HU15_2 17 0.799 -0.537 0.974 0.940 0.980 0.980 0.986 1.000

Rad2 18 0.075 0.025 -0.110 -0.315 -0.170 -0.170 -0.186 -0.278 1.000

DL2 19 0.994 -0.406 0.874 0.791 0.867 0.867 0.857 0.776 0.053

rain3 20 -0.572 0.107 -0.443 -0.271 -0.405 -0.405 -0.400 -0.340 -0.122

Tave3 21 0.919 -0.458 0.954 0.879 0.950 0.950 0.950 0.920 -0.194

HU0_3 22 0.926 -0.461 0.954 0.883 0.951 0.951 0.951 0.918 -0.188

HU5_3 23 0.925 -0.461 0.954 0.882 0.950 0.950 0.950 0.918 -0.188

HU10_3 24 0.925 -0.460 0.953 0.881 0.950 0.950 0.950 0.918 -0.190

HU15_3 25 0.916 -0.468 0.952 0.876 0.947 0.947 0.949 0.921 -0.200

WS3 26 -0.934 0.315 -0.925 -0.858 -0.923 -0.923 -0.914 -0.849 0.031

rad3 27 -0.059 0.276 -0.338 -0.458 -0.376 -0.377 -0.396 -0.505 0.864

DL3 28 -0.973 0.572 -0.923 -0.837 -0.915 -0.915 -0.909 -0.854 -0.059

rain4 29 -0.655 0.365 -0.550 -0.366 -0.510 -0.510 -0.507 -0.461 -0.105

Tx4 30 0.925 -0.492 0.980 0.887 0.971 0.971 0.971 0.943 -0.133

Tn4 31 0.888 -0.443 0.960 0.946 0.973 0.973 0.973 0.951 -0.283

WS4 32 -0.901 0.324 -0.908 -0.786 -0.890 -0.890 -0.884 -0.824 0.018

RHx4 33 -0.308 0.515 -0.236 -0.220 -0.235 -0.234 -0.226 -0.230 -0.053

RHn4 34 -0.552 0.558 -0.544 -0.376 -0.505 -0.505 -0.499 -0.487 -0.096

rad4 35 -0.017 0.189 -0.279 -0.434 -0.327 -0.327 -0.345 -0.450 0.927

ETx4 36 0.883 -0.460 0.945 0.878 0.942 0.942 0.941 0.917 -0.201

ETn4 37 0.640 -0.308 0.698 0.797 0.739 0.738 0.732 0.704 -0.066

frost4 38 -0.537 0.076 -0.494 -0.535 -0.514 -0.513 -0.493 -0.424 -0.094

HU0_4 39 0.922 -0.478 0.979 0.917 0.978 0.979 0.978 0.950 -0.183

HU5_4 40 0.922 -0.478 0.979 0.916 0.978 0.978 0.978 0.950 -0.183

HU10_4 41 0.919 -0.479 0.978 0.914 0.977 0.977 0.977 0.951 -0.189

HU15_4 42 0.902 -0.491 0.972 0.903 0.969 0.969 0.972 0.953 -0.220

RC4 43 -0.954 0.463 -0.971 -0.922 -0.974 -0.974 -0.971 -0.926 0.117

IC4 44 -0.945 0.454 -0.969 -0.935 -0.977 -0.976 -0.970 -0.919 0.080

PC4 45 -0.959 0.404 -0.943 -0.894 -0.946 -0.946 -0.935 -0.865 -0.018

Eto4 46 0.503 -0.327 0.352 0.102 0.289 0.289 0.279 0.216 0.470

DL4 47 -0.311 0.652 -0.482 -0.523 -0.498 -0.498 -0.506 -0.555 0.073

Alt 48 -0.879 0.444 -0.966 -0.907 -0.966 -0.966 -0.969 -0.953 0.262

Lat 49 -0.995 0.435 -0.905 -0.815 -0.897 -0.896 -0.889 -0.817 -0.031

Long 50 0.131 -0.198 0.505 0.541 0.522 0.523 0.544 0.645 -0.667

pH_H2O 51 0.936 -0.545 0.814 0.771 0.817 0.817 0.808 0.740 0.003

P 52 0.687 -0.426 0.431 0.295 0.401 0.400 0.385 0.288 0.568

K 53 0.385 -0.178 0.513 0.497 0.518 0.519 0.526 0.543 -0.312

Ca 54 0.859 -0.490 0.891 0.774 0.874 0.874 0.868 0.828 -0.025

Mg 55 0.827 -0.593 0.676 0.514 0.643 0.643 0.635 0.580 0.084

Resist 56 -0.448 0.085 -0.434 -0.296 -0.404 -0.404 -0.395 -0.337 -0.151

APP_N 57 -0.253 0.509 -0.171 -0.052 -0.140 -0.141 -0.143 -0.154 -0.019

10 11 12 13 14 15 16 17 18

DL2 19 1.000

rain3 20 -0.590 1.000

Tave3 21 0.917 -0.550 1.000

HU0_3 22 0.923 -0.543 1.000 1.000

HU5_3 23 0.923 -0.545 1.000 1.000 1.000

HU10_3 24 0.922 -0.546 1.000 1.000 1.000 1.000

HU15_3 25 0.914 -0.545 0.999 0.999 0.999 0.999 1.000

WS3 26 -0.937 0.515 -0.935 -0.938 -0.938 -0.938 -0.930 1.000

rad3 27 -0.060 -0.043 -0.338 -0.331 -0.331 -0.332 -0.346 0.161 1.000

DL3 28 -0.952 0.468 -0.917 -0.923 -0.922 -0.921 -0.915 0.910 0.126

rain4 29 -0.657 0.965 -0.635 -0.630 -0.632 -0.632 -0.633 0.564 0.035

Tx4 30 0.917 -0.539 0.992 0.991 0.991 0.991 0.991 -0.938 -0.319

Tn4 31 0.884 -0.451 0.984 0.984 0.984 0.984 0.982 -0.927 -0.419

WS4 32 -0.906 0.524 -0.916 -0.916 -0.916 -0.916 -0.911 0.960 0.165

RHx4 33 -0.251 0.421 -0.227 -0.228 -0.229 -0.227 -0.220 0.165 0.068

RHn4 34 -0.513 0.536 -0.538 -0.534 -0.534 -0.533 -0.529 0.473 0.118

rad4 35 -0.026 -0.076 -0.305 -0.299 -0.299 -0.300 -0.312 0.135 0.987

ETx4 36 0.872 -0.509 0.980 0.980 0.980 0.980 0.978 -0.928 -0.362

ETn4 37 0.627 -0.129 0.670 0.676 0.674 0.673 0.668 -0.667 -0.229

frost4 38 -0.537 0.131 -0.477 -0.478 -0.478 -0.477 -0.470 0.559 -0.072

HU0_4 39 0.915 -0.504 0.994 0.994 0.994 0.994 0.993 -0.943 -0.349

HU5_4 40 0.915 -0.506 0.994 0.994 0.994 0.994 0.993 -0.943 -0.350

HU10_4 41 0.912 -0.507 0.994 0.994 0.994 0.994 0.994 -0.940 -0.356

HU15_4 42 0.895 -0.507 0.995 0.994 0.994 0.994 0.995 -0.924 -0.388

RC4 43 -0.949 0.508 -0.978 -0.981 -0.981 -0.980 -0.976 0.963 0.272

IC4 44 -0.936 0.459 -0.945 -0.949 -0.949 -0.948 -0.940 0.958 0.242

PC4 45 -0.955 0.510 -0.927 -0.932 -0.932 -0.931 -0.920 0.969 0.138

Eto4 46 0.488 -0.599 0.378 0.377 0.378 0.377 0.371 -0.407 0.312

DL4 47 -0.255 -0.248 -0.396 -0.400 -0.398 -0.397 -0.406 0.279 0.308

Alt 48 -0.878 0.441 -0.980 -0.979 -0.979 -0.979 -0.980 0.925 0.429

Lat 49 -0.996 0.571 -0.937 -0.943 -0.943 -0.942 -0.935 0.950 0.099

Long 50 0.130 0.071 0.476 0.464 0.464 0.466 0.482 -0.325 -0.805

pH_H2O 51 0.921 -0.404 0.853 0.863 0.862 0.861 0.852 -0.846 -0.108

P 52 0.655 -0.364 0.398 0.410 0.409 0.408 0.394 -0.522 0.457

K 53 0.401 -0.195 0.510 0.500 0.500 0.501 0.511 -0.408 -0.271

Ca 54 0.844 -0.360 0.856 0.857 0.857 0.856 0.851 -0.871 -0.238

Mg 55 0.808 -0.507 0.719 0.724 0.724 0.722 0.715 -0.683 -0.033

Resist 56 -0.459 0.050 -0.402 -0.400 -0.399 -0.399 -0.393 0.501 -0.185

APP_N 57 -0.230 0.181 -0.204 -0.208 -0.207 -0.205 -0.206 0.089 0.093

	19	20	21	22	23	24	25	26	27
DL3	28	1.000							
rain4	29	0.588	1.000						
Tx4	30	-0.932	-0.634	1.000					
Tn4	31	-0.897	-0.539	0.976	1.000				
WS4	32	0.892	0.574	-0.925	-0.890	1.000			
RHx4	33	0.310	0.533	-0.241	-0.207	0.104	1.000		
RHn4	34	0.564	0.650	-0.564	-0.476	0.547	0.728	1.000	
rad4	35	0.069	-0.018	-0.272	-0.394	0.132	0.013	0.050	1.000

ETx4 36 -0.893 -0.598 0.974 0.967 -0.892 -0.272 -0.566 -0.327 1.000

ETn4 37 -0.720 -0.203 0.667 0.731 -0.594 -0.046 -0.092 -0.197 0.649

frost4 38 0.553 0.141 -0.484 -0.496 0.558 0.089 0.160 -0.077 -0.456

HU0_4 39 -0.930 -0.598 0.996 0.990 -0.919 -0.231 -0.532 -0.310 0.976

HU5_4 40 -0.930 -0.599 0.996 0.990 -0.919 -0.231 -0.532 -0.311 0.976

HU10_4 41 -0.927 -0.601 0.997 0.990 -0.917 -0.227 -0.530 -0.317 0.976

HU15_4 42 -0.913 -0.604 0.995 0.988 -0.906 -0.225 -0.531 -0.348 0.976

RC4 43 0.952 0.597 -0.983 -0.978 0.923 0.249 0.521 0.235 -0.959

IC4 44 0.946 0.549 -0.960 -0.959 0.914 0.254 0.517 0.204 -0.928

PC4 45 0.946 0.583 -0.942 -0.928 0.924 0.263 0.527 0.100 -0.913

Eto4 46 -0.452 -0.645 0.402 0.272 -0.507 -0.477 -0.823 0.366 0.353

DL4 47 0.461 -0.059 -0.427 -0.439 0.278 0.222 0.301 0.244 -0.435

Alt 48 0.893 0.529 -0.981 -0.983 0.923 0.141 0.498 0.394 -0.959

Lat 49 0.967 0.647 -0.941 -0.907 0.923 0.258 0.531 0.060 -0.901

Long 50 -0.219 0.011 0.473 0.542 -0.371 0.166 -0.139 -0.797 0.498

pH_H2O 51 -0.944 -0.520 0.850 0.832 -0.827 -0.281 -0.539 -0.075 0.838

P 52 -0.651 -0.450 0.431 0.341 -0.487 -0.456 -0.442 0.516 0.355

K 53 -0.393 -0.228 0.527 0.515 -0.448 -0.021 -0.303 -0.278 0.463

Ca 54 -0.894 -0.465 0.878 0.847 -0.938 -0.164 -0.620 -0.187 0.830

Mg 55 -0.818 -0.629 0.726 0.649 -0.744 -0.461 -0.789 0.016 0.695

Resist 56 0.449 0.067 -0.414 -0.386 0.623 -0.234 0.206 -0.175 -0.321

APP_N 57 0.305 0.302 -0.216 -0.140 0.210 0.426 0.706 0.044 -0.221

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 -0.640 1.000

HU0_4 39 0.699 -0.497 1.000

HU5_4 40 0.697 -0.496 1.000 1.000

HU10_4 41 0.693 -0.487 1.000 1.000 1.000

HU15_4 42 0.681 -0.466 0.997 0.997 0.998 1.000

RC4 43 -0.710 0.517 -0.990 -0.990 -0.988 -0.978 1.000

IC4 44 -0.717 0.529 -0.969 -0.969 -0.965 -0.949 0.989 1.000

PC4 45 -0.702 0.571 -0.947 -0.947 -0.942 -0.920 0.977 0.989 1.000

Eto4 46 -0.034 -0.103 0.356 0.356 0.355 0.346 -0.373 -0.366 -0.420

DL4 47 -0.535 0.293 -0.436 -0.435 -0.436 -0.447 0.401 0.400 0.343

Alt 48 -0.679 0.466 -0.987 -0.987 -0.988 -0.989 0.966 0.941 0.909

Lat 49 -0.646 0.537 -0.938 -0.938 -0.936 -0.921 0.965 0.951 0.964

Long 50 0.336 -0.052 0.490 0.490 0.498 0.529 -0.392 -0.362 -0.262

pH_H2O 51 0.639 -0.499 0.856 0.856 0.852 0.837 -0.883 -0.878 -0.887

P 52 0.286 -0.373 0.412 0.412 0.406 0.375 -0.493 -0.520 -0.573

K 53 0.162 -0.239 0.523 0.523 0.526 0.536 -0.476 -0.472 -0.426

Ca 54 0.596 -0.499 0.874 0.874 0.871 0.860 -0.876 -0.887 -0.878

Mg 55 0.277 -0.280 0.706 0.706 0.704 0.695 -0.727 -0.714 -0.729

Resist 56 -0.228 0.369 -0.409 -0.409 -0.405 -0.389 0.416 0.455 0.464

APP_N 57 0.107 -0.183 -0.190 -0.189 -0.190 -0.201 0.179 0.157 0.152

37 38 39 40 41 42 43 44 45

Eto4 46 1.000

DL4 47 -0.038 1.000

Alt 48 -0.319 0.445 1.000

Lat 49 -0.477 0.295 0.905 1.000

Long 50 -0.174 -0.466 -0.584 -0.185 1.000

pH_H2O 51 0.429 -0.428 -0.823 -0.925 0.136 1.000

P 52 0.609 -0.163 -0.328 -0.639 -0.462 0.602 1.000

K 53 0.106 -0.293 -0.547 -0.402 0.497 0.359 -0.039 1.000

Ca 54 0.530 -0.409 -0.888 -0.869 0.394 0.842 0.507 0.394 1.000

Mg 55 0.706 -0.246 -0.680 -0.815 0.015 0.850 0.653 0.325 0.800

Resist 56 -0.375 0.058 0.446 0.467 -0.140 -0.391 -0.405 -0.366 -0.654

APP_N 57 -0.568 0.304 0.209 0.241 -0.023 -0.415 -0.198 -0.215 -0.352

46 47 48 49 50 51 52 53 54

Mg 55 1.000

Resist 56 -0.453 1.000

APP_N 57 -0.688 0.073 1.000

55 56 57

===== Correlations for Cultivar 12 =====

*** Degrees of freedom ***

Correlations: 19

*** Correlation matrix ***

fyield 1 1.000

Tcllefprun 2 0.507 1.000

Tfertclad 3 0.858 0.824 1.000

Tftotal 4 0.938 0.460 0.835 1.000

Tfnoat 5 0.963 0.552 0.877 0.953 1.000

Tn1 6 0.512 0.745 0.723 0.538 0.638 1.000

RC1 7 -0.591 -0.706 -0.761 -0.659 -0.730 -0.935 1.000

IC1 8 -0.638 -0.724 -0.802 -0.685 -0.764 -0.935 0.989 1.000

C1 9 -0.657 -0.676 -0.790 -0.734 -0.791 -0.871 0.968 0.972 1.000

DL1 10 0.705 0.524 0.738 0.795 0.828 0.762 -0.903 -0.891 -0.948

rain2 11 -0.325 0.021 -0.207 -0.345 -0.383 -0.367 0.465 0.462 0.401

Tx2 12 0.586 0.656 0.728 0.658 0.725 0.868 -0.982 -0.968 -0.948

Tn2 13 0.517 0.734 0.713 0.541 0.648 0.989 -0.965 -0.961 -0.903

HU0_2 14 0.578 0.689 0.737 0.638 0.717 0.917 -0.994 -0.982 -0.952

HU5_2 15 0.578 0.689 0.737 0.638 0.716 0.917 -0.994 -0.982 -0.952

HU10_2 16 0.569 0.687 0.730 0.627 0.705 0.913 -0.991 -0.977 -0.941

HU15_2 17 0.501 0.656 0.662 0.546 0.636 0.894 -0.960 -0.937 -0.872

Rad2 18 0.375 -0.085 0.150 0.379 0.252 -0.347 0.165 0.114 -0.020

DL2 19 0.679 0.538 0.736 0.777 0.805 0.752 -0.891 -0.877 -0.942

rain3 20 -0.369 -0.091 -0.272 -0.486 -0.464 -0.238 0.425 0.368 0.495

Tave3 21 0.509 0.572 0.660 0.639 0.676 0.840 -0.957 -0.915 -0.925

HU0_3 22 0.515 0.576 0.665 0.643 0.680 0.844 -0.959 -0.918 -0.929

HU5_3 23 0.515 0.576 0.665 0.643 0.680 0.843 -0.959 -0.918 -0.928

HU10_3 24 0.513 0.576 0.664 0.642 0.679 0.843 -0.958 -0.917 -0.927

HU15_3 25 0.502 0.571 0.655 0.633 0.668 0.836 -0.954 -0.910 -0.918

WS3 26 -0.575 -0.684 -0.743 -0.668 -0.731 -0.820 0.940 0.923 0.967

rad3 27 0.261 -0.229 0.052 0.295 0.133 -0.445 0.342 0.293 0.142

DL3 28 -0.684 -0.519 -0.720 -0.765 -0.805 -0.794 0.924 0.918 0.944

rain4 29 -0.429 -0.079 -0.308 -0.544 -0.535 -0.321 0.521 0.467 0.568

Tx4 30 0.549 0.591 0.684 0.660 0.704 0.837 -0.969 -0.936 -0.941

Tn4 31 0.503 0.649 0.688 0.605 0.666 0.919 -0.981 -0.949 -0.929

WS4 32 -0.503 -0.577 -0.659 -0.630 -0.673 -0.734 0.896 0.886 0.929

RHx4 33 -0.352 0.203 -0.022 -0.291 -0.396 -0.197 0.227 0.216 0.245

RHn4 34 -0.293 0.114 -0.090 -0.354 -0.406 -0.292 0.477 0.464 0.511

rad4 35 0.316 -0.213 0.080 0.338 0.184 -0.435 0.303 0.252 0.103

ETx4 36 0.430 0.557 0.596 0.550 0.605 0.834 -0.945 -0.897 -0.911

ETn4 37 0.486 0.693 0.646 0.545 0.573 0.827 -0.763 -0.767 -0.728

frost4 38 -0.398 -0.469 -0.489 -0.500 -0.533 -0.550 0.532 0.558 0.605

HU0_4 39 0.544 0.620 0.697 0.649 0.701 0.875 -0.981 -0.950 -0.947

HU5_4 40 0.543 0.620 0.696 0.649 0.701 0.875 -0.981 -0.949 -0.946

HU10_4 41 0.539 0.617 0.692 0.645 0.696 0.871 -0.978 -0.946 -0.941

HU15_4 42 0.510 0.598 0.665 0.621 0.671 0.859 -0.968 -0.930 -0.920

RC4 43 -0.611 -0.643 -0.745 -0.700 -0.754 -0.884 0.985 0.963 0.973

IC4 44 -0.650 -0.672 -0.782 -0.714 -0.781 -0.901 0.987 0.985 0.987

PC4 45 -0.661 -0.651 -0.778 -0.738 -0.794 -0.860 0.962 0.963 0.997

Eto4 46 0.370 -0.138 0.128 0.469 0.424 0.021 -0.283 -0.282 -0.400

DL4 47 -0.163 -0.262 -0.237 -0.144 -0.205 -0.495 0.472 0.484 0.377

Alt 48 -0.463 -0.623 -0.650 -0.566 -0.629 -0.859 0.962 0.928 0.910

Lat 49 -0.668 -0.546 -0.732 -0.769 -0.802 -0.773 0.915 0.897 0.953

Long	50	-0.206	0.399	0.106	-0.160	-0.076	0.511	-0.478	-0.433	-0.286
pH_H2O	51	0.530	0.370	0.566	0.629	0.661	0.735	-0.838	-0.832	-0.874
P	52	0.818	0.216	0.601	0.798	0.816	0.266	-0.423	-0.468	-0.561
K	53	0.224	0.237	0.330	0.237	0.290	0.457	-0.490	-0.490	-0.435
Ca	54	0.509	0.484	0.605	0.607	0.663	0.714	-0.864	-0.877	-0.878
Mg	55	0.490	0.028	0.358	0.589	0.607	0.444	-0.642	-0.634	-0.700
Resist	56	-0.411	-0.287	-0.516	-0.510	-0.490	-0.277	0.402	0.466	0.473
APP_N	57	0.051	0.500	0.293	0.020	0.012	0.029	0.113	0.097	0.124

	1	2	3	4	5	6	7	8	9
DL1	10	1.000							
rain2	11	-0.465	1.000						
Tx2	12	0.892	-0.513	1.000					
Tn2	13	0.803	-0.424	0.919	1.000				
HU0_2	14	0.883	-0.494	0.994	0.958	1.000			
HU5_2	15	0.883	-0.494	0.994	0.957	1.000	1.000		
HU10_2	16	0.874	-0.502	0.994	0.955	0.999	0.999	1.000	
HU15_2	17	0.799	-0.537	0.974	0.940	0.980	0.980	0.986	1.000
Rad2	18	0.075	0.025	-0.110	-0.315	-0.170	-0.170	-0.186	-0.278	1.000
DL2	19	0.994	-0.406	0.874	0.791	0.867	0.867	0.857	0.776	0.053
rain3	20	-0.572	0.107	-0.443	-0.271	-0.405	-0.405	-0.400	-0.340	-0.122
Tave3	21	0.919	-0.458	0.954	0.879	0.950	0.950	0.950	0.920	-0.194
HU0_3	22	0.926	-0.461	0.954	0.883	0.951	0.951	0.951	0.918	-0.188
HU5_3	23	0.925	-0.461	0.954	0.882	0.950	0.950	0.950	0.918	-0.188
HU10_3	24	0.925	-0.460	0.953	0.881	0.950	0.950	0.950	0.918	-0.190
HU15_3	25	0.916	-0.468	0.952	0.876	0.947	0.947	0.949	0.921	-0.200
WS3	26	-0.934	0.315	-0.925	-0.858	-0.923	-0.923	-0.914	-0.849	0.031
rad3	27	-0.059	0.276	-0.338	-0.458	-0.376	-0.377	-0.396	-0.505	0.864
DL3	28	-0.973	0.572	-0.923	-0.837	-0.915	-0.915	-0.909	-0.854	-0.059
rain4	29	-0.655	0.365	-0.550	-0.366	-0.510	-0.510	-0.507	-0.461	-0.105
Tx4	30	0.925	-0.492	0.980	0.887	0.971	0.971	0.971	0.943	-0.133

Tn4 31 0.888 -0.443 0.960 0.946 0.973 0.973 0.973 0.951 -0.283

WS4 32 -0.901 0.324 -0.908 -0.786 -0.890 -0.890 -0.884 -0.824 0.018

RHx4 33 -0.308 0.515 -0.236 -0.220 -0.235 -0.234 -0.226 -0.230 -0.053

RHn4 34 -0.552 0.558 -0.544 -0.376 -0.505 -0.505 -0.499 -0.487 -0.096

rad4 35 -0.017 0.189 -0.279 -0.434 -0.327 -0.327 -0.345 -0.450 0.927

ETx4 36 0.883 -0.460 0.945 0.878 0.942 0.942 0.941 0.917 -0.201

ETn4 37 0.640 -0.308 0.698 0.797 0.739 0.738 0.732 0.704 -0.066

frost4 38 -0.537 0.076 -0.494 -0.535 -0.514 -0.513 -0.493 -0.424 -0.094

HU0_4 39 0.922 -0.478 0.979 0.917 0.978 0.979 0.978 0.950 -0.183

HU5_4 40 0.922 -0.478 0.979 0.916 0.978 0.978 0.978 0.950 -0.183

HU10_4 41 0.919 -0.479 0.978 0.914 0.977 0.977 0.977 0.951 -0.189

HU15_4 42 0.902 -0.491 0.972 0.903 0.969 0.969 0.972 0.953 -0.220

RC4 43 -0.954 0.463 -0.971 -0.922 -0.974 -0.974 -0.971 -0.926 0.117

IC4 44 -0.945 0.454 -0.969 -0.935 -0.977 -0.976 -0.970 -0.919 0.080

PC4 45 -0.959 0.404 -0.943 -0.894 -0.946 -0.946 -0.935 -0.865 -0.018

Eto4 46 0.503 -0.327 0.352 0.102 0.289 0.289 0.279 0.216 0.470

DL4 47 -0.311 0.652 -0.482 -0.523 -0.498 -0.498 -0.506 -0.555 0.073

Alt 48 -0.879 0.444 -0.966 -0.907 -0.966 -0.966 -0.969 -0.953 0.262

Lat 49 -0.995 0.435 -0.905 -0.815 -0.897 -0.896 -0.889 -0.817 -0.031

Long 50 0.131 -0.198 0.505 0.541 0.522 0.523 0.544 0.645 -0.667

pH_H2O 51 0.936 -0.545 0.814 0.771 0.817 0.817 0.808 0.740 0.003

P 52 0.687 -0.426 0.431 0.295 0.401 0.400 0.385 0.288 0.568

K 53 0.385 -0.178 0.513 0.497 0.518 0.519 0.526 0.543 -0.312

Ca 54 0.859 -0.490 0.891 0.774 0.874 0.874 0.868 0.828 -0.025

Mg 55 0.827 -0.593 0.676 0.514 0.643 0.643 0.635 0.580 0.084

Resist 56 -0.448 0.085 -0.434 -0.296 -0.404 -0.404 -0.395 -0.337 -0.151

APP_N 57 -0.253 0.509 -0.171 -0.052 -0.140 -0.141 -0.143 -0.154 -0.019

10 11 12 13 14 15 16 17 18

DL2 19 1.000

rain3 20 -0.590 1.000

Tave3 21 0.917 -0.550 1.000

HU0_3 22 0.923 -0.543 1.000 1.000

HU5_3 23 0.923 -0.545 1.000 1.000 1.000

HU10_3 24 0.922 -0.546 1.000 1.000 1.000 1.000

HU15_3 25 0.914 -0.545 0.999 0.999 0.999 0.999 1.000

WS3 26 -0.937 0.515 -0.935 -0.938 -0.938 -0.938 -0.930 1.000

rad3 27 -0.060 -0.043 -0.338 -0.331 -0.331 -0.332 -0.346 0.161 1.000

DL3 28 -0.952 0.468 -0.917 -0.923 -0.922 -0.921 -0.915 0.910 0.126

rain4 29 -0.657 0.965 -0.635 -0.630 -0.632 -0.632 -0.633 0.564 0.035

Tx4 30 0.917 -0.539 0.992 0.991 0.991 0.991 0.991 -0.938 -0.319

Tn4 31 0.884 -0.451 0.984 0.984 0.984 0.984 0.982 -0.927 -0.419

WS4 32 -0.906 0.524 -0.916 -0.916 -0.916 -0.916 -0.911 0.960 0.165

RHx4 33 -0.251 0.421 -0.227 -0.228 -0.229 -0.227 -0.220 0.165 0.068

RHn4 34 -0.513 0.536 -0.538 -0.534 -0.534 -0.533 -0.529 0.473 0.118

rad4 35 -0.026 -0.076 -0.305 -0.299 -0.299 -0.300 -0.312 0.135 0.987

ETx4 36 0.872 -0.509 0.980 0.980 0.980 0.980 0.978 -0.928 -0.362

ETn4 37 0.627 -0.129 0.670 0.676 0.674 0.673 0.668 -0.667 -0.229

frost4 38 -0.537 0.131 -0.477 -0.478 -0.478 -0.477 -0.470 0.559 -0.072

HU0_4 39 0.915 -0.504 0.994 0.994 0.994 0.994 0.993 -0.943 -0.349

HU5_4 40 0.915 -0.506 0.994 0.994 0.994 0.994 0.993 -0.943 -0.350

HU10_4 41 0.912 -0.507 0.994 0.994 0.994 0.994 0.994 -0.940 -0.356

HU15_4 42 0.895 -0.507 0.995 0.994 0.994 0.994 0.995 -0.924 -0.388

RC4 43 -0.949 0.508 -0.978 -0.981 -0.981 -0.980 -0.976 0.963 0.272

IC4 44 -0.936 0.459 -0.945 -0.949 -0.949 -0.948 -0.940 0.958 0.242

PC4 45 -0.955 0.510 -0.927 -0.932 -0.932 -0.931 -0.920 0.969 0.138

Eto4 46 0.488 -0.599 0.378 0.377 0.378 0.377 0.371 -0.407 0.312

DL4 47 -0.255 -0.248 -0.396 -0.400 -0.398 -0.397 -0.406 0.279 0.308

Alt 48 -0.878 0.441 -0.980 -0.979 -0.979 -0.979 -0.980 0.925 0.429

Lat 49 -0.996 0.571 -0.937 -0.943 -0.943 -0.942 -0.935 0.950 0.099

Long 50 0.130 0.071 0.476 0.464 0.464 0.466 0.482 -0.325 -0.805

pH_H2O 51 0.921 -0.404 0.853 0.863 0.862 0.861 0.852 -0.846 -0.108

P 52 0.655 -0.364 0.398 0.410 0.409 0.408 0.394 -0.522 0.457

K	53	0.401	-0.195	0.510	0.500	0.500	0.501	0.511	-0.408	-0.271
Ca	54	0.844	-0.360	0.856	0.857	0.857	0.856	0.851	-0.871	-0.238
Mg	55	0.808	-0.507	0.719	0.724	0.724	0.722	0.715	-0.683	-0.033
Resist	56	-0.459	0.050	-0.402	-0.400	-0.399	-0.399	-0.393	0.501	-0.185
APP_N	57	-0.230	0.181	-0.204	-0.208	-0.207	-0.205	-0.206	0.089	0.093

	19	20	21	22	23	24	25	26	27
DL3	28	1.000							
rain4	29	0.588	1.000						
Tx4	30	-0.932	-0.634	1.000					
Tn4	31	-0.897	-0.539	0.976	1.000				
WS4	32	0.892	0.574	-0.925	-0.890	1.000			
RHx4	33	0.310	0.533	-0.241	-0.207	0.104	1.000		
RHn4	34	0.564	0.650	-0.564	-0.476	0.547	0.728	1.000	
rad4	35	0.069	-0.018	-0.272	-0.394	0.132	0.013	0.050	1.000
ETx4	36	-0.893	-0.598	0.974	0.967	-0.892	-0.272	-0.566	-0.327	1.000
ETn4	37	-0.720	-0.203	0.667	0.731	-0.594	-0.046	-0.092	-0.197	0.649
frost4	38	0.553	0.141	-0.484	-0.496	0.558	0.089	0.160	-0.077	-0.456
HU0_4	39	-0.930	-0.598	0.996	0.990	-0.919	-0.231	-0.532	-0.310	0.976
HU5_4	40	-0.930	-0.599	0.996	0.990	-0.919	-0.231	-0.532	-0.311	0.976
HU10_4	41	-0.927	-0.601	0.997	0.990	-0.917	-0.227	-0.530	-0.317	0.976
HU15_4	42	-0.913	-0.604	0.995	0.988	-0.906	-0.225	-0.531	-0.348	0.976
RC4	43	0.952	0.597	-0.983	-0.978	0.923	0.249	0.521	0.235	-0.959
IC4	44	0.946	0.549	-0.960	-0.959	0.914	0.254	0.517	0.204	-0.928
PC4	45	0.946	0.583	-0.942	-0.928	0.924	0.263	0.527	0.100	-0.913
Eto4	46	-0.452	-0.645	0.402	0.272	-0.507	-0.477	-0.823	0.366	0.353
DL4	47	0.461	-0.059	-0.427	-0.439	0.278	0.222	0.301	0.244	-0.435
Alt	48	0.893	0.529	-0.981	-0.983	0.923	0.141	0.498	0.394	-0.959
Lat	49	0.967	0.647	-0.941	-0.907	0.923	0.258	0.531	0.060	-0.901
Long	50	-0.219	0.011	0.473	0.542	-0.371	0.166	-0.139	-0.797	0.498
pH_H2O	51	-0.944	-0.520	0.850	0.832	-0.827	-0.281	-0.539	-0.075	0.838

P 52 -0.651 -0.450 0.431 0.341 -0.487 -0.456 -0.442 0.516 0.355

K 53 -0.393 -0.228 0.527 0.515 -0.448 -0.021 -0.303 -0.278 0.463

Ca 54 -0.894 -0.465 0.878 0.847 -0.938 -0.164 -0.620 -0.187 0.830

Mg 55 -0.818 -0.629 0.726 0.649 -0.744 -0.461 -0.789 0.016 0.695

Resist 56 0.449 0.067 -0.414 -0.386 0.623 -0.234 0.206 -0.175 -0.321

APP_N 57 0.305 0.302 -0.216 -0.140 0.210 0.426 0.706 0.044 -0.221

28 29 30 31 32 33 34 35 36

ETn4 37 1.000

frost4 38 -0.640 1.000

HU0_4 39 0.699 -0.497 1.000

HU5_4 40 0.697 -0.496 1.000 1.000

HU10_4 41 0.693 -0.487 1.000 1.000 1.000

HU15_4 42 0.681 -0.466 0.997 0.997 0.998 1.000

RC4 43 -0.710 0.517 -0.990 -0.990 -0.988 -0.978 1.000

IC4 44 -0.717 0.529 -0.969 -0.969 -0.965 -0.949 0.989 1.000

PC4 45 -0.702 0.571 -0.947 -0.947 -0.942 -0.920 0.977 0.989 1.000

Eto4 46 -0.034 -0.103 0.356 0.356 0.355 0.346 -0.373 -0.366 -0.420

DL4 47 -0.535 0.293 -0.436 -0.435 -0.436 -0.447 0.401 0.400 0.343

Alt 48 -0.679 0.466 -0.987 -0.987 -0.988 -0.989 0.966 0.941 0.909

Lat 49 -0.646 0.537 -0.938 -0.938 -0.936 -0.921 0.965 0.951 0.964

Long 50 0.336 -0.052 0.490 0.490 0.498 0.529 -0.392 -0.362 -0.262

pH_H2O 51 0.639 -0.499 0.856 0.856 0.852 0.837 -0.883 -0.878 -0.887

P 52 0.286 -0.373 0.412 0.412 0.406 0.375 -0.493 -0.520 -0.573

K 53 0.162 -0.239 0.523 0.523 0.526 0.536 -0.476 -0.472 -0.426

Ca 54 0.596 -0.499 0.874 0.874 0.871 0.860 -0.876 -0.887 -0.878

Mg 55 0.277 -0.280 0.706 0.706 0.704 0.695 -0.727 -0.714 -0.729

Resist 56 -0.228 0.369 -0.409 -0.409 -0.405 -0.389 0.416 0.455 0.464

APP_N 57 0.107 -0.183 -0.190 -0.189 -0.190 -0.201 0.179 0.157 0.152

37 38 39 40 41 42 43 44 45

Eto4 46 1.000

DL4 47 -0.038 1.000

Alt 48 -0.319 0.445 1.000

Lat 49 -0.477 0.295 0.905 1.000

Long 50 -0.174 -0.466 -0.584 -0.185 1.000

pH_H2O 51 0.429 -0.428 -0.823 -0.925 0.136 1.000

P 52 0.609 -0.163 -0.328 -0.639 -0.462 0.602 1.000

K 53 0.106 -0.293 -0.547 -0.402 0.497 0.359 -0.039 1.000

Ca 54 0.530 -0.409 -0.888 -0.869 0.394 0.842 0.507 0.394 1.000

Mg 55 0.706 -0.246 -0.680 -0.815 0.015 0.850 0.653 0.325 0.800

Resist 56 -0.375 0.058 0.446 0.467 -0.140 -0.391 -0.405 -0.366 -0.654

APP_N 57 -0.568 0.304 0.209 0.241 -0.023 -0.415 -0.198 -0.215 -0.352

46 47 48 49 50 51 52 53 54

Mg 55 1.000

Resist 56 -0.453 1.000

APP_N 57 -0.688 0.073 1.000

55 56 57

Appendix 3.9.1 Regression analysis on the number of cladodes left after pruning for cultivars combined, individual cultivars, production year and areas

JPcllefttprunFS.out

file is JPfyieldFS.gen

========== CACTUS PEAR ENVIRONMENTAL ADAPTIBILITY: FRUIT YIELD

===== FS regression model on all data for Tcllefttprun =====

441.....

***** Regression Analysis *****

Response variate: Tcllefttprun

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	318.9	318.876	150.65	<.001
Residual	229	484.7	2.117		
Total	230	803.6	3.494		
Change	-1	-318.9	318.876	150.65	<.001

Percentage variance accounted for 39.4

Standard error of observations is estimated to be 1.45

*** Estimates of parameters ***

	estimate	s.e.	t(229)	t pr.
Constant	2.629	0.335	7.85	<.001
APP_N	0.04221	0.00344	12.27	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, IC1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	457.5	228.750	150.70	<.001
Residual	228	346.1	1.518		
Total	230	803.6	3.494		
Change	-1	-138.6	138.624	91.33	<.001

Percentage variance accounted for 56.6

Standard error of observations is estimated to be 1.23

*** Estimates of parameters ***

	estimate	s.e.	t(228)	t pr.

Constant	4.063	0.321	12.66	<.001
APP_N	0.04493	0.00293	15.35	<.001
IC1	-0.002100	0.000220	-9.56	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, IC1, Mg

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	494.5	164.837	121.07	<.001
Residual	227	309.1	1.362		
Total	230	803.6	3.494		
Change	-1	-37.0	37.012	27.18	<.001

Percentage variance accounted for 61.0

Standard error of observations is estimated to be 1.17

*** Estimates of parameters ***

	estimate	s.e.	t(227)	t pr.
Constant	8.893	0.975	9.12	<.001
APP_N	0.02470	0.00477	5.18	<.001

IC1	-0.003475	0.000336	-10.35	<.001
Mg	-0.01822	0.00350	-5.21	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, IC1, Mg, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	507.2	126.808	96.71	<.001
Residual	226	296.3	1.311		
Total	230	803.6	3.494		
Change	-1	-12.7	12.722	9.70	0.002

Percentage variance accounted for 62.5

Standard error of observations is estimated to be 1.15

*** Estimates of parameters ***

	estimate	s.e.	t(226)	t pr.
Constant	15.23	2.25	6.77	<.001
APP_N	0.01640	0.00539	3.04	0.003
IC1	-0.002178	0.000531	-4.10	<.001

Mg	-0.02567	0.00418	-6.14	<.001
WS3	-2.238	0.718	-3.11	0.002

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, IC1, Mg, WS3, Tave3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	530.3	106.061	87.32	<.001
Residual	225	273.3	1.215		
Total	230	803.6	3.494		
Change	-1	-23.1	23.071	18.99	<.001

Percentage variance accounted for 65.2

Standard error of observations is estimated to be 1.10

*** Estimates of parameters ***

	estimate	s.e.	t(225)	t pr.
Constant	28.49	3.73	7.63	<.001
APP_N	0.01299	0.00524	2.48	0.014
IC1	-0.003123	0.000555	-5.63	<.001

Mg	-0.02484	0.00403	-6.16	<.001
WS3	-4.049	0.807	-5.02	<.001
Tave3	-0.3563	0.0818	-4.36	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, IC1, Mg, WS3, Tave3, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	533.0	88.835	73.55	<.001
Residual	224	270.6	1.208		
Total	230	803.6	3.494		
Change	-1	-2.7	2.708	2.24	0.136

Percentage variance accounted for 65.4

Standard error of observations is estimated to be 1.10

*** Estimates of parameters ***

	estimate	s.e.	t(224)	t pr.
Constant	28.96	3.74	7.75	<.001
APP_N	0.01513	0.00542	2.79	0.006

IC1	-0.003294	0.000565	-5.83	<.001
Mg	-0.02381	0.00408	-5.84	<.001
WS3	-4.168	0.808	-5.16	<.001
Tave3	-0.3742	0.0824	-4.54	<.001
frost4	0.282	0.188	1.50	0.136

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, IC1, Mg, WS3, Tave3, frost4,
Alt

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	534.9	76.408	63.41	<.001
Residual	223	268.7	1.205		
Total	230	803.6	3.494		
Change	-1	-1.8	1.842	1.53	0.218

Percentage variance accounted for 65.5

Standard error of observations is estimated to be 1.10

*** Estimates of parameters ***

	estimate	s.e.	t(223)	t pr.
Constant	32.01	4.48	7.15	<.001
APP_N	0.01871	0.00614	3.05	0.003
IC1	-0.002971	0.000622	-4.78	<.001
Mg	-0.02101	0.00466	-4.51	<.001
WS3	-3.948	0.827	-4.77	<.001
Tave3	-0.532	0.152	-3.50	<.001
frost4	0.270	0.189	1.43	0.153
Alt	-0.001073	0.000868	-1.24	0.218

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, IC1, Mg, WS3, Tave3, frost4,

Alt, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	538.2	67.271	56.27	<.001
Residual	222	265.4	1.196		
Total	230	803.6	3.494		
Change	-1	-3.3	3.313	2.77	0.097

Percentage variance accounted for 65.8

Standard error of observations is estimated to be 1.09

*** Estimates of parameters ***

	estimate	s.e.	t(222)	t pr.
Constant	31.81	4.46	7.13	<.001
APP_N	0.01493	0.00652	2.29	0.023
IC1	-0.002549	0.000669	-3.81	<.001
Mg	-0.02704	0.00589	-4.59	<.001
WS3	-3.588	0.852	-4.21	<.001
Tave3	-0.524	0.151	-3.46	<.001
frost4	0.274	0.188	1.46	0.145
Alt	-0.001701	0.000943	-1.80	0.073
P	0.0228	0.0137	1.66	0.097

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, IC1, Mg, WS3, Tave3, frost4,
Alt, P, rain2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	540.0	59.999	50.30	<.001
Residual	221	263.6	1.193		
Total	230	803.6	3.494		

Change -1 -1.8 1.821 1.53 0.218

Percentage variance accounted for 65.9

Standard error of observations is estimated to be 1.09

*** Estimates of parameters ***

	estimate	s.e.	t(221)	t pr.
Constant	29.13	4.96	5.88	<.001
APP_N	0.01319	0.00666	1.98	0.049
IC1	-0.002860	0.000714	-4.01	<.001
Mg	-0.02751	0.00589	-4.67	<.001
WS3	-2.83	1.05	-2.70	0.008
Tave3	-0.479	0.155	-3.08	0.002
frost4	0.303	0.189	1.60	0.111
Alt	-0.001802	0.000946	-1.91	0.058
P	0.0307	0.0151	2.03	0.043
rain2	0.00281	0.00227	1.24	0.218

===== Cultivar 1 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	18.71	18.7146	21.81	<.001
Residual	19	16.30	0.8579		
Total	20	35.02	1.7508		
Change	-1	-18.71	18.7146	21.81	<.001

Percentage variance accounted for 51.0

Standard error of observations is estimated to be 0.926

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	2.825	0.707	3.99	<.001
APP_N	0.03392	0.00726	4.67	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, C1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	23.63	11.8133	18.67	<.001
Residual	18	11.39	0.6327		
Total	20	35.02	1.7508		
Change	-1	-4.91	4.9120	7.76	0.012

Percentage variance accounted for 63.9

Standard error of observations is estimated to be 0.795

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	3.074	0.614	5.01	<.001
APP_N	0.03610	0.00629	5.74	<.001
C1	-0.001182	0.000424	-2.79	0.012

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, C1, Tave3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	29.471	9.8236	30.12	<.001

Residual	17	5.545	0.3262		
Total	20	35.015	1.7508		
Change	-1	-5.844	5.8441	17.92	<.001

Percentage variance accounted for 81.4

Standard error of observations is estimated to be 0.571

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	15.12	2.88	5.25	<.001
APP_N	0.03145	0.00464	6.77	<.001
C1	-0.004338	0.000805	-5.39	<.001
Tave3	-0.493	0.116	-4.23	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, C1, Tave3, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	30.279	7.5696	25.57	<.001
Residual	16	4.737	0.2960		

Total	20	35.015	1.7508		
Change	-1	-0.808	0.8079	2.73	0.118

Percentage variance accounted for 83.1

Standard error of observations is estimated to be 0.544

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	15.91	2.78	5.71	<.001
APP_N	0.03358	0.00461	7.28	<.001
C1	-0.005004	0.000867	-5.77	<.001
Tave3	-0.532	0.113	-4.69	<.001
frost4	0.534	0.323	1.65	0.118

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, C1, Tave3, frost4, RHx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	30.940	6.1880	22.78	<.001
Residual	15	4.075	0.2717		

Total 20 35.015 1.7508

Change -1 -0.661 0.6615 2.43 0.140

Percentage variance accounted for 84.5

Standard error of observations is estimated to be 0.521

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	10.73	4.25	2.52	0.023
APP_N	0.03041	0.00486	6.25	<.001
C1	-0.005187	0.000839	-6.19	<.001
Tave3	-0.548	0.109	-5.02	<.001
frost4	0.512	0.310	1.65	0.120
RHx4	0.0669	0.0429	1.56	0.140

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, C1, Tave3, frost4, RHx4,

Resist

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.

Regression	6	31.815	5.3025	23.20 <.001
Residual	14	3.200	0.2286	
Total	20	35.015	1.7508	
Change	-1	-0.875	0.8749	3.83 0.071

Percentage variance accounted for 86.9

Standard error of observations is estimated to be 0.478

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	7.29	4.28	1.70	0.110
APP_N	0.02774	0.00466	5.95	<.001
C1	-0.005679	0.000809	-7.02	<.001
Tave3	-0.578	0.101	-5.71	<.001
frost4	0.427	0.288	1.49	0.159
RHx4	0.1093	0.0449	2.43	0.029
Resist	0.000301	0.000154	1.96	0.071

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, C1, Tave3, frost4, RHx4,

Resist, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	32.422	4.6317	23.22	<.001
Residual	13	2.594	0.1995		
Total	20	35.015	1.7508		
Change	-1	-0.607	0.6068	3.04	0.105

Percentage variance accounted for 88.6

Standard error of observations is estimated to be 0.447

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	15.74	6.28	2.51	0.026
APP_N	0.02607	0.00446	5.84	<.001
C1	-0.00433	0.00108	-4.01	0.001
Tave3	-0.665	0.107	-6.22	<.001
frost4	0.371	0.271	1.37	0.194
RHx4	0.1008	0.0422	2.39	0.033
Resist	0.000356	0.000147	2.42	0.031
WS3	-2.43	1.39	-1.74	0.105

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, C1, Tave3, frost4, RHx4,
Resist, WS3, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	32.858	4.1072	22.84	<.001
Residual	12	2.158	0.1798		
Total	20	35.015	1.7508		
Change	-1	-0.436	0.4361	2.43	0.145

Percentage variance accounted for 89.7

Standard error of observations is estimated to be 0.424

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	19.05	6.33	3.01	0.011
APP_N	0.02029	0.00563	3.60	0.004
C1	-0.00492	0.00109	-4.50	<.001
Tave3	-0.654	0.102	-6.43	<.001
frost4	0.262	0.266	0.99	0.344
RHx4	0.1159	0.0413	2.81	0.016
Resist	0.000404	0.000143	2.83	0.015
WS3	-2.63	1.33	-1.98	0.071
pH_H2O	-0.669	0.430	-1.56	0.145

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, C1, Tave3, frost4, RHx4,
Resist, WS3, pH_H2O, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	33.560	3.7289	28.18	<.001
Residual	11	1.455	0.1323		
Total	20	35.015	1.7508		
Change	-1	-0.702	0.7022	5.31	0.042

Percentage variance accounted for 92.4

Standard error of observations is estimated to be 0.364

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	11.28	6.39	1.76	0.105
APP_N	0.01560	0.00524	2.98	0.013
C1	-0.004911	0.000938	-5.24	<.001
Tave3	-0.525	0.104	-5.06	<.001
frost4	0.144	0.234	0.62	0.551
RHx4	0.1884	0.0474	3.98	0.002
Resist	0.000580	0.000144	4.02	0.002

WS3 -2.14 1.16 -1.85 0.091

pH_H2O -1.248 0.446 -2.80 0.017

P 0.0332 0.0144 2.30 0.042

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, C1, Tave3, frost4, RHx4,

Resist, WS3, pH_H2O, P, Tn1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	34.3594	3.43594	52.38	<.001
Residual	10	0.6560	0.06560		
Total	20	35.0153	1.75077		
Change	-1	-0.7994	0.79935	12.19	0.006

Percentage variance accounted for 96.3

Standard error of observations is estimated to be 0.256

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	7.60	4.62	1.64	0.131

APP_N	0.00653	0.00451	1.45	0.179
C1	-0.003173	0.000827	-3.84	0.003
Tave3	-0.5283	0.0731	-7.23	<.001
frost4	0.041	0.167	0.25	0.811
RHx4	0.2453	0.0371	6.61	<.001
Resist	0.000652	0.000104	6.29	<.001
WS3	-3.147	0.864	-3.64	0.005
pH_H2O	-1.827	0.355	-5.14	<.001
P	0.0622	0.0131	4.74	<.001
Tn1	0.477	0.137	3.49	0.006

===== Cultivar 2 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	18.137	18.1371	36.45	<.001
Residual	19	9.455	0.4976		
Total	20	27.592	1.3796		
Change	-1	-18.137	18.1371	36.45	<.001

Percentage variance accounted for 63.9

Standard error of observations is estimated to be 0.705

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	2.163	0.539	4.01	<.001
APP_N	0.03339	0.00553	6.04	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, HU15_2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	23.704	11.8522	54.87	<.001
Residual	18	3.888	0.2160		
Total	20	27.592	1.3796		
Change	-1	-5.567	5.5673	25.77	<.001

Percentage variance accounted for 84.3

Standard error of observations is estimated to be 0.465

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	1.143	0.408	2.80	0.012
APP_N	0.03628	0.00369	9.84	<.001
HU15_2	0.002282	0.000450	5.08	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, HU15_2, Mg

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	25.245	8.4151	60.95	<.001
Residual	17	2.347	0.1381		
Total	20	27.592	1.3796		
Change	-1	-1.541	1.5408	11.16	0.004

Percentage variance accounted for 90.0

Standard error of observations is estimated to be 0.372

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	2.846	0.605	4.70	<.001
APP_N	0.02531	0.00441	5.74	<.001
HU15_2	0.003341	0.000479	6.97	<.001
Mg	-0.01019	0.00305	-3.34	0.004

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, HU15_2, Mg, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	26.370	6.59256	86.31	<.001
Residual	16	1.222	0.07639		
Total	20	27.592	1.37962		
Change	-1	-1.125	1.12502	14.73	0.001

Percentage variance accounted for 94.5

Standard error of observations is estimated to be 0.276

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	10.71	2.10	5.10	<.001
APP_N	0.01347	0.00450	2.99	0.009
HU15_2	0.001869	0.000523	3.57	0.003
Mg	-0.02022	0.00346	-5.84	<.001
WS3	-2.013	0.524	-3.84	0.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, HU15_2, Mg, WS3, IC1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	26.6579	5.33157	85.57	<.001
Residual	15	0.9346	0.06230		
Total	20	27.5924	1.37962		
Change	-1	-0.2876	0.28762	4.62	0.048

Percentage variance accounted for 95.5

Standard error of observations is estimated to be 0.250

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	11.31	1.92	5.91	<.001
APP_N	0.01114	0.00421	2.65	0.018
HU15_2	0.000631	0.000746	0.85	0.411
Mg	-0.02183	0.00321	-6.79	<.001
WS3	-1.542	0.522	-2.95	0.010
IC1	-0.001301	0.000605	-2.15	0.048

===== Cultivar 3 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	30.02	30.0215	51.03	<.001
Residual	19	11.18	0.5883		
Total	20	41.20	2.0600		
Change	-1	-30.02	30.0215	51.03	<.001

Percentage variance accounted for 71.4

Standard error of observations is estimated to be 0.767

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	1.955	0.586	3.34	0.003
APP_N	0.04296	0.00601	7.14	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, C1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	32.453	16.2267	33.40	<.001
Residual	18	8.746	0.4859		
Total	20	41.200	2.0600		
Change	-1	-2.432	2.4320	5.01	0.038

Percentage variance accounted for 76.4

Standard error of observations is estimated to be 0.697

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	2.129	0.538	3.96	<.001
APP_N	0.04449	0.00551	8.08	<.001
C1	-0.000832	0.000372	-2.24	0.038

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, C1, Tave3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	36.101	12.0336	40.12	<.001
Residual	17	5.099	0.2999		
Total	20	41.200	2.0600		
Change	-1	-3.647	3.6474	12.16	0.003

Percentage variance accounted for 85.4

Standard error of observations is estimated to be 0.548

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	11.64	2.76	4.22	<.001

APP_N	0.04082	0.00445	9.16	<.001
C1	-0.003325	0.000772	-4.31	<.001
Tave3	-0.389	0.112	-3.49	0.003

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, C1, Tave3, Mg

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	37.823	9.4557	44.81	<.001
Residual	16	3.377	0.2110		
Total	20	41.200	2.0600		
Change	-1	-1.722	1.7221	8.16	0.011

Percentage variance accounted for 89.8

Standard error of observations is estimated to be 0.459

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	14.43	2.51	5.74	<.001
APP_N	0.02438	0.00686	3.55	0.003

C1	-0.004274	0.000728	-5.87	<.001
Tave3	-0.3570	0.0943	-3.79	0.002
Mg	-0.01562	0.00547	-2.86	0.011

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, C1, Tave3, Mg, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	38.409	7.6817	41.29	<.001
Residual	15	2.791	0.1861		
Total	20	41.200	2.0600		
Change	-1	-0.586	0.5857	3.15	0.096

Percentage variance accounted for 91.0

Standard error of observations is estimated to be 0.431

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	22.35	5.05	4.43	<.001
APP_N	0.02033	0.00683	2.98	0.009

C1	-0.003137	0.000937	-3.35	0.004
Tave3	-0.4372	0.0994	-4.40	<.001
Mg	-0.01786	0.00529	-3.38	0.004
WS3	-2.31	1.30	-1.77	0.096

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, C1, Tave3, Mg, WS3, RC4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	39.016	6.5027	41.70	<.001
Residual	14	2.183	0.1560		
Total	20	41.200	2.0600		
Change	-1	-0.608	0.6075	3.90	0.068

Percentage variance accounted for 92.4

Standard error of observations is estimated to be 0.395

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	24.18	4.71	5.13	<.001

APP_N	0.02042	0.00626	3.26	0.006
C1	-0.00118	0.00131	-0.90	0.383
Tave3	-0.746	0.181	-4.12	0.001
Mg	-0.01835	0.00485	-3.78	0.002
WS3	-2.36	1.19	-1.98	0.068
RC4	-0.000873	0.000442	-1.97	0.068

===== Cultivar 4 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	60.64	60.645	28.97	<.001
Residual	19	39.77	2.093		
Total	20	100.42	5.021		
Change	-1	-60.64	60.645	28.97	<.001

Percentage variance accounted for 58.3

Standard error of observations is estimated to be 1.45

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	1.66	1.10	1.50	0.150
APP_N	0.0611	0.0113	5.38	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, IC1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	73.02	36.511	23.99	<.001
Residual	18	27.40	1.522		
Total	20	100.42	5.021		
Change	-1	-12.38	12.377	8.13	0.011

Percentage variance accounted for 69.7

Standard error of observations is estimated to be 1.23

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.

Constant	3.08	1.07	2.89	0.010
APP_N	0.06375	0.00972	6.56	<.001
IC1	-0.002081	0.000730	-2.85	0.011

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, IC1, Tave3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	84.52	28.1728	30.12	<.001
Residual	17	15.90	0.9353		
Total	20	100.42	5.0209		
Change	-1	-11.50	11.4964	12.29	0.003

Percentage variance accounted for 81.4

Standard error of observations is estimated to be 0.967

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	21.55	5.33	4.04	<.001
APP_N	0.05574	0.00795	7.01	<.001

IC1	-0.00675	0.00145	-4.66	<.001
Tave3	-0.662	0.189	-3.51	0.003

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, IC1, Tave3, Alt

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	89.39	22.3467	32.41	<.001
Residual	16	11.03	0.6895		
Total	20	100.42	5.0209		
Change	-1	-4.87	4.8683	7.06	0.017

Percentage variance accounted for 86.3

Standard error of observations is estimated to be 0.830

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	40.60	8.51	4.77	<.001
APP_N	0.05850	0.00691	8.47	<.001
IC1	-0.00524	0.00137	-3.83	0.001

Tave3	-1.373	0.313	-4.39	<.001
Alt	-0.00501	0.00189	-2.66	0.017

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, IC1, Tave3, Alt, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	92.384	18.4767	34.50	<.001
Residual	15	8.034	0.5356		
Total	20	100.418	5.0209		
Change	-1	-2.997	2.9970	5.60	0.032

Percentage variance accounted for 89.3

Standard error of observations is estimated to be 0.732

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	55.80	9.88	5.65	<.001
APP_N	0.05542	0.00623	8.90	<.001
IC1	-0.00391	0.00133	-2.94	0.010

Tave3	-1.659	0.301	-5.51	<.001
Alt	-0.00520	0.00166	-3.12	0.007
WS3	-3.73	1.57	-2.37	0.032

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, IC1, Tave3, Alt, WS3, Mg

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	96.568	16.0946	58.52	<.001
Residual	14	3.850	0.2750		
Total	20	100.418	5.0209		
Change	-1	-4.184	4.1842	15.21	0.002

Percentage variance accounted for 94.5

Standard error of observations is estimated to be 0.524

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	57.22	7.09	8.08	<.001
APP_N	0.02265	0.00951	2.38	0.032

IC1	-0.004503	0.000965	-4.67 <.001
Tave3	-1.245	0.240	-5.18 <.001
Alt	-0.00254	0.00137	-1.85 0.085
WS3	-6.26	1.30	-4.81 <.001
Mg	-0.02857	0.00732	-3.90 0.002

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, IC1, Tave3, Alt, WS3, Mg,
Eto4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	97.385	13.9122	59.64	<.001
Residual	13	3.033	0.2333		
Total	20	100.418	5.0209		
Change	-1	-0.817	0.8175	3.50	0.084

Percentage variance accounted for 95.4

Standard error of observations is estimated to be 0.483

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	54.22	6.72	8.07	<.001
APP_N	0.02696	0.00906	2.98	0.011
IC1	-0.004765	0.000899	-5.30	<.001
Tave3	-1.301	0.223	-5.83	<.001
Alt	-0.00321	0.00131	-2.44	0.030
WS3	-5.37	1.29	-4.16	0.001
Mg	-0.03109	0.00688	-4.52	<.001
Eto4	0.766	0.409	1.87	0.084

===== Cultivar 5 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	49.80	49.796	31.84	<.001
Residual	19	29.72	1.564		
Total	20	79.51	3.976		
Change	-1	-49.80	49.796	31.84	<.001

Percentage variance accounted for 60.7

Standard error of observations is estimated to be 1.25

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-3.07	1.78	-1.72	0.102
Tn1	1.169	0.207	5.64	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	62.02	31.0106	31.91	<.001
Residual	18	17.49	0.9718		
Total	20	79.51	3.9757		
Change	-1	-12.23	12.2250	12.58	0.002

Percentage variance accounted for 75.6

Standard error of observations is estimated to be 0.986

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-5.48	1.56	-3.51	0.002
Tn1	1.153	0.163	7.05	<.001
APP_N	0.02743	0.00773	3.55	0.002

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Alt

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	67.03	22.3427	30.42	<.001
Residual	17	12.49	0.7344		
Total	20	79.51	3.9757		
Change	-1	-5.01	5.0069	6.82	0.018

Percentage variance accounted for 81.5

Standard error of observations is estimated to be 0.857

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	1.90	3.14	0.61	0.552
Tn1	0.447	0.305	1.47	0.161
APP_N	0.03644	0.00756	4.82	<.001
Alt	-0.002037	0.000780	-2.61	0.018

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Alt, Tn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	69.26	17.3153	27.02	<.001
Residual	16	10.25	0.6407		
Total	20	79.51	3.9757		
Change	-1	-2.23	2.2333	3.49	0.080

Percentage variance accounted for 83.9

Standard error of observations is estimated to be 0.800

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.

Constant	20.0	10.1	1.98	0.066
Tn1	1.054	0.432	2.44	0.027
APP_N	0.03734	0.00707	5.28	<.001
Alt	-0.00616	0.00232	-2.65	0.017
Tn4	-1.389	0.744	-1.87	0.080

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Alt, Tn4, Rad2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	71.107	14.2215	25.38	<.001
Residual	15	8.406	0.5604		
Total	20	79.513	3.9757		
Change	-1	-1.846	1.8460	3.29	0.090

Percentage variance accounted for 85.9

Standard error of observations is estimated to be 0.749

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.

Constant	17.08	9.62	1.78	0.096
Tn1	1.216	0.414	2.94	0.010
APP_N	0.03708	0.00662	5.60	<.001
Alt	-0.00637	0.00218	-2.93	0.010
Tn4	-1.493	0.698	-2.14	0.049
Rad2	0.202	0.111	1.81	0.090

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Alt, Tn4, Rad2, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	73.482	12.2470	28.43	<.001
Residual	14	6.031	0.4308		
Total	20	79.513	3.9757		
Change	-1	-2.375	2.3749	5.51	0.034

Percentage variance accounted for 89.2

Standard error of observations is estimated to be 0.656

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	15.42	8.46	1.82	0.090
Tn1	1.471	0.379	3.88	0.002
APP_N	0.04028	0.00596	6.76	<.001
Alt	-0.00687	0.00192	-3.58	0.003
Tn4	-1.633	0.615	-2.66	0.019
Rad2	0.295	0.105	2.80	0.014
frost4	0.893	0.380	2.35	0.034

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Alt, Tn4, Rad2, frost4,

Tx2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	75.145	10.7350	31.95	<.001
Residual	13	4.368	0.3360		
Total	20	79.513	3.9757		
Change	-1	-1.663	1.6628	4.95	0.044

Percentage variance accounted for 91.5

Standard error of observations is estimated to be 0.580

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	23.52	8.31	2.83	0.014
Tn1	1.855	0.377	4.93	<.001
APP_N	0.04075	0.00527	7.74	<.001
Alt	-0.00979	0.00215	-4.57	<.001
Tn4	-1.770	0.547	-3.24	0.006
Rad2	0.505	0.132	3.81	0.002
frost4	1.068	0.345	3.10	0.009
Tx2	-0.431	0.194	-2.22	0.044

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Alt, Tn4, Rad2, frost4,

Tx2, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	76.417	9.5521	37.02	<.001
Residual	12	3.097	0.2580		
Total	20	79.513	3.9757		
Change	-1	-1.272	1.2717	4.93	0.046

Percentage variance accounted for 93.5

Standard error of observations is estimated to be 0.508

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	23.16	7.29	3.18	0.008
Tn1	1.828	0.330	5.53	<.001
APP_N	0.04141	0.00463	8.95	<.001
Alt	-0.00961	0.00188	-5.11	<.001
Tn4	-1.364	0.513	-2.66	0.021
Rad2	0.954	0.233	4.09	0.002
frost4	0.955	0.307	3.11	0.009
Tx2	-0.663	0.199	-3.33	0.006
rad3	-0.348	0.157	-2.22	0.046

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Alt, Tn4, Rad2, frost4,

Tx2, rad3, ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.

Regression	9	77.187	8.5764	40.56 <.001
Residual	11	2.326	0.2114	
Total	20	79.513	3.9757	
Change	-1	-0.771	0.7708	3.65 0.083

Percentage variance accounted for 94.7

Standard error of observations is estimated to be 0.460

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	23.12	6.60	3.50	0.005
Tn1	2.352	0.406	5.79	<.001
APP_N	0.04259	0.00423	10.06	<.001
Alt	-0.01067	0.00179	-5.95	<.001
Tn4	-1.292	0.466	-2.77	0.018
Rad2	1.352	0.297	4.56	<.001
frost4	0.764	0.295	2.59	0.025
Tx2	-0.936	0.230	-4.07	0.002
rad3	-0.551	0.177	-3.11	0.010
ETn4	-0.352	0.184	-1.91	0.083

===== Cultivar 6 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	56.81	56.812	45.55	<.001
Residual	19	23.70	1.247		
Total	20	80.51	4.025		
Change	-1	-56.81	56.812	45.55	<.001

Percentage variance accounted for 69.0

Standard error of observations is estimated to be 1.12

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	1.909	0.853	2.24	0.037
APP_N	0.05910	0.00876	6.75	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, Tn2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	63.00	31.4977	32.37	<.001
Residual	18	17.51	0.9729		
Total	20	80.51	4.0254		
Change	-1	-6.18	6.1838	6.36	0.021

Percentage variance accounted for 75.8

Standard error of observations is estimated to be 0.986

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-1.68	1.61	-1.04	0.310
APP_N	0.06011	0.00774	7.76	<.001
Tn2	0.367	0.146	2.52	0.021

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, Tn2, HU15_3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	68.97	22.9904	33.88	<.001
Residual	17	11.54	0.6787		
Total	20	80.51	4.0254		
Change	-1	-5.98	5.9757	8.81	0.009

Percentage variance accounted for 83.1

Standard error of observations is estimated to be 0.824

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-4.80	1.71	-2.81	0.012
APP_N	0.05332	0.00686	7.77	<.001
Tn2	1.056	0.262	4.03	<.001
HU15_3	-0.001848	0.000623	-2.97	0.009

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, Tn2, HU15_3, Alt

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	72.756	18.1891	37.54	<.001
Residual	16	7.752	0.4845		
Total	20	80.508	4.0254		
Change	-1	-3.785	3.7852	7.81	0.013

Percentage variance accounted for 88.0

Standard error of observations is estimated to be 0.696

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	8.56	4.99	1.71	0.106
APP_N	0.05681	0.00593	9.58	<.001
Tn2	0.666	0.262	2.54	0.022
HU15_3	-0.00493	0.00122	-4.03	<.001
Alt	-0.00482	0.00172	-2.80	0.013

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, Tn2, HU15_3, Alt, Eto4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	74.874	14.9747	39.86	<.001
Residual	15	5.635	0.3757		
Total	20	80.508	4.0254		
Change	-1	-2.117	2.1171	5.64	0.031

Percentage variance accounted for 90.7

Standard error of observations is estimated to be 0.613

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	4.16	4.77	0.87	0.396
APP_N	0.06386	0.00601	10.63	<.001
Tn2	0.857	0.244	3.51	0.003
HU15_3	-0.00585	0.00114	-5.11	<.001
Alt	-0.00521	0.00153	-3.41	0.004
Eto4	1.085	0.457	2.37	0.031

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, Tn2, HU15_3, Alt, Eto4, Mg

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	76.690	12.7817	46.86	<.001
Residual	14	3.819	0.2728		
Total	20	80.508	4.0254		
Change	-1	-1.816	1.8164	6.66	0.022

Percentage variance accounted for 93.2

Standard error of observations is estimated to be 0.522

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	2.34	4.13	0.57	0.580
APP_N	0.05087	0.00718	7.09	<.001
Tn2	0.915	0.209	4.37	<.001
HU15_3	-0.00474	0.00106	-4.45	<.001
Alt	-0.00452	0.00133	-3.40	0.004
Eto4	1.581	0.434	3.64	0.003
Mg	-0.01644	0.00637	-2.58	0.022

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, Tn2, HU15_3, Alt, Eto4, Mg,

frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	77.721	11.1030	51.78	<.001
Residual	13	2.788	0.2144		
Total	20	80.508	4.0254		
Change	-1	-1.031	1.0309	4.81	0.047

Percentage variance accounted for 94.7

Standard error of observations is estimated to be 0.463

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	0.11	3.80	0.03	0.976
APP_N	0.05709	0.00697	8.19	<.001
Tn2	1.032	0.193	5.35	<.001
HU15_3	-0.004892	0.000947	-5.17	<.001
Alt	-0.00449	0.00118	-3.82	0.002
Eto4	1.661	0.387	4.29	<.001
Mg	-0.01301	0.00586	-2.22	0.045
frost4	0.582	0.266	2.19	0.047

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, Tn2, HU15_3, Alt, Eto4, Mg,
frost4, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	78.968	9.8711	76.91	<.001
Residual	12	1.540	0.1283		
Total	20	80.508	4.0254		
Change	-1	-1.248	1.2475	9.72	0.009

Percentage variance accounted for 96.8

Standard error of observations is estimated to be 0.358

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	11.38	4.66	2.44	0.031
APP_N	0.04371	0.00689	6.34	<.001
Tn2	0.899	0.155	5.79	<.001
HU15_3	-0.004790	0.000733	-6.53	<.001
Alt	-0.003408	0.000975	-3.50	0.004
Eto4	1.220	0.331	3.69	0.003
Mg	-0.02033	0.00511	-3.98	0.002
frost4	0.646	0.206	3.13	0.009
WS3	-3.001	0.963	-3.12	0.009

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, Tn2, HU15_3, Alt, Eto4, Mg,

frost4, WS3, DL1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	79.171	8.7968	72.36	<.001
Residual	11	1.337	0.1216		
Total	20	80.508	4.0254		
Change	-1	-0.203	0.2028	1.67	0.223

Percentage variance accounted for 97.0

Standard error of observations is estimated to be 0.349

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	194.	142.	1.37	0.198
APP_N	0.04653	0.00705	6.60	<.001
Tn2	0.974	0.162	6.02	<.001
HU15_3	-0.004287	0.000813	-5.28	<.001
Alt	-0.00282	0.00105	-2.67	0.022

Eto4	1.228	0.322	3.81	0.003
Mg	-0.01464	0.00664	-2.20	0.050
frost4	0.609	0.203	3.00	0.012
WS3	-3.61	1.05	-3.44	0.006
DL1	-16.5	12.8	-1.29	0.223

===== Cultivar 7 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	19.74	19.7404	24.10	<.001
Residual	19	15.56	0.8190		
Total	20	35.30	1.7650		
Change	-1	-19.74	19.7404	24.10	<.001

Percentage variance accounted for 53.6

Standard error of observations is estimated to be 0.905

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	2.671	0.691	3.86	0.001
APP_N	0.03484	0.00710	4.91	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, C1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	23.57	11.7854	18.08	<.001
Residual	18	11.73	0.6517		
Total	20	35.30	1.7650		
Change	-1	-3.83	3.8303	5.88	0.026

Percentage variance accounted for 63.1

Standard error of observations is estimated to be 0.807

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	2.890	0.623	4.64	<.001

APP_N	0.03676	0.00638	5.76	<.001
C1	-0.001044	0.000431	-2.42	0.026

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, C1, Tave3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	26.756	8.9186	17.74	<.001
Residual	17	8.545	0.5027		
Total	20	35.301	1.7650		
Change	-1	-3.185	3.1851	6.34	0.022

Percentage variance accounted for 71.5

Standard error of observations is estimated to be 0.709

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	11.78	3.57	3.30	0.004
APP_N	0.03333	0.00577	5.78	<.001
C1	-0.003374	0.001000	-3.37	0.004

Tave3	-0.364	0.144	-2.52	0.022

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, C1, Tave3, Mg

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	29.074	7.2685	18.68	<.001
Residual	16	6.227	0.3892		
Total	20	35.301	1.7650		
Change	-1	-2.318	2.3182	5.96	0.027

Percentage variance accounted for 78.0

Standard error of observations is estimated to be 0.624

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	15.02	3.41	4.40	<.001
APP_N	0.01425	0.00932	1.53	0.146
C1	-0.004475	0.000989	-4.53	<.001
Tave3	-0.326	0.128	-2.55	0.021

Mg -0.01813 0.00743 -2.44 0.027

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, C1, Tave3, Mg, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	30.421	6.0842	18.70	<.001
Residual	15	4.880	0.3253		
Total	20	35.301	1.7650		
Change	-1	-1.347	1.3470	4.14	0.060

Percentage variance accounted for 81.6

Standard error of observations is estimated to be 0.570

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	27.03	6.68	4.05	0.001
APP_N	0.00812	0.00904	0.90	0.383
C1	-0.00275	0.00124	-2.22	0.042
Tave3	-0.448	0.131	-3.41	0.004

Mg	-0.02152	0.00699	-3.08	0.008
WS3	-3.51	1.72	-2.03	0.060

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, C1, Tave3, Mg, WS3, RC4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	31.361	5.2268	18.57	<.001
Residual	14	3.940	0.2815		
Total	20	35.301	1.7650		
Change	-1	-0.940	0.9395	3.34	0.089

Percentage variance accounted for 84.1

Standard error of observations is estimated to be 0.531

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	29.30	6.33	4.63	<.001
APP_N	0.00822	0.00841	0.98	0.345
C1	-0.00032	0.00176	-0.18	0.859

Tave3	-0.832	0.243	-3.42	0.004
Mg	-0.02212	0.00651	-3.40	0.004
WS3	-3.57	1.60	-2.22	0.043
RC4	-0.001086	0.000594	-1.83	0.089

===== Cultivar 8 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	30.22	30.217	15.27	<.001
Residual	19	37.61	1.980		
Total	20	67.83	3.391		
Change	-1	-30.22	30.217	15.27	<.001

Percentage variance accounted for 41.6

Standard error of observations is estimated to be 1.41

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-1.12	2.01	-0.56	0.582
Tn1	0.911	0.233	3.91	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	52.97	26.4868	32.10	<.001
Residual	18	14.85	0.8252		
Total	20	67.83	3.3914		
Change	-1	-22.76	22.7564	27.58	<.001

Percentage variance accounted for 75.7

Standard error of observations is estimated to be 0.908

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-4.42	1.44	-3.07	0.007
Tn1	0.888	0.151	5.90	<.001

APP_N 0.03742 0.00713 5.25 <.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Tn2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	57.31	19.1025	30.87	<.001
Residual	17	10.52	0.6189		
Total	20	67.83	3.3914		
Change	-1	-4.33	4.3337	7.00	0.017

Percentage variance accounted for 81.8

Standard error of observations is estimated to be 0.787

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-5.53	1.32	-4.21	<.001
Tn1	-1.81	1.03	-1.76	0.096
APP_N	0.04772	0.00730	6.54	<.001
Tn2	2.423	0.915	2.65	0.017

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Tn2, Rad2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	59.472	14.8681	28.47	<.001
Residual	16	8.356	0.5222		
Total	20	67.828	3.3914		
Change	-1	-2.165	2.1649	4.15	0.059

Percentage variance accounted for 84.6

Standard error of observations is estimated to be 0.723

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-9.71	2.38	-4.08	<.001
Tn1	-1.282	0.979	-1.31	0.209
APP_N	0.04617	0.00674	6.85	<.001
Tn2	2.032	0.863	2.36	0.032
Rad2	0.223	0.110	2.04	0.059

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Tn2, Rad2, Mg

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	61.448	12.2895	28.89	<.001
Residual	15	6.380	0.4254		
Total	20	67.828	3.3914		
Change	-1	-1.975	1.9753	4.64	0.048

Percentage variance accounted for 87.5

Standard error of observations is estimated to be 0.652

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-10.84	2.21	-4.90	<.001
Tn1	-1.371	0.884	-1.55	0.142
APP_N	0.03183	0.00902	3.53	0.003
Tn2	2.346	0.792	2.96	0.010
Rad2	0.319	0.108	2.94	0.010

Mg -0.01277 0.00593 -2.15 0.048

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Tn2, Rad2, Mg, rain2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	63.124	10.5206	31.31	<.001
Residual	14	4.704	0.3360		
Total	20	67.828	3.3914		
Change	-1	-1.676	1.6760	4.99	0.042

Percentage variance accounted for 90.1

Standard error of observations is estimated to be 0.580

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	-11.97	2.03	-5.90	<.001
Tn1	-1.541	0.790	-1.95	0.071
APP_N	0.02692	0.00831	3.24	0.006
Tn2	2.587	0.712	3.63	0.003

Rad2	0.3313	0.0965	3.43	0.004
Mg	-0.01189	0.00528	-2.25	0.041
rain2	0.00686	0.00307	2.23	0.042

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Tn2, Rad2, Mg, rain2,

P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	63.907	9.1295	30.27	<.001
Residual	13	3.921	0.3016		
Total	20	67.828	3.3914		
Change	-1	-0.783	0.7831	2.60	0.131

Percentage variance accounted for 91.1

Standard error of observations is estimated to be 0.549

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-8.90	2.71	-3.29	0.006

Tn1	-1.934	0.787	-2.46	0.029
APP_N	0.01924	0.00921	2.09	0.057
Tn2	2.955	0.712	4.15	0.001
Rad2	0.172	0.135	1.28	0.224
Mg	-0.02057	0.00735	-2.80	0.015
rain2	0.00882	0.00315	2.80	0.015
P	0.0440	0.0273	1.61	0.131

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Tn2, Rad2, Mg, rain2,

P, RHx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	65.631	8.2038	44.80	<.001
Residual	12	2.198	0.1831		
Total	20	67.828	3.3914		
Change	-1	-1.724	1.7239	9.41	0.010

Percentage variance accounted for 94.6

Standard error of observations is estimated to be 0.428

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	-18.18	3.69	-4.93	<.001
Tn1	-1.777	0.615	-2.89	0.014
APP_N	0.01109	0.00765	1.45	0.173
Tn2	2.829	0.557	5.08	<.001
Rad2	0.092	0.108	0.85	0.413
Mg	-0.02486	0.00590	-4.22	0.001
rain2	0.00743	0.00250	2.97	0.012
P	0.0723	0.0232	3.12	0.009
RHx4	0.1275	0.0415	3.07	0.010

===== Cultivar 10 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	64.08	64.0811	75.45	<.001
Residual	19	16.14	0.8493		
Total	20	80.22	4.0109		

Change	-1	-64.08	64.0811	75.45	<.001

Percentage variance accounted for 78.8

Standard error of observations is estimated to be 0.922

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	1.772	0.704	2.52	0.021
APP_N	0.06276	0.00723	8.69	<.001

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, Mg

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	67.75	33.8742	48.90	<.001
Residual	18	12.47	0.6928		
Total	20	80.22	4.0109		
Change	-1	-3.67	3.6673	5.29	0.034

Percentage variance accounted for 82.7

Standard error of observations is estimated to be 0.832

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	4.29	1.27	3.39	0.003
APP_N	0.04852	0.00899	5.39	<.001
Mg	-0.01179	0.00512	-2.30	0.034

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, Mg, IC1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	73.241	24.4138	59.49	<.001
Residual	17	6.977	0.4104		
Total	20	80.218	4.0109		
Change	-1	-5.493	5.4930	13.38	0.002

Percentage variance accounted for 89.8

Standard error of observations is estimated to be 0.641

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	9.72	1.78	5.47	<.001
APP_N	0.02935	0.00868	3.38	0.004
Mg	-0.03007	0.00636	-4.72	<.001
IC1	-0.002237	0.000612	-3.66	0.002

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, Mg, IC1, RHn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	75.051	18.7628	58.10	<.001
Residual	16	5.167	0.3229		
Total	20	80.218	4.0109		
Change	-1	-1.810	1.8097	5.60	0.031

Percentage variance accounted for 91.9

Standard error of observations is estimated to be 0.568

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	12.67	2.01	6.31	<.001
APP_N	0.03736	0.00841	4.44	<.001
Mg	-0.03415	0.00590	-5.78	<.001
IC1	-0.001982	0.000553	-3.58	0.002
RHn4	-0.0708	0.0299	-2.37	0.031

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, Mg, IC1, RHn4, Tx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	76.908	15.3816	69.70	<.001
Residual	15	3.310	0.2207		
Total	20	80.218	4.0109		
Change	-1	-1.857	1.8570	8.41	0.011

Percentage variance accounted for 94.5

Standard error of observations is estimated to be 0.470

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	21.14	3.36	6.29	<.001
APP_N	0.04010	0.00702	5.71	<.001
Mg	-0.02945	0.00514	-5.73	<.001
IC1	-0.003981	0.000827	-4.81	<.001
RHn4	-0.0819	0.0250	-3.28	0.005
Tx4	-0.2795	0.0963	-2.90	0.011

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, Mg, IC1, RHn4, Tx4, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	78.711	13.1185	121.88	<.001
Residual	14	1.507	0.1076		
Total	20	80.218	4.0109		
Change	-1	-1.803	1.8031	16.75	0.001

Percentage variance accounted for 97.3

Standard error of observations is estimated to be 0.328

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	34.91	4.10	8.51	<.001
APP_N	0.02926	0.00557	5.25	<.001
Mg	-0.03731	0.00407	-9.16	<.001
IC1	-0.003256	0.000604	-5.39	<.001
RHn4	-0.0844	0.0175	-4.83	<.001
Tx4	-0.4375	0.0776	-5.64	<.001
WS3	-3.225	0.788	-4.09	0.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, Mg, IC1, RHn4, Tx4, WS3,

Long

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	79.7191	11.38844	296.66	<.001
Residual	13	0.4991	0.03839		
Total	20	80.2182	4.01091		
Change	-1	-1.0079	1.00788	26.25	<.001

Percentage variance accounted for 99.0

Standard error of observations is estimated to be 0.196

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	23.10	3.36	6.87	<.001
APP_N	0.03948	0.00388	10.18	<.001
Mg	-0.02512	0.00340	-7.38	<.001
IC1	-0.003140	0.000361	-8.69	<.001
RHn4	-0.0835	0.0104	-8.00	<.001
Tx4	-0.6183	0.0582	-10.62	<.001
WS3	-3.608	0.476	-7.57	<.001
Long	0.5039	0.0983	5.12	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, Mg, IC1, RHn4, Tx4, WS3,

Long, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	79.8655	9.98318	339.67	<.001
Residual	12	0.3527	0.02939		

Total 20 80.2182 4.01091

Change -1 -0.1464 0.14637 4.98 0.045

Percentage variance accounted for 99.3

Standard error of observations is estimated to be 0.171

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	21.72	3.01	7.22	<.001
APP_N	0.03858	0.00342	11.29	<.001
Mg	-0.02546	0.00298	-8.54	<.001
IC1	-0.003212	0.000318	-10.10	<.001
RHn4	-0.08235	0.00915	-9.00	<.001
Tx4	-0.5968	0.0519	-11.51	<.001
WS3	-3.470	0.421	-8.23	<.001
Long	0.5316	0.0869	6.11	<.001
K	-0.002201	0.000986	-2.23	0.045

===== Cultivar 11 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	34.13	34.128	20.18	<.001
Residual	19	32.14	1.691		
Total	20	66.26	3.313		
Change	-1	-34.13	34.128	20.18	<.001

Percentage variance accounted for 49.0

Standard error of observations is estimated to be 1.30

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-1.75	1.85	-0.94	0.358
Tn1	0.968	0.215	4.49	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	51.93	25.9655	32.61	<.001
Residual	18	14.33	0.7962		
Total	20	66.26	3.3132		
Change	-1	-17.80	17.8027	22.36	<.001

Percentage variance accounted for 76.0

Standard error of observations is estimated to be 0.892

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-4.67	1.41	-3.30	0.004
Tn1	0.948	0.148	6.41	<.001
APP_N	0.03310	0.00700	4.73	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Tn2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	57.336	19.1120	36.39	<.001

Residual	17	8.927	0.5251		
Total	20	66.263	3.3132		
Change	-1	-5.405	5.4050	10.29	0.005

Percentage variance accounted for 84.1

Standard error of observations is estimated to be 0.725

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-5.91	1.21	-4.88	<.001
Tn1	-2.064	0.946	-2.18	0.044
APP_N	0.04460	0.00672	6.64	<.001
Tn2	2.706	0.843	3.21	0.005

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Tn2, RHx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	58.623	14.6557	30.69	<.001
Residual	16	7.641	0.4775		

Total	20	66.263	3.3132		
Change	-1	-1.287	1.2869	2.69	0.120

Percentage variance accounted for 85.6

Standard error of observations is estimated to be 0.691

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-14.04	5.09	-2.76	0.014
Tn1	-1.887	0.909	-2.08	0.054
APP_N	0.03971	0.00707	5.62	<.001
Tn2	2.587	0.807	3.20	0.006
RHx4	0.0934	0.0569	1.64	0.120

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Tn2, RHx4, Mg

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	59.234	11.8468	25.28	<.001
Residual	15	7.030	0.4686		

Total	20	66.263	3.3132	
Change	-1	-0.611	0.6110	1.30 0.271

Percentage variance accounted for 85.9

Standard error of observations is estimated to be 0.685

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-12.71	5.17	-2.46	0.027
Tn1	-2.071	0.915	-2.26	0.039
APP_N	0.03326	0.00900	3.70	0.002
Tn2	2.850	0.832	3.42	0.004
RHx4	0.0820	0.0572	1.43	0.172
Mg	-0.00658	0.00577	-1.14	0.271

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Tn2, RHx4, Mg, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	60.771	10.1284	25.82	<.001

Residual	14	5.493	0.3923		
Total	20	66.263	3.3132		
Change	-1	-1.537	1.5367	3.92	0.068

Percentage variance accounted for 88.2

Standard error of observations is estimated to be 0.626

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	3.58	9.50	0.38	0.712
Tn1	-1.353	0.912	-1.48	0.160
APP_N	0.0176	0.0114	1.54	0.145
Tn2	1.871	0.908	2.06	0.058
RHx4	0.0498	0.0548	0.91	0.379
Mg	-0.02023	0.00868	-2.33	0.035
WS3	-2.83	1.43	-1.98	0.068

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Tn2, RHx4, Mg, WS3,

P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	62.077	8.8681	27.54	<.001
Residual	13	4.187	0.3221		
Total	20	66.263	3.3132		
Change	-1	-1.306	1.3061	4.06	0.065

Percentage variance accounted for 90.3

Standard error of observations is estimated to be 0.567

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-0.86	8.88	-0.10	0.924
Tn1	-1.353	0.827	-1.64	0.126
APP_N	0.0070	0.0116	0.60	0.557
Tn2	1.999	0.825	2.42	0.031
RHx4	0.0947	0.0545	1.74	0.106
Mg	-0.02998	0.00924	-3.25	0.006
WS3	-2.63	1.30	-2.02	0.065
P	0.0402	0.0200	2.01	0.065

===== Cultivar 12 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	42.56	42.559	23.71	<.001
Residual	19	34.10	1.795		
Total	20	76.66	3.833		
Change	-1	-42.56	42.559	23.71	<.001

Percentage variance accounted for 53.2

Standard error of observations is estimated to be 1.34

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-2.47	1.91	-1.29	0.211
Tn1	1.081	0.222	4.87	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	60.17	30.0863	32.84	<.001
Residual	18	16.49	0.9161		
Total	20	76.66	3.8331		
Change	-1	-17.61	17.6131	19.23	<.001

Percentage variance accounted for 76.1

Standard error of observations is estimated to be 0.957

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-5.37	1.52	-3.54	0.002
Tn1	1.061	0.159	6.69	<.001
APP_N	0.03292	0.00751	4.38	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Tn2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	66.12	22.0395	35.54	<.001
Residual	17	10.54	0.6202		
Total	20	76.66	3.8331		
Change	-1	-5.95	5.9459	9.59	0.007

Percentage variance accounted for 83.8

Standard error of observations is estimated to be 0.788

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-6.67	1.32	-5.07	<.001
Tn1	-2.10	1.03	-2.04	0.057
APP_N	0.04498	0.00730	6.16	<.001
Tn2	2.838	0.916	3.10	0.007

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Tn2, RHx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	67.591	16.8978	29.81	<.001
Residual	16	9.071	0.5669		
Total	20	76.662	3.8331		
Change	-1	-1.473	1.4729	2.60	0.127

Percentage variance accounted for 85.2

Standard error of observations is estimated to be 0.753

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-15.38	5.54	-2.77	0.014
Tn1	-1.909	0.990	-1.93	0.072
APP_N	0.03976	0.00770	5.16	<.001
Tn2	2.711	0.880	3.08	0.007
RHx4	0.0999	0.0620	1.61	0.127

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Tn2, RHx4, Rad2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	69.459	13.8918	28.93	<.001
Residual	15	7.203	0.4802		
Total	20	76.662	3.8331		
Change	-1	-1.868	1.8678	3.89	0.067

Percentage variance accounted for 87.5

Standard error of observations is estimated to be 0.693

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-20.97	5.84	-3.59	0.003
Tn1	-1.377	0.951	-1.45	0.168
APP_N	0.03731	0.00719	5.19	<.001
Tn2	2.319	0.834	2.78	0.014
RHx4	0.1189	0.0579	2.06	0.058
Rad2	0.210	0.107	1.97	0.067

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Tn2, RHx4, Rad2, rad4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	70.451	11.7419	26.47	<.001
Residual	14	6.211	0.4436		
Total	20	76.662	3.8331		
Change	-1	-0.992	0.9920	2.24	0.157

Percentage variance accounted for 88.4

Standard error of observations is estimated to be 0.666

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	-20.21	5.64	-3.59	0.003
Tn1	-0.58	1.06	-0.55	0.592
APP_N	0.03536	0.00704	5.03	<.001
Tn2	1.551	0.952	1.63	0.126
RHx4	0.1277	0.0559	2.28	0.039
Rad2	0.651	0.312	2.09	0.056
rad4	-0.417	0.279	-1.50	0.157

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Tn2, RHx4, Rad2, rad4,

rain2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	71.420	10.2028	25.30	<.001
Residual	13	5.242	0.4033		
Total	20	76.662	3.8331		
Change	-1	-0.969	0.9686	2.40	0.145

Percentage variance accounted for 89.5

Standard error of observations is estimated to be 0.635

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-18.18	5.53	-3.29	0.006
Tn1	-0.59	1.01	-0.58	0.569
APP_N	0.03157	0.00714	4.42	<.001
Tn2	1.616	0.909	1.78	0.099
RHx4	0.0996	0.0563	1.77	0.100
Rad2	0.777	0.308	2.52	0.026
rad4	-0.531	0.276	-1.92	0.077
rain2	0.00573	0.00370	1.55	0.145

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Tn2, RHx4, Rad2, rad4,

rain2, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	73.389	9.1737	33.64	<.001
Residual	12	3.273	0.2727		
Total	20	76.662	3.8331		
Change	-1	-1.970	1.9696	7.22	0.020

Percentage variance accounted for 92.9

Standard error of observations is estimated to be 0.522

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	-16.90	4.57	-3.70	0.003
Tn1	-0.306	0.836	-0.37	0.720
APP_N	0.02984	0.00591	5.05	<.001
Tn2	1.167	0.766	1.52	0.153
RHx4	0.1513	0.0501	3.02	0.011
Rad2	0.839	0.255	3.30	0.006
rad4	-0.851	0.256	-3.32	0.006
rain2	0.00882	0.00325	2.71	0.019
P	0.0571	0.0212	2.69	0.020

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Tn1, APP_N, Tn2, RHx4, Rad2, rad4,

rain2, P, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	74.623	8.2915	44.73	<.001
Residual	11	2.039	0.1854		
Total	20	76.662	3.8331		
Change	-1	-1.234	1.2339	6.66	0.026

Percentage variance accounted for 95.2

Standard error of observations is estimated to be 0.431

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	-18.44	3.82	-4.83	<.001
Tn1	-0.119	0.693	-0.17	0.867
APP_N	0.01883	0.00648	2.91	0.014
Tn2	1.347	0.635	2.12	0.057
RHx4	0.2087	0.0469	4.45	<.001

Rad2	0.737	0.214	3.45	0.005
rad4	-0.750	0.215	-3.49	0.005
rain2	0.00828	0.00269	3.08	0.010
P	0.0846	0.0205	4.13	0.002
pH_H2O	-1.183	0.459	-2.58	0.026

===== Area 1 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	126.1	126.079	77.01	<.001
Residual	75	122.8	1.637		
Total	76	248.9	3.275		
Change	-1	-126.1	126.079	77.01	<.001

Percentage variance accounted for 50.0

Standard error of observations is estimated to be 1.28

*** Estimates of parameters ***

	estimate	s.e.	t(75)	t pr.
Constant	2.874	0.520	5.53	<.001
APP_N	0.04946	0.00564	8.78	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, Tx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	152.96	76.482	59.01	<.001
Residual	74	95.91	1.296		
Total	76	248.87	3.275		
Change	-1	-26.88	26.884	20.74	<.001

Percentage variance accounted for 60.4

Standard error of observations is estimated to be 1.14

*** Estimates of parameters ***

	estimate	s.e.	t(74)	t pr.

Constant	37.61	7.64	4.92	<.001
APP_N	0.04429	0.00514	8.62	<.001
Tx4	-1.176	0.258	-4.55	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, APP_N, Tx4, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	156.34	52.112	41.11	<.001
Residual	73	92.54	1.268		
Total	76	248.87	3.275		
Change	-1	-3.37	3.373	2.66	0.107

Percentage variance accounted for 61.3

Standard error of observations is estimated to be 1.13

*** Estimates of parameters ***

	estimate	s.e.	t(73)	t pr.
Constant	37.67	7.56	4.99	<.001
APP_N	0.04258	0.00519	8.20	<.001

Tx4	-1.155	0.256	-4.52	<.001
K	-0.00356	0.00218	-1.63	0.107

===== Area 2 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	188.73	188.7263	347.72	<.001
Residual	75	40.71	0.5428		
Total	76	229.43	3.0189		
Change	-1	-188.73	188.7263	347.72	<.001

Percentage variance accounted for 82.0

Standard error of observations is estimated to be 0.737

*** Estimates of parameters ***

	estimate	s.e.	t(75)	t pr.
Constant	-24.46	1.65	-14.84	<.001

rad3 1.3750 0.0737 18.65 <.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, rad3, rain4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	195.01	97.5028	209.58	<.001
Residual	74	34.43	0.4652		
Total	76	229.43	3.0189		
Change	-1	-6.28	6.2793	13.50	<.001

Percentage variance accounted for 84.6

Standard error of observations is estimated to be 0.682

*** Estimates of parameters ***

	estimate	s.e.	t(74)	t pr.
Constant	-23.36	1.56	-15.01	<.001
rad3	1.2518	0.0761	16.46	<.001
rain4	0.002841	0.000773	3.67	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, rad3, rain4, HU10_3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	197.69	65.8983	151.57	<.001
Residual	73	31.74	0.4348		
Total	76	229.43	3.0189		
Change	-1	-2.69	2.6893	6.19	0.015

Percentage variance accounted for 85.6

Standard error of observations is estimated to be 0.659

*** Estimates of parameters ***

	estimate	s.e.	t(73)	t pr.
Constant	-28.58	2.58	-11.06	<.001
rad3	1.2758	0.0742	17.20	<.001
rain4	0.003325	0.000773	4.30	<.001
HU10_3	0.001568	0.000631	2.49	0.015

===== Area 3 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	123.3	123.292	62.67	<.001
Residual	75	147.6	1.967		
Total	76	270.8	3.564		
Change	-1	-123.3	123.292	62.67	<.001

Percentage variance accounted for 44.8

Standard error of observations is estimated to be 1.40

*** Estimates of parameters ***

	estimate	s.e.	t(75)	t pr.
Constant	38.44	4.07	9.43	<.001
WS3	-10.55	1.33	-7.92	<.001

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, WS3, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	140.6	70.298	39.94	<.001
Residual	74	130.2	1.760		
Total	76	270.8	3.564		
Change	-1	-17.3	17.303	9.83	0.002

Percentage variance accounted for 50.6

Standard error of observations is estimated to be 1.33

*** Estimates of parameters ***

	estimate	s.e.	t(74)	t pr.
Constant	34.72	4.03	8.61	<.001
WS3	-9.20	1.33	-6.91	<.001
frost4	-0.687	0.219	-3.14	0.002

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, WS3, frost4, ETx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	145.1	48.358	28.07	<.001
Residual	73	125.8	1.723		
Total	76	270.8	3.564		
Change	-1	-4.5	4.479	2.60	0.111

Percentage variance accounted for 51.7

Standard error of observations is estimated to be 1.31

*** Estimates of parameters ***

	estimate	s.e.	t(73)	t pr.
Constant	45.09	7.57	5.96	<.001
WS3	-10.53	1.55	-6.78	<.001
frost4	-0.586	0.226	-2.59	0.011
ETx4	-0.208	0.129	-1.61	0.111

===== Year 1 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	5.181	5.1815	21.95	<.001
Residual	31	7.318	0.2361		
Total	32	12.500	0.3906		
Change	-1	-5.181	5.1815	21.95	<.001

Percentage variance accounted for 39.6

Standard error of observations is estimated to be 0.486

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	2.881	0.237	12.15	<.001
K	0.00914	0.00195	4.69	<.001

===== Year 2 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Rad2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	10.68	10.6828	23.46	<.001
Residual	31	14.12	0.4554		
Total	32	24.80	0.7750		
Change	-1	-10.68	10.6828	23.46	<.001

Percentage variance accounted for 41.2

Standard error of observations is estimated to be 0.675

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	19.00	2.86	6.64	<.001
Rad2	-0.923	0.191	-4.84	<.001

===== Year 3 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Long

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	21.24	21.237	21.11	<.001
Residual	31	31.18	1.006		
Total	32	52.42	1.638		
Change	-1	-21.24	21.237	21.11	<.001

Percentage variance accounted for 38.6

Standard error of observations is estimated to be 1.00

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	-24.33	6.62	-3.67	<.001
Long	1.019	0.222	4.59	<.001

===== Year 4 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	6.64	6.640	6.01	0.020
Residual	31	34.24	1.105		
Total	32	40.88	1.278		
Change	-1	-6.64	6.640	6.01	0.020

Percentage variance accounted for 13.5

Standard error of observations is estimated to be 1.05

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	12.27	2.08	5.89	<.001
rad3	-0.2442	0.0996	-2.45	0.020

===== Year 5 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, HU15_2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	3.34	3.336	2.55	0.121
Residual	31	40.59	1.309		
Total	32	43.93	1.373		
Change	-1	-3.34	3.336	2.55	0.121

Percentage variance accounted for 4.6

Standard error of observations is estimated to be 1.14

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	6.970	0.412	16.93	<.001
HU15_2	0.001341	0.000840	1.60	0.121

===== Year 6 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, Alt

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	6.46	6.457	3.36	0.076
Residual	31	59.58	1.922		
Total	32	66.04	2.064		
Change	-1	-6.46	6.457	3.36	0.076

Percentage variance accounted for 6.9

Standard error of observations is estimated to be 1.39

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	9.009	0.557	16.16	<.001
Alt	-0.000840	0.000458	-1.83	0.076

===== Year 7 for Tclleftprun =====

441.....

***** Regression Analysis *****

Response variate: Tclleftprun

Fitted terms: Constant, IC1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	9.01	9.009	4.49	0.042
Residual	31	62.23	2.008		
Total	32	71.24	2.226		
Change	-1	-9.01	9.009	4.49	0.042

Percentage variance accounted for 9.8

Standard error of observations is estimated to be 1.42

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	9.509	0.757	12.55	<.001
IC1	-0.001885	0.000890	-2.12	0.042

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Appendix 3.9.2 Regression analysis on the number of fertile cladodes for cultivars combined, individual cultivars, production year and areas

JPfertcladFS.out

file is JPfyieldFS.gen

========== CACTUS PEAR ENVIRONMENTAL ADAPTIBILITY: FRUIT YIELD

===== FS regression model on all data for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	65.6	65.560	29.35	<.001
Residual	229	511.5	2.234		
Total	230	577.1	2.509		
Change	-1	-65.6	65.560	29.35	<.001

Percentage variance accounted for 11.0

Standard error of observations is estimated to be 1.49

*** Estimates of parameters ***

	estimate	s.e.	t(229)	t pr.
Constant	1.242	0.344	3.61	<.001
APP_N	0.01914	0.00353	5.42	<.001

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	143.1	71.554	37.59	<.001
Residual	228	434.0	1.903		
Total	230	577.1	2.509		
Change	-1	-77.5	77.547	40.74	<.001

Percentage variance accounted for 24.1

Standard error of observations is estimated to be 1.38

*** Estimates of parameters ***

	estimate	s.e.	t(228)	t pr.

Constant	-0.106	0.381	-0.28	0.781
APP_N	0.02335	0.00333	7.02	<.001
P	0.05443	0.00853	6.38	<.001

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, P, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	156.6	52.197	28.18	<.001
Residual	227	420.5	1.852		
Total	230	577.1	2.509		
Change	-1	-13.5	13.485	7.28	0.007

Percentage variance accounted for 26.2

Standard error of observations is estimated to be 1.36

*** Estimates of parameters ***

	estimate	s.e.	t(227)	t pr.
Constant	-0.866	0.470	-1.84	0.067
APP_N	0.02541	0.00337	7.54	<.001

P	0.05637	0.00844	6.68	<.001
K	0.00509	0.00189	2.70	0.007

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, P, K, RHx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	160.8	40.210	21.83	<.001
Residual	226	416.2	1.842		
Total	230	577.1	2.509		
Change	-1	-4.2	4.250	2.31	0.130

Percentage variance accounted for 26.6

Standard error of observations is estimated to be 1.36

*** Estimates of parameters ***

	estimate	s.e.	t(226)	t pr.
Constant	-5.57	3.13	-1.78	0.077
APP_N	0.02328	0.00364	6.39	<.001
P	0.06221	0.00926	6.72	<.001

K	0.00495	0.00188	2.63	0.009
RHx4	0.0547	0.0360	1.52	0.130

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, P, K, RHx4, ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	164.6	32.929	17.97	<.001
Residual	225	412.4	1.833		
Total	230	577.1	2.509		
Change	-1	-3.8	3.806	2.08	0.151

Percentage variance accounted for 26.9

Standard error of observations is estimated to be 1.35

*** Estimates of parameters ***

	estimate	s.e.	t(225)	t pr.
Constant	-5.31	3.13	-1.70	0.091
APP_N	0.02221	0.00371	5.99	<.001
P	0.05771	0.00975	5.92	<.001

K	0.00431	0.00193	2.24	0.026
RHx4	0.0534	0.0359	1.49	0.139
ETn4	0.0925	0.0642	1.44	0.151

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, P, K, RHx4, ETn4, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	169.1	28.180	15.47	<.001
Residual	224	408.0	1.821		
Total	230	577.1	2.509		
Change	-1	-4.4	4.435	2.44	0.120

Percentage variance accounted for 27.4

Standard error of observations is estimated to be 1.35

*** Estimates of parameters ***

	estimate	s.e.	t(224)	t pr.
Constant	-3.58	3.31	-1.08	0.280
APP_N	0.01786	0.00463	3.86	<.001

P	0.0702	0.0126	5.58	<.001
K	0.00565	0.00211	2.68	0.008
RHx4	0.0648	0.0365	1.77	0.078
ETn4	0.2016	0.0948	2.13	0.035
pH_H2O	-0.508	0.325	-1.56	0.120

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, P, K, RHx4, ETn4, pH_H2O,

DL1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	173.8	24.822	13.72	<.001
Residual	223	403.3	1.809		
Total	230	577.1	2.509		
Change	-1	-4.7	4.674	2.58	0.109

Percentage variance accounted for 27.9

Standard error of observations is estimated to be 1.34

*** Estimates of parameters ***

	estimate	s.e.	t(223)	t pr.
Constant	-192.	118.	-1.64	0.103
APP_N	0.01447	0.00507	2.85	0.005
P	0.0590	0.0143	4.12	<.001
K	0.00405	0.00232	1.74	0.083
RHx4	0.0749	0.0369	2.03	0.044
ETn4	0.1903	0.0947	2.01	0.046
pH_H2O	-1.230	0.554	-2.22	0.027
DL1	17.3	10.8	1.61	0.109

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, P, K, RHx4, ETn4, pH_H2O,
DL1, Alt

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	177.1	22.134	12.28	<.001
Residual	222	400.0	1.802		
Total	230	577.1	2.509		
Change	-1	-3.3	3.317	1.84	0.176

Percentage variance accounted for 28.2

Standard error of observations is estimated to be 1.34

*** Estimates of parameters ***

	estimate	s.e.	t(222)	t pr.
Constant	-409.	198.	-2.06	0.040
APP_N	0.01259	0.00525	2.40	0.017
P	0.0400	0.0200	1.99	0.047
K	0.00483	0.00239	2.02	0.045
RHx4	0.0799	0.0371	2.16	0.032
ETn4	0.239	0.101	2.36	0.019
pH_H2O	-1.498	0.587	-2.55	0.011
DL1	36.8	18.0	2.05	0.041
Alt	0.000880	0.000648	1.36	0.176

===== Cultivar 1 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	14.23	14.2275	24.58	<.001

Residual	19	11.00	0.5788		
Total	20	25.22	1.2612		
Change	-1	-14.23	14.2275	24.58	<.001

Percentage variance accounted for 54.1

Standard error of observations is estimated to be 0.761

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	0.531	0.316	1.68	0.109
P	0.0758	0.0153	4.96	<.001

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, P, rain2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	18.915	9.4573	26.98	<.001
Residual	18	6.310	0.3506		
Total	20	25.225	1.2612		

Change	-1	-4.687	4.6870	13.37	0.002

Percentage variance accounted for 72.2

Standard error of observations is estimated to be 0.592

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-0.450	0.364	-1.24	0.232
P	0.0963	0.0132	7.32	<.001
rain2	0.00953	0.00261	3.66	0.002

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, P, rain2, DL2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	19.470	6.4902	19.17	<.001
Residual	17	5.754	0.3385		
Total	20	25.225	1.2612		

Change	-1	-0.556	0.5560	1.64	0.217

Percentage variance accounted for 73.2

Standard error of observations is estimated to be 0.582

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-71.1	55.1	-1.29	0.214
P	0.0844	0.0159	5.31	<.001
rain2	0.01015	0.00261	3.89	0.001
DL2	6.48	5.06	1.28	0.217

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, P, rain2, DL2, Alt

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	21.874	5.4685	26.11	<.001
Residual	16	3.351	0.2094		
Total	20	25.225	1.2612		
Change	-1	-2.403	2.4034	11.48	0.004

Percentage variance accounted for 83.4

Standard error of observations is estimated to be 0.458

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-478.	128.	-3.74	0.002
P	0.0339	0.0195	1.74	0.101
rain2	0.00607	0.00238	2.56	0.021
DL2	43.6	11.7	3.74	0.002
Alt	0.002133	0.000630	3.39	0.004

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, P, rain2, DL2, Alt, RC1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	22.909	4.5817	29.67	<.001
Residual	15	2.316	0.1544		
Total	20	25.225	1.2612		
Change	-1	-1.035	1.0347	6.70	0.021

Percentage variance accounted for 87.8

Standard error of observations is estimated to be 0.393

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-467.	110.	-4.26	<.001
P	0.0257	0.0170	1.51	0.151
rain2	0.00625	0.00204	3.06	0.008
DL2	42.5	10.0	4.24	<.001
Alt	0.003631	0.000792	4.58	<.001
RC1	-0.001079	0.000417	-2.59	0.021

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, P, rain2, DL2, Alt, RC1, RHx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	23.621	3.9368	34.36	<.001
Residual	14	1.604	0.1146		
Total	20	25.225	1.2612		
Change	-1	-0.712	0.7123	6.22	0.026

Percentage variance accounted for 90.9

Standard error of observations is estimated to be 0.338

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	-476.6	94.6	-5.04	<.001
P	0.0306	0.0148	2.07	0.057
rain2	0.00431	0.00192	2.24	0.042
DL2	42.70	8.64	4.94	<.001
Alt	0.003973	0.000696	5.71	<.001
RC1	-0.001258	0.000366	-3.44	0.004
RHx4	0.0773	0.0310	2.49	0.026

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, P, rain2, DL2, Alt, RC1, RHx4, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	24.132	3.44749	41.03	<.001
Residual	13	1.092	0.08403		
Total	20	25.225	1.26124		

Change -1 -0.512 0.51164 6.09 0.028

Percentage variance accounted for 93.3

Standard error of observations is estimated to be 0.290

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-646.	106.	-6.09	<.001
P	0.0233	0.0130	1.79	0.097
rain2	0.00188	0.00192	0.98	0.346
DL2	58.51	9.79	5.98	<.001
Alt	0.004251	0.000606	7.01	<.001
RC1	-0.001306	0.000314	-4.16	0.001
RHx4	0.0844	0.0267	3.16	0.008
pH_H2O	-0.771	0.313	-2.47	0.028

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, P, rain2, DL2, Alt, RC1, RHx4, pH_H2O,

frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.

Regression	8	24.4494	3.05617	47.30 <.001
Residual	12	0.7754	0.06462	
Total	20	25.2248	1.26124	
Change	-1	-0.3169	0.31695	4.91 0.047

Percentage variance accounted for 94.9

Standard error of observations is estimated to be 0.254

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	-631.7	93.2	-6.78	<.001
P	0.0268	0.0115	2.33	0.038
rain2	0.00290	0.00175	1.66	0.123
DL2	57.14	8.60	6.64	<.001
Alt	0.004366	0.000534	8.17	<.001
RC1	-0.001483	0.000287	-5.17	<.001
RHx4	0.0856	0.0234	3.65	0.003
pH_H2O	-0.678	0.277	-2.45	0.031
frost4	0.317	0.143	2.21	0.047

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, P, rain2, DL2, Alt, RC1, RHx4, pH_H2O,

frost4, ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	24.6464	2.73849	52.09	<.001
Residual	11	0.5783	0.05258		
Total	20	25.2248	1.26124		
Change	-1	-0.1970	0.19705	3.75	0.079

Percentage variance accounted for 95.8

Standard error of observations is estimated to be 0.229

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	-653.3	84.8	-7.70	<.001
P	0.0280	0.0104	2.69	0.021
rain2	0.00314	0.00158	1.99	0.072
DL2	59.28	7.84	7.56	<.001
Alt	0.004087	0.000503	8.12	<.001
RC1	-0.001141	0.000313	-3.64	0.004
RHx4	0.0730	0.0221	3.30	0.007
pH_H2O	-0.767	0.254	-3.02	0.012
frost4	0.436	0.143	3.05	0.011
ETn4	0.1264	0.0653	1.94	0.079

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, P, rain2, DL2, Alt, RC1, RHx4, pH_H2O,
frost4, ETn4, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	24.8556	2.48556	67.32	<.001
Residual	10	0.3692	0.03692		
Total	20	25.2248	1.26124		
Change	-1	-0.2091	0.20912	5.66	0.039

Percentage variance accounted for 97.1

Standard error of observations is estimated to be 0.192

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	-624.1	72.1	-8.65	<.001
P	0.01691	0.00989	1.71	0.118
rain2	0.00248	0.00135	1.84	0.096
DL2	56.64	6.66	8.50	<.001
Alt	0.003641	0.000461	7.89	<.001
RC1	-0.001077	0.000264	-4.08	0.002
RHx4	0.0546	0.0201	2.72	0.022
pH_H2O	-0.790	0.213	-3.70	0.004

frost4 0.476 0.121 3.93 0.003

ETn4 0.1432 0.0552 2.60 0.027

rad3 0.1000 0.0420 2.38 0.039

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, P, rain2, DL2, Alt, RC1, RHx4, pH_H2O,

frost4, ETn4, rad3, Mg

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	11	24.9658	2.26962	78.87	<.001
Residual	9	0.2590	0.02878		
Total	20	25.2248	1.26124		
Change	-1	-0.1102	0.11023	3.83	0.082

Percentage variance accounted for 97.7

Standard error of observations is estimated to be 0.170

*** Estimates of parameters ***

	estimate	s.e.	t(9)	t pr.
Constant	-616.9	63.8	-9.67	<.001

P	0.01430	0.00883	1.62	0.140
rain2	0.00294	0.00122	2.42	0.039
DL2	55.91	5.89	9.49	<.001
Alt	0.004073	0.000463	8.79	<.001
RC1	-0.001306	0.000261	-5.01	<.001
RHx4	0.0724	0.0199	3.63	0.005
pH_H2O	-1.072	0.237	-4.52	0.001
frost4	0.466	0.107	4.36	0.002
ETn4	0.1927	0.0549	3.51	0.007
rad3	0.0871	0.0377	2.31	0.046
Mg	0.00525	0.00268	1.96	0.082

===== Cultivar 2 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, DL2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	1.828	1.8279	5.51	0.030
Residual	19	6.305	0.3318		
Total	20	8.133	0.4066		
Change	-1	-1.828	1.8279	5.51	0.030

Percentage variance accounted for 18.4

Standard error of observations is estimated to be 0.576

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-93.4	40.6	-2.30	0.033
DL2	8.73	3.72	2.35	0.030

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, DL2, Mg

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	4.883	2.4413	13.52	<.001
Residual	18	3.250	0.1806		
Total	20	8.133	0.4066		
Change	-1	-3.055	3.0547	16.92	<.001

Percentage variance accounted for 55.6

Standard error of observations is estimated to be 0.425

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-261.2	50.6	-5.16	<.001
DL2	24.23	4.66	5.20	<.001
Mg	-0.01326	0.00322	-4.11	<.001

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, DL2, Mg, PC4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	5.618	1.8726	12.66	<.001
Residual	17	2.515	0.1479		
Total	20	8.133	0.4066		
Change	-1	-0.735	0.7353	4.97	0.040

Percentage variance accounted for 63.6

Standard error of observations is estimated to be 0.385

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-482.	109.	-4.41	<.001
DL2	44.5	10.0	4.44	<.001
Mg	-0.01491	0.00301	-4.95	<.001
PC4	0.001336	0.000599	2.23	0.040

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, DL2, Mg, PC4, rain2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	5.932	1.4830	10.78	<.001
Residual	16	2.201	0.1376		
Total	20	8.133	0.4066		
Change	-1	-0.314	0.3140	2.28	0.150

Percentage variance accounted for 66.2

Standard error of observations is estimated to be 0.371

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-440.	109.	-4.04	<.001
DL2	40.56	9.99	4.06	<.001
Mg	-0.01221	0.00341	-3.58	0.002
PC4	0.001144	0.000592	1.93	0.071
rain2	0.00287	0.00190	1.51	0.150

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, DL2, Mg, PC4, rain2, Tx2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	6.411	1.2822	11.17	<.001
Residual	15	1.722	0.1148		
Total	20	8.133	0.4066		
Change	-1	-0.479	0.4793	4.18	0.059

Percentage variance accounted for 71.8

Standard error of observations is estimated to be 0.339

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-484.	102.	-4.75	<.001
DL2	44.18	9.29	4.75	<.001
Mg	-0.01114	0.00316	-3.53	0.003
PC4	0.002431	0.000830	2.93	0.010
rain2	0.00483	0.00198	2.44	0.028
Tx2	0.1447	0.0708	2.04	0.059

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, DL2, Mg, PC4, rain2, Tx2, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	6.871	1.14518	12.71	<.001
Residual	14	1.262	0.09012		
Total	20	8.133	0.40664		
Change	-1	-0.460	0.45999	5.10	0.040

Percentage variance accounted for 77.8

Standard error of observations is estimated to be 0.300

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	-475.7	90.3	-5.27	<.001
DL2	43.03	8.25	5.22	<.001
Mg	-0.01134	0.00280	-4.05	0.001
PC4	0.002976	0.000774	3.85	0.002
rain2	0.00484	0.00176	2.76	0.015
Tx2	0.2395	0.0755	3.17	0.007
rad3	0.0965	0.0427	2.26	0.040

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, DL2, Mg, PC4, rain2, Tx2, rad3,
WS4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	7.070	1.01001	12.36	<.001
Residual	13	1.063	0.08174		
Total	20	8.133	0.40664		
Change	-1	-0.199	0.19896	2.43	0.143

Percentage variance accounted for 79.9

Standard error of observations is estimated to be 0.286

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-497.5	87.2	-5.71	<.001
DL2	44.62	7.92	5.63	<.001
Mg	-0.00906	0.00304	-2.98	0.011
PC4	0.003048	0.000739	4.13	0.001
rain2	0.00674	0.00207	3.26	0.006
Tx2	0.3163	0.0871	3.63	0.003
rad3	0.1029	0.0409	2.52	0.026
WS4	0.959	0.615	1.56	0.143

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, DL2, Mg, PC4, rain2, Tx2, rad3,
WS4, IC1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	7.2471	0.90588	12.27	<.001
Residual	12	0.8856	0.07380		
Total	20	8.1327	0.40664		

Change	-1	-0.1770	0.17701	2.40	0.147

Percentage variance accounted for 81.9

Standard error of observations is estimated to be 0.272

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	-535.0	86.3	-6.20	<.001
DL2	48.12	7.86	6.12	<.001
Mg	-0.00728	0.00311	-2.34	0.037
PC4	0.00424	0.00104	4.07	0.002
rain2	0.00774	0.00207	3.74	0.003
Tx2	0.2809	0.0859	3.27	0.007
rad3	0.1232	0.0410	3.01	0.011
WS4	1.016	0.585	1.74	0.108
IC1	-0.00161	0.00104	-1.55	0.147

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, DL2, Mg, PC4, rain2, Tx2, rad3,

WS4, IC1, ETx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	7.4374	0.82638	13.07	<.001
Residual	11	0.6953	0.06321		
Total	20	8.1327	0.40664		
Change	-1	-0.1903	0.19033	3.01	0.111

Percentage variance accounted for 84.5

Standard error of observations is estimated to be 0.251

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	-534.0	79.8	-6.69	<.001
DL2	47.85	7.28	6.58	<.001
Mg	-0.00674	0.00289	-2.33	0.040
PC4	0.00499	0.00106	4.73	<.001
rain2	0.00803	0.00192	4.18	0.002
Tx2	0.2017	0.0917	2.20	0.050
rad3	0.1633	0.0444	3.68	0.004
WS4	1.122	0.545	2.06	0.064
IC1	-0.00256	0.00111	-2.32	0.041
ETx4	0.0816	0.0470	1.74	0.111

===== Cultivar 3 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	10.24	10.2354	18.05	<.001
Residual	19	10.77	0.5671		
Total	20	21.01	1.0505		
Change	-1	-10.24	10.2354	18.05	<.001

Percentage variance accounted for 46.0

Standard error of observations is estimated to be 0.753

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-5.28	1.67	-3.16	0.005
rad3	0.3472	0.0817	4.25	<.001

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rad3, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	13.490	6.7449	16.15	<.001
Residual	18	7.520	0.4178		
Total	20	21.010	1.0505		
Change	-1	-3.254	3.2545	7.79	0.012

Percentage variance accounted for 60.2

Standard error of observations is estimated to be 0.646

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-6.24	1.48	-4.22	<.001
rad3	0.3289	0.0704	4.67	<.001
APP_N	0.01421	0.00509	2.79	0.012

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rad3, APP_N, DL3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	15.593	5.1977	16.31	<.001
Residual	17	5.416	0.3186		
Total	20	21.010	1.0505		
Change	-1	-2.103	2.1033	6.60	0.020

Percentage variance accounted for 69.7

Standard error of observations is estimated to be 0.564

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	177.3	71.4	2.48	0.024
rad3	0.3453	0.0619	5.58	<.001
APP_N	0.01776	0.00465	3.81	0.001
DL3	-14.65	5.70	-2.57	0.020

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rad3, APP_N, DL3, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	17.042	4.2606	17.18	<.001
Residual	16	3.967	0.2479		
Total	20	21.010	1.0505		
Change	-1	-1.449	1.4492	5.84	0.028

Percentage variance accounted for 76.4

Standard error of observations is estimated to be 0.498

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	620.	194.	3.20	0.006
rad3	0.3537	0.0547	6.47	<.001
APP_N	0.01332	0.00450	2.96	0.009
DL3	-49.2	15.2	-3.25	0.005
pH_H2O	-1.419	0.587	-2.42	0.028

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rad3, APP_N, DL3, pH_H2O, Long

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	17.907	3.5814	17.31	<.001
Residual	15	3.103	0.2068		
Total	20	21.010	1.0505		
Change	-1	-0.865	0.8646	4.18	0.059

Percentage variance accounted for 80.3

Standard error of observations is estimated to be 0.455

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	770.	192.	4.02	0.001
rad3	0.2096	0.0864	2.43	0.028
APP_N	0.01356	0.00411	3.30	0.005
DL3	-59.7	14.8	-4.04	0.001
pH_H2O	-1.750	0.560	-3.13	0.007
Long	-0.469	0.229	-2.04	0.059

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rad3, APP_N, DL3, pH_H2O, Long,

rad4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	18.516	3.0860	17.33	<.001
Residual	14	2.493	0.1781		
Total	20	21.010	1.0505		
Change	-1	-0.609	0.6093	3.42	0.086

Percentage variance accounted for 83.0

Standard error of observations is estimated to be 0.422

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	1065.	239.	4.46	<.001
rad3	0.929	0.397	2.34	0.035
APP_N	0.00960	0.00437	2.20	0.045
DL3	-82.3	18.4	-4.48	<.001
pH_H2O	-2.526	0.668	-3.78	0.002
Long	-0.594	0.223	-2.66	0.019
rad4	-0.857	0.463	-1.85	0.086

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rad3, APP_N, DL3, pH_H2O, Long,

rad4, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	19.040	2.7200	17.95	<.001
Residual	13	1.970	0.1515		
Total	20	21.010	1.0505		
Change	-1	-0.524	0.5237	3.46	0.086

Percentage variance accounted for 85.6

Standard error of observations is estimated to be 0.389

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	1133.	223.	5.08	<.001
rad3	1.003	0.368	2.72	0.017
APP_N	0.01254	0.00433	2.90	0.013
DL3	-87.9	17.2	-5.11	<.001
pH_H2O	-2.479	0.616	-4.02	0.001
Long	-0.583	0.206	-2.83	0.014
rad4	-0.922	0.429	-2.15	0.051
frost4	0.434	0.233	1.86	0.086

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rad3, APP_N, DL3, pH_H2O, Long,
rad4, frost4, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	19.438	2.4298	18.56	<.001
Residual	12	1.571	0.1309		
Total	20	21.010	1.0505		
Change	-1	-0.398	0.3981	3.04	0.107

Percentage variance accounted for 87.5

Standard error of observations is estimated to be 0.362

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	1380.	251.	5.50	<.001
rad3	0.951	0.344	2.77	0.017
APP_N	0.01249	0.00403	3.10	0.009
DL3	-106.8	19.3	-5.53	<.001
pH_H2O	-2.736	0.592	-4.62	<.001
Long	-0.848	0.245	-3.47	0.005
rad4	-0.845	0.401	-2.11	0.057

frost4 0.475 0.218 2.18 0.050

P -0.0324 0.0186 -1.74 0.107

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rad3, APP_N, DL3, pH_H2O, Long,

rad4, frost4, P, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	19.718	2.1909	18.66	<.001
Residual	11	1.292	0.1174		
Total	20	21.010	1.0505		
Change	-1	-0.280	0.2798	2.38	0.151

Percentage variance accounted for 88.8

Standard error of observations is estimated to be 0.343

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	1448.	242.	5.99	<.001
rad3	1.111	0.341	3.25	0.008

APP_N	0.01071	0.00398	2.69	0.021
DL3	-112.3	18.6	-6.03	<.001
pH_H2O	-2.859	0.566	-5.05	<.001
Long	-0.739	0.242	-3.05	0.011
rad4	-1.001	0.393	-2.55	0.027
frost4	0.442	0.208	2.13	0.057
P	-0.0345	0.0176	-1.96	0.076
K	-0.00319	0.00207	-1.54	0.151

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rad3, APP_N, DL3, pH_H2O, Long,
rad4, frost4, P, K, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	19.888	1.9888	17.74	<.001
Residual	10	1.121	0.1121		
Total	20	21.010	1.0505		
Change	-1	-0.170	0.1705	1.52	0.246

Percentage variance accounted for 89.3

Standard error of observations is estimated to be 0.335

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	1580.	260.	6.09	<.001
rad3	1.267	0.357	3.55	0.005
APP_N	0.01261	0.00418	3.01	0.013
DL3	-123.4	20.3	-6.08	<.001
pH_H2O	-2.819	0.554	-5.09	<.001
Long	-0.632	0.252	-2.51	0.031
rad4	-1.159	0.405	-2.86	0.017
frost4	0.466	0.204	2.28	0.045
P	-0.0317	0.0174	-1.83	0.098
K	-0.00335	0.00202	-1.66	0.129
WS3	0.883	0.716	1.23	0.246

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rad3, APP_N, DL3, pH_H2O, Long,

rad4, frost4, P, K, WS3, DL2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	11	20.3764	1.85240	26.33	<.001
Residual	9	0.6332	0.07035		

Total	20	21.0095	1.05048	
Change	-1	-0.4879	0.48788	6.93 0.027

Percentage variance accounted for 93.3

Standard error of observations is estimated to be 0.265

*** Estimates of parameters ***

	estimate	s.e.	t(9)	t pr.
Constant	1025.	295.	3.48	0.007
rad3	1.184	0.284	4.16	0.002
APP_N	0.01271	0.00331	3.84	0.004
DL3	-103.2	17.8	-5.79	<.001
pH_H2O	-2.835	0.439	-6.46	<.001
Long	-0.271	0.242	-1.12	0.292
rad4	-1.004	0.326	-3.08	0.013
frost4	0.380	0.165	2.31	0.047
P	-0.0295	0.0138	-2.14	0.061
K	-0.00524	0.00176	-2.98	0.015
WS3	2.332	0.790	2.95	0.016
DL2	26.19	9.95	2.63	0.027

===== Cultivar 4 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	33.60	33.596	26.17	<.001
Residual	19	24.39	1.284		
Total	20	57.99	2.899		
Change	-1	-33.60	33.596	26.17	<.001

Percentage variance accounted for 55.7

Standard error of observations is estimated to be 1.13

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-0.638	0.865	-0.74	0.470
APP_N	0.04545	0.00888	5.12	<.001

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, Rad2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	42.36	21.1823	24.40	<.001
Residual	18	15.62	0.8680		
Total	20	57.99	2.8995		
Change	-1	-8.77	8.7686	10.10	0.005

Percentage variance accounted for 70.1

Standard error of observations is estimated to be 0.932

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-7.24	2.20	-3.30	0.004
APP_N	0.04588	0.00731	6.28	<.001
Rad2	0.411	0.129	3.18	0.005

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, Rad2, rain3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	45.31	15.1035	20.25	<.001
Residual	17	12.68	0.7458		
Total	20	57.99	2.8995		
Change	-1	-2.95	2.9460	3.95	0.063

Percentage variance accounted for 74.3

Standard error of observations is estimated to be 0.864

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-8.74	2.17	-4.03	<.001
APP_N	0.04342	0.00688	6.31	<.001
Rad2	0.440	0.121	3.64	0.002
rain3	0.00202	0.00102	1.99	0.063

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, Rad2, rain3, rain2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	47.52	11.8806	18.16	<.001
Residual	16	10.47	0.6542		
Total	20	57.99	2.8995		
Change	-1	-2.21	2.2118	3.38	0.085

Percentage variance accounted for 77.4

Standard error of observations is estimated to be 0.809

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-9.09	2.04	-4.45	<.001
APP_N	0.05029	0.00745	6.75	<.001
Rad2	0.449	0.113	3.96	0.001
rain3	0.002056	0.000951	2.16	0.046
rain2	-0.00688	0.00374	-1.84	0.085

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, Rad2, rain3, rain2, ETx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	49.849	9.9697	18.37	<.001
Residual	15	8.140	0.5427		
Total	20	57.989	2.8995		
Change	-1	-2.326	2.3261	4.29	0.056

Percentage variance accounted for 81.3

Standard error of observations is estimated to be 0.737

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-3.39	3.33	-1.02	0.325
APP_N	0.05187	0.00683	7.60	<.001
Rad2	0.374	0.109	3.43	0.004
rain3	0.00080	0.00106	0.76	0.458
rain2	-0.01070	0.00388	-2.76	0.015
ETx4	-0.1001	0.0483	-2.07	0.056

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, Rad2, rain3, rain2, ETx4,

Tx2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	55.431	9.2385	50.56	<.001
Residual	14	2.558	0.1827		
Total	20	57.989	2.8995		
Change	-1	-5.582	5.5823	30.55	<.001

Percentage variance accounted for 93.7

Standard error of observations is estimated to be 0.427

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	1.25	2.10	0.59	0.562
APP_N	0.04538	0.00413	10.98	<.001
Rad2	0.2712	0.0660	4.11	0.001
rain3	0.000370	0.000618	0.60	0.558
rain2	-0.00624	0.00239	-2.61	0.021
ETx4	-0.4610	0.0711	-6.49	<.001
Tx2	0.4750	0.0859	5.53	<.001

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, Rad2, rain3, rain2, ETx4,

Tx2, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	55.742	7.9631	46.06	<.001
Residual	13	2.247	0.1729		
Total	20	57.989	2.8995		
Change	-1	-0.311	0.3108	1.80	0.203

Percentage variance accounted for 94.0

Standard error of observations is estimated to be 0.416

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	2.36	2.21	1.07	0.305
APP_N	0.04508	0.00403	11.19	<.001
Rad2	0.1956	0.0855	2.29	0.040
rain3	0.000514	0.000611	0.84	0.415
rain2	-0.00514	0.00246	-2.09	0.057
ETx4	-0.4623	0.0691	-6.69	<.001
Tx2	0.4612	0.0842	5.48	<.001
P	0.0184	0.0137	1.34	0.203

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, Rad2, rain3, rain2, ETx4,
Tx2, P, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	56.164	7.0205	46.16	<.001
Residual	12	1.825	0.1521		
Total	20	57.989	2.8995		
Change	-1	-0.422	0.4224	2.78	0.121

Percentage variance accounted for 94.8

Standard error of observations is estimated to be 0.390

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	3.77	2.24	1.68	0.118
APP_N	0.04180	0.00426	9.82	<.001
Rad2	0.1745	0.0812	2.15	0.053
rain3	0.000817	0.000601	1.36	0.199
rain2	-0.00458	0.00234	-1.96	0.073
ETx4	-0.4000	0.0748	-5.34	<.001
Tx2	0.4580	0.0790	5.80	<.001
P	0.0340	0.0159	2.14	0.054
pH_H2O	-0.627	0.376	-1.67	0.121

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, Rad2, rain3, rain2, ETx4,

Tx2, P, pH_H2O, C1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	56.630	6.2922	50.93	<.001
Residual	11	1.359	0.1235		
Total	20	57.989	2.8995		
Change	-1	-0.466	0.4659	3.77	0.078

Percentage variance accounted for 95.7

Standard error of observations is estimated to be 0.351

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	11.77	4.59	2.57	0.026
APP_N	0.03886	0.00413	9.42	<.001
Rad2	0.1561	0.0738	2.12	0.058
rain3	0.001011	0.000551	1.84	0.093

rain2	-0.00695	0.00243	-2.86	0.016
ETx4	-0.3933	0.0675	-5.82	<.001
Tx2	0.287	0.113	2.53	0.028
P	0.0265	0.0149	1.79	0.102
pH_H2O	-1.143	0.431	-2.65	0.022
C1	-0.00215	0.00111	-1.94	0.078

===== Cultivar 5 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	25.18	25.1797	29.67	<.001
Residual	19	16.12	0.8486		
Total	20	41.30	2.0652		
Change	-1	-25.18	25.1797	29.67	<.001

Percentage variance accounted for 58.9

Standard error of observations is estimated to be 0.921

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	6.178	0.480	12.87	<.001
IC1	-0.002955	0.000542	-5.45	<.001

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	32.848	16.4239	34.96	<.001
Residual	18	8.455	0.4697		
Total	20	41.303	2.0652		
Change	-1	-7.668	7.6682	16.32	<.001

Percentage variance accounted for 77.3

Standard error of observations is estimated to be 0.685

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.

Constant	4.270	0.592	7.21	<.001
IC1	-0.003114	0.000405	-7.68	<.001
APP_N	0.02182	0.00540	4.04	<.001

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N, rad4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	36.062	12.0205	38.99	<.001
Residual	17	5.242	0.3083		
Total	20	41.303	2.0652		
Change	-1	-3.214	3.2138	10.42	0.005

Percentage variance accounted for 85.1

Standard error of observations is estimated to be 0.555

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	0.24	1.34	0.18	0.858
IC1	-0.003387	0.000339	-9.98	<.001

APP_N 0.02152 0.00438 4.92 <.001

rad4 0.2278 0.0706 3.23 0.005

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N, rad4, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	36.823	9.2057	32.88	<.001
Residual	16	4.480	0.2800		
Total	20	41.303	2.0652		
Change	-1	-0.761	0.7612	2.72	0.119

Percentage variance accounted for 86.4

Standard error of observations is estimated to be 0.529

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-0.97	1.47	-0.66	0.520
IC1	-0.003122	0.000361	-8.65	<.001
APP_N	0.02287	0.00425	5.38	<.001

rad4	0.2483	0.0684	3.63	0.002
K	0.00464	0.00281	1.65	0.119

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N, rad4, K, DL3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	37.647	7.5294	30.89	<.001
Residual	15	3.656	0.2437		
Total	20	41.303	2.0652		
Change	-1	-0.824	0.8242	3.38	0.086

Percentage variance accounted for 88.2

Standard error of observations is estimated to be 0.494

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	396.	216.	1.83	0.087
IC1	-0.00121	0.00109	-1.11	0.286
APP_N	0.02902	0.00519	5.60	<.001

rad4	0.1821	0.0733	2.49	0.025
K	0.00602	0.00273	2.21	0.043
DL3	-31.7	17.2	-1.84	0.086

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N, rad4, K, DL3, C1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	38.785	6.4641	35.94	<.001
Residual	14	2.518	0.1799		
Total	20	41.303	2.0652		
Change	-1	-1.138	1.1379	6.33	0.025

Percentage variance accounted for 91.3

Standard error of observations is estimated to be 0.424

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	582.	200.	2.92	0.011
IC1	-0.00414	0.00150	-2.77	0.015

APP_N	0.02998	0.00447	6.70	<.001
rad4	0.2660	0.0712	3.73	0.002
K	0.00574	0.00235	2.44	0.028
DL3	-46.5	15.9	-2.92	0.011
C1	0.00337	0.00134	2.52	0.025

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N, rad4, K, DL3, C1, DL2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	39.340	5.6201	37.22	<.001
Residual	13	1.963	0.1510		
Total	20	41.303	2.0652		
Change	-1	-0.556	0.5556	3.68	0.077

Percentage variance accounted for 92.7

Standard error of observations is estimated to be 0.389

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.

Constant	-11.	360.	-0.03	0.975
IC1	-0.00657	0.00186	-3.52	0.004
APP_N	0.02797	0.00423	6.62	<.001
rad4	0.3127	0.0697	4.49	<.001
K	0.00440	0.00226	1.95	0.074
DL3	-20.3	20.0	-1.01	0.330
C1	0.00591	0.00181	3.27	0.006
DL2	24.2	12.6	1.92	0.077

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N, rad4, K, DL3, C1, DL2,

pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	40.137	5.01707	51.61	<.001
Residual	12	1.167	0.09721		
Total	20	41.303	2.06516		
Change	-1	-0.796	0.79613	8.19	0.014

Percentage variance accounted for 95.3

Standard error of observations is estimated to be 0.312

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	123.	292.	0.42	0.682
IC1	-0.00663	0.00150	-4.43	<.001
APP_N	0.02388	0.00368	6.49	<.001
rad4	0.2996	0.0561	5.34	<.001
K	0.00363	0.00183	1.98	0.071
DL3	-37.9	17.2	-2.21	0.048
C1	0.00608	0.00145	4.19	0.001
DL2	32.9	10.6	3.11	0.009
pH_H2O	-1.140	0.398	-2.86	0.014

===== Cultivar 6 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	22.647	22.6471	43.45	<.001
Residual	19	9.903	0.5212		
Total	20	32.550	1.6275		

Change	-1	-22.647	22.6471	43.45	<.001

Percentage variance accounted for 68.0

Standard error of observations is estimated to be 0.722

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	0.115	0.551	0.21	0.836
APP_N	0.03731	0.00566	6.59	<.001

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	25.510	12.7551	32.61	<.001
Residual	18	7.040	0.3911		
Total	20	32.550	1.6275		

Change	-1	-2.863	2.8632	7.32	0.014

Percentage variance accounted for 76.0

Standard error of observations is estimated to be 0.625

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-3.53	1.43	-2.47	0.024
APP_N	0.03607	0.00492	7.32	<.001
rad3	0.1844	0.0682	2.71	0.014

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, rad3, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	26.691	8.8970	25.81	<.001
Residual	17	5.859	0.3446		
Total	20	32.550	1.6275		
Change	-1	-1.181	1.1807	3.43	0.082

Percentage variance accounted for 78.8

Standard error of observations is estimated to be 0.587

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-3.90	1.36	-2.88	0.010
APP_N	0.03761	0.00470	8.01	<.001
rad3	0.1911	0.0641	2.98	0.008
frost4	0.484	0.261	1.85	0.082

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, rad3, frost4, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	27.625	6.9063	22.44	<.001
Residual	16	4.925	0.3078		
Total	20	32.550	1.6275		
Change	-1	-0.934	0.9342	3.04	0.101

Percentage variance accounted for 81.1

Standard error of observations is estimated to be 0.555

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-5.27	1.50	-3.50	0.003
APP_N	0.03969	0.00460	8.64	<.001
rad3	0.2228	0.0632	3.52	0.003
frost4	0.627	0.260	2.41	0.028
K	0.00483	0.00277	1.74	0.101

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, rad3, frost4, K, rain2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	28.498	5.6997	21.10	<.001
Residual	15	4.052	0.2701		
Total	20	32.550	1.6275		
Change	-1	-0.873	0.8731	3.23	0.092

Percentage variance accounted for 83.4

Standard error of observations is estimated to be 0.520

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-6.13	1.49	-4.12	<.001
APP_N	0.04454	0.00508	8.76	<.001
rad3	0.2550	0.0619	4.12	<.001
frost4	0.731	0.251	2.92	0.011
K	0.00511	0.00260	1.97	0.068
rain2	-0.00461	0.00256	-1.80	0.092

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, rad3, frost4, K, rain2, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	29.579	4.9299	23.23	<.001
Residual	14	2.970	0.2122		
Total	20	32.550	1.6275		
Change	-1	-1.081	1.0811	5.10	0.040

Percentage variance accounted for 87.0

Standard error of observations is estimated to be 0.461

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	-2.43	2.10	-1.16	0.267
APP_N	0.04044	0.00486	8.33	<.001
rad3	0.2560	0.0548	4.67	<.001
frost4	0.368	0.274	1.34	0.201
K	0.00595	0.00233	2.55	0.023
rain2	-0.00675	0.00246	-2.74	0.016
pH_H2O	-0.584	0.259	-2.26	0.040

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, rad3, frost4, K, rain2, pH_H2O,

Tn1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	30.549	4.3642	28.36	<.001
Residual	13	2.001	0.1539		
Total	20	32.550	1.6275		
Change	-1	-0.970	0.9698	6.30	0.026

Percentage variance accounted for 90.5

Standard error of observations is estimated to be 0.392

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-3.44	1.84	-1.87	0.084
APP_N	0.03237	0.00524	6.18	<.001
rad3	0.3548	0.0611	5.81	<.001
frost4	0.470	0.237	1.98	0.069
K	0.00424	0.00210	2.02	0.065
rain2	-0.00640	0.00210	-3.04	0.009
pH_H2O	-1.256	0.347	-3.62	0.003
Tn1	0.421	0.168	2.51	0.026

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, rad3, frost4, K, rain2, pH_H2O,
Tn1, DL4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	31.7059	3.96324	56.35	<.001

Residual	12	0.8440	0.07034		
Total	20	32.5500	1.62750		
Change	-1	-1.1567	1.15668	16.45	0.002

Percentage variance accounted for 95.7

Standard error of observations is estimated to be 0.265

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	-836.	205.	-4.07	0.002
APP_N	0.02799	0.00370	7.56	<.001
rad3	0.3700	0.0415	8.93	<.001
frost4	0.277	0.167	1.66	0.124
K	0.00431	0.00142	3.04	0.010
rain2	-0.01033	0.00172	-6.01	<.001
pH_H2O	-1.627	0.252	-6.47	<.001
Tn1	0.597	0.121	4.92	<.001
DL4	69.5	17.1	4.06	0.002

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, rad3, frost4, K, rain2, pH_H2O,

Tn1, DL4, rain3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	31.8587	3.53985	56.33	<.001
Residual	11	0.6913	0.06284		
Total	20	32.5500	1.62750		
Change	-1	-0.1527	0.15275	2.43	0.147

Percentage variance accounted for 96.1

Standard error of observations is estimated to be 0.251

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	-1033.	232.	-4.46	<.001
APP_N	0.02719	0.00354	7.69	<.001
rad3	0.3761	0.0394	9.55	<.001
frost4	0.266	0.158	1.68	0.121
K	0.00459	0.00135	3.39	0.006
rain2	-0.01090	0.00167	-6.54	<.001
pH_H2O	-1.592	0.239	-6.66	<.001
Tn1	0.627	0.116	5.39	<.001
DL4	85.8	19.3	4.45	<.001
rain3	0.000601	0.000386	1.56	0.147

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, rad3, frost4, K, rain2, pH_H2O,
Tn1, DL4, rain3, Long

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	32.0196	3.20196	60.38	<.001
Residual	10	0.5303	0.05303		
Total	20	32.5500	1.62750		
Change	-1	-0.1609	0.16094	3.03	0.112

Percentage variance accounted for 96.7

Standard error of observations is estimated to be 0.230

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	-1243.	244.	-5.08	<.001
APP_N	0.02634	0.00329	8.02	<.001
rad3	0.4437	0.0530	8.37	<.001
frost4	0.224	0.147	1.52	0.160
K	0.00346	0.00140	2.47	0.033
rain2	-0.01182	0.00162	-7.30	<.001
pH_H2O	-1.577	0.220	-7.18	<.001
Tn1	0.621	0.107	5.80	<.001
DL4	102.5	20.2	5.09	<.001

rain3 0.000689 0.000358 1.93 0.083

Long 0.260 0.150 1.74 0.112

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, rad3, frost4, K, rain2, pH_H2O,

Tn1, DL4, rain3, Long, C1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	11	32.1051	2.91864	59.05	<.001
Residual	9	0.4449	0.04943		
Total	20	32.5500	1.62750		
Change	-1	-0.0855	0.08548	1.73	0.221

Percentage variance accounted for 97.0

Standard error of observations is estimated to be 0.222

*** Estimates of parameters ***

	estimate	s.e.	t(9)	t pr.
Constant	-1326.	244.	-5.43	<.001
APP_N	0.02631	0.00317	8.29	<.001

rad3	0.4955	0.0646	7.67	<.001
frost4	0.169	0.148	1.14	0.285
K	0.00322	0.00137	2.36	0.043
rain2	-0.01235	0.00161	-7.65	<.001
pH_H2O	-1.412	0.246	-5.73	<.001
Tn1	0.752	0.143	5.24	<.001
DL4	109.0	20.1	5.43	<.001
rain3	0.000400	0.000409	0.98	0.354
Long	0.370	0.167	2.22	0.054
C1	0.000727	0.000553	1.32	0.221

===== Cultivar 7 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	6.589	6.5891	20.54	<.001
Residual	19	6.096	0.3209		
Total	20	12.686	0.6343		
Change	-1	-6.589	6.5891	20.54	<.001

Percentage variance accounted for 49.4

Standard error of observations is estimated to be 0.566

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-4.22	1.26	-3.35	0.003
rad3	0.2786	0.0615	4.53	<.001

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rad3, DL2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	8.815	4.4075	20.50	<.001
Residual	18	3.871	0.2150		
Total	20	12.686	0.6343		
Change	-1	-2.226	2.2259	10.35	0.005

Percentage variance accounted for 66.1

Standard error of observations is estimated to be 0.464

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-109.8	32.8	-3.34	0.004
rad3	0.2882	0.0504	5.72	<.001
DL2	9.65	3.00	3.22	0.005

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rad3, DL2, Tx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	9.867	3.2889	19.84	<.001
Residual	17	2.819	0.1658		
Total	20	12.686	0.6343		
Change	-1	-1.052	1.0518	6.34	0.022

Percentage variance accounted for 73.9

Standard error of observations is estimated to be 0.407

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-320.5	88.5	-3.62	0.002
rad3	0.1893	0.0592	3.20	0.005
DL2	29.63	8.36	3.54	0.002
Tx4	-0.2137	0.0849	-2.52	0.022

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rad3, DL2, Tx4, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	10.693	2.6733	21.47	<.001
Residual	16	1.992	0.1245		
Total	20	12.686	0.6343		
Change	-1	-0.827	0.8266	6.64	0.020

Percentage variance accounted for 80.4

Standard error of observations is estimated to be 0.353

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-482.2	99.1	-4.87	<.001
rad3	0.1692	0.0519	3.26	0.005
DL2	44.94	9.37	4.80	<.001
Tx4	-0.2274	0.0737	-3.08	0.007
pH_H2O	-0.839	0.326	-2.58	0.020

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rad3, DL2, Tx4, pH_H2O, RC4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	11.314	2.26286	24.75	<.001
Residual	15	1.371	0.09141		
Total	20	12.686	0.63428		
Change	-1	-0.621	0.62100	6.79	0.020

Percentage variance accounted for 85.6

Standard error of observations is estimated to be 0.302

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-335.	102.	-3.28	0.005
rad3	0.1995	0.0459	4.34	<.001
DL2	31.66	9.51	3.33	0.005
Tx4	-0.461	0.110	-4.20	<.001
pH_H2O	-0.880	0.279	-3.15	0.007
RC4	-0.000674	0.000258	-2.61	0.020

===== Cultivar 8 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, C1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	25.22	25.2190	37.52	<.001
Residual	19	12.77	0.6721		
Total	20	37.99	1.8994		
Change	-1	-25.22	25.2190	37.52	<.001

Percentage variance accounted for 64.6

Standard error of observations is estimated to be 0.820

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	4.283	0.244	17.56	<.001
C1	-0.002658	0.000434	-6.13	<.001

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, C1, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	29.826	14.9128	32.88	<.001
Residual	18	8.163	0.4535		
Total	20	37.988	1.8994		
Change	-1	-4.607	4.6065	10.16	0.005

Percentage variance accounted for 76.1

Standard error of observations is estimated to be 0.673

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	2.755	0.520	5.30	<.001
C1	-0.002801	0.000359	-7.80	<.001
APP_N	0.01696	0.00532	3.19	0.005

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, C1, APP_N, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	33.042	11.0141	37.86	<.001
Residual	17	4.946	0.2909		
Total	20	37.988	1.8994		
Change	-1	-3.217	3.2168	11.06	0.004

Percentage variance accounted for 84.7

Standard error of observations is estimated to be 0.539

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	1.530	0.556	2.75	0.014

C1	-0.002168	0.000345	-6.29	<.001
APP_N	0.01920	0.00432	4.45	<.001
P	0.0441	0.0133	3.33	0.004

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, C1, APP_N, P, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	34.798	8.6995	43.63	<.001
Residual	16	3.190	0.1994		
Total	20	37.988	1.8994		
Change	-1	-1.756	1.7557	8.81	0.009

Percentage variance accounted for 89.5

Standard error of observations is estimated to be 0.447

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	0.005	0.690	0.01	0.995
C1	-0.001590	0.000346	-4.60	<.001

APP_N	0.02207	0.00370	5.96	<.001
P	0.0591	0.0121	4.89	<.001
K	0.00737	0.00248	2.97	0.009

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, C1, APP_N, P, K, ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	35.525	7.1051	43.27	<.001
Residual	15	2.463	0.1642		
Total	20	37.988	1.8994		
Change	-1	-0.727	0.7274	4.43	0.053

Percentage variance accounted for 91.4

Standard error of observations is estimated to be 0.405

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-0.662	0.702	-0.94	0.360
C1	-0.000850	0.000471	-1.80	0.091

APP_N	0.02071	0.00342	6.05	<.001
P	0.0665	0.0115	5.77	<.001
K	0.00898	0.00238	3.77	0.002
ETn4	0.2014	0.0957	2.10	0.053

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, C1, APP_N, P, K, ETn4, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	36.211	6.0351	47.53	<.001
Residual	14	1.778	0.1270		
Total	20	37.988	1.8994		
Change	-1	-0.685	0.6854	5.40	0.036

Percentage variance accounted for 93.3

Standard error of observations is estimated to be 0.356

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	-1.247	0.666	-1.87	0.082

C1	-0.000899	0.000415	-2.17	0.048
APP_N	0.02291	0.00315	7.27	<.001
P	0.0726	0.0105	6.94	<.001
K	0.01000	0.00214	4.68	<.001
ETn4	0.2801	0.0907	3.09	0.008
frost4	0.523	0.225	2.32	0.036

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, C1, APP_N, P, K, ETn4, frost4, rad4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	36.935	5.27649	65.15	<.001
Residual	13	1.053	0.08099		
Total	20	37.988	1.89942		
Change	-1	-0.725	0.72466	8.95	0.010

Percentage variance accounted for 95.7

Standard error of observations is estimated to be 0.285

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-3.566	0.940	-3.79	0.002
C1	-0.001244	0.000351	-3.55	0.004
APP_N	0.02168	0.00255	8.49	<.001
P	0.0521	0.0108	4.83	<.001
K	0.01003	0.00171	5.87	<.001
ETn4	0.3120	0.0732	4.26	<.001
frost4	0.621	0.183	3.40	0.005
rad4	0.1530	0.0511	2.99	0.010

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, C1, APP_N, P, K, ETn4, frost4, rad4,

IC1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	37.2076	4.65095	71.49	<.001
Residual	12	0.7807	0.06506		
Total	20	37.9883	1.89942		
Change	-1	-0.2722	0.27218	4.18	0.063

Percentage variance accounted for 96.6

Standard error of observations is estimated to be 0.255

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	-3.140	0.868	-3.62	0.004
C1	0.000333	0.000833	0.40	0.696
APP_N	0.02012	0.00241	8.34	<.001
P	0.0433	0.0106	4.10	0.001
K	0.00804	0.00181	4.43	<.001
ETn4	0.2188	0.0799	2.74	0.018
frost4	0.475	0.179	2.65	0.021
rad4	0.2287	0.0589	3.88	0.002
IC1	-0.00226	0.00110	-2.05	0.063

===== Cultivar 10 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	18.425	18.4254	68.91	<.001
Residual	19	5.080	0.2674		

Total	20	23.506	1.1753		
Change	-1	-18.425	18.4254	68.91	<.001

Percentage variance accounted for 77.2

Standard error of observations is estimated to be 0.517

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	1.400	0.395	3.55	0.002
APP_N	0.03366	0.00405	8.30	<.001

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	19.545	9.7726	44.41	<.001
Residual	18	3.961	0.2200		
Total	20	23.506	1.1753		
Change	-1	-1.120	1.1198	5.09	0.037

Percentage variance accounted for 81.3

Standard error of observations is estimated to be 0.469

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-0.88	1.07	-0.82	0.423
APP_N	0.03288	0.00369	8.90	<.001
rad3	0.1153	0.0511	2.26	0.037

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, rad3, Long

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	20.115	6.7052	33.62	<.001
Residual	17	3.390	0.1994		
Total	20	23.506	1.1753		
Change	-1	-0.570	0.5703	2.86	0.109

Percentage variance accounted for 83.0

Standard error of observations is estimated to be 0.447

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-13.70	7.65	-1.79	0.091
APP_N	0.03236	0.00353	9.17	<.001
rad3	0.2277	0.0824	2.76	0.013
Long	0.354	0.209	1.69	0.109

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, rad3, Long, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	20.339	5.0849	25.69	<.001
Residual	16	3.166	0.1979		
Total	20	23.506	1.1753		
Change	-1	-0.224	0.2240	1.13	0.303

Percentage variance accounted for 83.2

Standard error of observations is estimated to be 0.445

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-13.49	7.62	-1.77	0.096
APP_N	0.03063	0.00387	7.91	<.001
rad3	0.2330	0.0822	2.83	0.012
Long	0.383	0.210	1.82	0.087
pH_H2O	-0.187	0.175	-1.06	0.303

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, rad3, Long, pH_H2O, DL3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	21.008	4.2016	25.23	<.001
Residual	15	2.498	0.1665		
Total	20	23.506	1.1753		
Change	-1	-0.669	0.6685	4.01	0.064

Percentage variance accounted for 85.8

Standard error of observations is estimated to be 0.408

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	331.	172.	1.92	0.074
APP_N	0.02866	0.00369	7.77	<.001
rad3	0.1969	0.0775	2.54	0.023
Long	0.240	0.206	1.17	0.261
pH_H2O	-1.140	0.502	-2.27	0.038
DL3	-26.5	13.2	-2.00	0.064

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, rad3, Long, pH_H2O, DL3,

rad4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	21.533	3.5889	25.47	<.001
Residual	14	1.973	0.1409		
Total	20	23.506	1.1753		
Change	-1	-0.525	0.5253	3.73	0.074

Percentage variance accounted for 88.0

Standard error of observations is estimated to be 0.375

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	604.	212.	2.85	0.013
APP_N	0.02499	0.00389	6.43	<.001
rad3	0.865	0.353	2.45	0.028
Long	0.124	0.199	0.62	0.542
pH_H2O	-1.860	0.594	-3.13	0.007
DL3	-47.6	16.3	-2.91	0.011
rad4	-0.795	0.412	-1.93	0.074

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, rad3, Long, pH_H2O, DL3,

rad4, Mg

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	22.120	3.1600	29.64	<.001
Residual	13	1.386	0.1066		
Total	20	23.506	1.1753		

Change	-1	-0.587	0.5867	5.50	0.035

Percentage variance accounted for 90.9

Standard error of observations is estimated to be 0.327

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	939.	233.	4.02	0.001
APP_N	0.01372	0.00587	2.34	0.036
rad3	1.134	0.328	3.46	0.004
Long	-0.068	0.191	-0.35	0.729
pH_H2O	-2.118	0.528	-4.01	0.001
DL3	-73.4	18.0	-4.08	0.001
rad4	-1.136	0.387	-2.94	0.012
Mg	-0.01192	0.00508	-2.35	0.035

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, rad3, Long, pH_H2O, DL3,
rad4, Mg, WS4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	22.462	2.80780	32.29	<.001
Residual	12	1.043	0.08695		
Total	20	23.506	1.17529		
Change	-1	-0.342	0.34244	3.94	0.071

Percentage variance accounted for 92.6

Standard error of observations is estimated to be 0.295

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	916.	211.	4.34	<.001
APP_N	0.00707	0.00628	1.13	0.282
rad3	1.075	0.298	3.61	0.004
Long	-0.383	0.235	-1.63	0.129
pH_H2O	-2.215	0.479	-4.62	<.001
DL3	-70.3	16.3	-4.31	0.001
rad4	-1.146	0.349	-3.28	0.007
Mg	-0.01895	0.00580	-3.27	0.007
WS4	-1.189	0.599	-1.98	0.071

===== Cultivar 11 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	24.55	24.5455	34.80	<.001
Residual	19	13.40	0.7053		
Total	20	37.95	1.8973		
Change	-1	-24.55	24.5455	34.80	<.001

Percentage variance accounted for 62.8

Standard error of observations is estimated to be 0.840

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	5.929	0.438	13.55	<.001
IC1	-0.002917	0.000495	-5.90	<.001

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	29.053	14.5264	29.40	<.001
Residual	18	8.894	0.4941		
Total	20	37.947	1.8973		
Change	-1	-4.507	4.5073	9.12	0.007

Percentage variance accounted for 74.0

Standard error of observations is estimated to be 0.703

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	4.466	0.607	7.35	<.001
IC1	-0.003039	0.000416	-7.31	<.001
APP_N	0.01673	0.00554	3.02	0.007

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	30.792	10.2639	24.39	<.001
Residual	17	7.155	0.4209		
Total	20	37.947	1.8973		
Change	-1	-1.739	1.7390	4.13	0.058

Percentage variance accounted for 77.8

Standard error of observations is estimated to be 0.649

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	3.436	0.755	4.55	<.001
IC1	-0.002636	0.000432	-6.10	<.001
APP_N	0.01855	0.00519	3.58	0.002
P	0.0304	0.0150	2.03	0.058

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N, P, RHn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	31.890	7.9726	21.06	<.001
Residual	16	6.057	0.3785		
Total	20	37.947	1.8973		
Change	-1	-1.098	1.0984	2.90	0.108

Percentage variance accounted for 80.0

Standard error of observations is estimated to be 0.615

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	1.80	1.20	1.50	0.152
IC1	-0.002988	0.000459	-6.51	<.001
APP_N	0.00929	0.00734	1.27	0.224
P	0.0365	0.0146	2.49	0.024
RHn4	0.0543	0.0319	1.70	0.108

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N, P, RHn4, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	33.216	6.6432	21.06	<.001
Residual	15	4.731	0.3154		
Total	20	37.947	1.8973		
Change	-1	-1.326	1.3259	4.20	0.058

Percentage variance accounted for 83.4

Standard error of observations is estimated to be 0.562

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	8.70	3.54	2.46	0.027
IC1	-0.004485	0.000842	-5.33	<.001
APP_N	-0.00307	0.00901	-0.34	0.738
P	0.0532	0.0157	3.40	0.004
RHn4	0.0822	0.0321	2.56	0.022
pH_H2O	-1.128	0.550	-2.05	0.058

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N, P, RHn4, pH_H2O, Tave3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	35.354	5.8923	31.81	<.001
Residual	14	2.593	0.1852		
Total	20	37.947	1.8973		
Change	-1	-2.138	2.1379	11.54	0.004

Percentage variance accounted for 90.2

Standard error of observations is estimated to be 0.430

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	3.92	3.05	1.29	0.219
IC1	-0.003308	0.000732	-4.52	<.001
APP_N	-0.01225	0.00741	-1.65	0.121
P	0.0756	0.0137	5.52	<.001
RHn4	0.1251	0.0277	4.52	<.001
pH_H2O	-2.096	0.509	-4.12	0.001
Tave3	0.355	0.105	3.40	0.004

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N, P, RHn4, pH_H2O, Tave3,

DL3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	35.611	5.0873	28.32	<.001
Residual	13	2.336	0.1797		
Total	20	37.947	1.8973		
Change	-1	-0.257	0.2574	1.43	0.253

Percentage variance accounted for 90.5

Standard error of observations is estimated to be 0.424

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	416.	345.	1.21	0.248
IC1	-0.002674	0.000895	-2.99	0.010
APP_N	-0.00874	0.00787	-1.11	0.287
P	0.0590	0.0193	3.05	0.009
RHn4	0.1151	0.0285	4.04	0.001
pH_H2O	-2.352	0.545	-4.32	<.001
Tave3	0.259	0.131	1.98	0.069
DL3	-32.5	27.2	-1.20	0.253

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N, P, RHn4, pH_H2O, Tave3,
DL3, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	35.911	4.4889	26.46	<.001
Residual	12	2.036	0.1697		
Total	20	37.947	1.8973		
Change	-1	-0.300	0.2996	1.77	0.209

Percentage variance accounted for 91.1

Standard error of observations is estimated to be 0.412

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	488.	339.	1.44	0.175
IC1	-0.002272	0.000921	-2.47	0.030
APP_N	-0.00547	0.00803	-0.68	0.509
P	0.0591	0.0188	3.14	0.009
RHn4	0.1092	0.0281	3.89	0.002
pH_H2O	-2.252	0.535	-4.21	0.001
Tave3	0.217	0.131	1.65	0.124
DL3	-38.3	26.8	-1.43	0.178
K	0.00324	0.00244	1.33	0.209

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N, P, RHn4, pH_H2O, Tave3,

DL3, K, rain4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	36.175	4.0194	24.95	<.001
Residual	11	1.772	0.1611		
Total	20	37.947	1.8973		
Change	-1	-0.264	0.2637	1.64	0.227

Percentage variance accounted for 91.5

Standard error of observations is estimated to be 0.401

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	519.	331.	1.57	0.145
IC1	-0.001763	0.000982	-1.80	0.100
APP_N	-0.00372	0.00795	-0.47	0.649
P	0.0628	0.0186	3.39	0.006
RHn4	0.0949	0.0295	3.21	0.008

pH_H2O	-2.324	0.524	-4.43	0.001
Tave3	0.293	0.141	2.08	0.062
DL3	-40.9	26.2	-1.56	0.146
K	0.00320	0.00238	1.35	0.205
rain4	0.000979	0.000765	1.28	0.227

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N, P, RHn4, pH_H2O, Tave3,
DL3, K, rain4, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	36.440	3.6440	24.19	<.001
Residual	10	1.507	0.1507		
Total	20	37.947	1.8973		
Change	-1	-0.266	0.2655	1.76	0.214

Percentage variance accounted for 92.1

Standard error of observations is estimated to be 0.388

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	745.	363.	2.05	0.067
IC1	-0.00123	0.00103	-1.20	0.260
APP_N	0.0053	0.0102	0.51	0.618
P	0.0539	0.0192	2.81	0.018
RHn4	0.0706	0.0339	2.08	0.064
pH_H2O	-2.115	0.531	-3.98	0.003
Tave3	0.223	0.146	1.53	0.158
DL3	-58.9	28.7	-2.05	0.067
K	0.00421	0.00242	1.74	0.113
rain4	0.001321	0.000783	1.69	0.123
frost4	0.382	0.288	1.33	0.214

===== Cultivar 12 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	29.52	29.5180	34.34	<.001
Residual	19	16.33	0.8596		
Total	20	45.85	2.2925		

Change	-1	-29.52	29.5180	34.34	<.001

Percentage variance accounted for 62.5

Standard error of observations is estimated to be 0.927

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	6.418	0.483	13.28	<.001
IC1	-0.003199	0.000546	-5.86	<.001

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	35.876	17.9379	32.37	<.001
Residual	18	9.975	0.5541		
Total	20	45.850	2.2925		

Change	-1	-6.358	6.3577	11.47	0.003

Percentage variance accounted for 75.8

Standard error of observations is estimated to be 0.744

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	4.681	0.643	7.28	<.001
IC1	-0.003344	0.000440	-7.59	<.001
APP_N	0.01986	0.00586	3.39	0.003

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	40.724	13.5747	45.02	<.001
Residual	17	5.126	0.3015		
Total	20	45.850	2.2925		
Change	-1	-4.849	4.8485	16.08	<.001

Percentage variance accounted for 86.8

Standard error of observations is estimated to be 0.549

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	2.961	0.639	4.63	<.001
IC1	-0.002670	0.000366	-7.30	<.001
APP_N	0.02292	0.00439	5.22	<.001
P	0.0508	0.0127	4.01	<.001

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N, P, RHn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	41.657	10.4142	39.73	<.001
Residual	16	4.194	0.2621		
Total	20	45.850	2.2925		
Change	-1	-0.932	0.9324	3.56	0.078

Percentage variance accounted for 88.6

Standard error of observations is estimated to be 0.512

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	1.455	0.997	1.46	0.164
IC1	-0.002995	0.000382	-7.84	<.001
APP_N	0.01438	0.00611	2.35	0.032
P	0.0564	0.0122	4.63	<.001
RHn4	0.0501	0.0265	1.89	0.078

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N, P, RHn4, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	42.976	8.5953	44.86	<.001
Residual	15	2.874	0.1916		
Total	20	45.850	2.2925		
Change	-1	-1.320	1.3197	6.89	0.019

Percentage variance accounted for 91.6

Standard error of observations is estimated to be 0.438

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	8.33	2.76	3.02	0.009
IC1	-0.004488	0.000656	-6.84	<.001
APP_N	0.00205	0.00702	0.29	0.774
P	0.0731	0.0122	5.99	<.001
RHn4	0.0779	0.0250	3.11	0.007
pH_H2O	-1.125	0.429	-2.62	0.019

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, IC1, APP_N, P, RHn4, pH_H2O, DL1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	43.841	7.3068	50.91	<.001
Residual	14	2.010	0.1435		
Total	20	45.850	2.2925		
Change	-1	-0.865	0.8645	6.02	0.028

Percentage variance accounted for 93.7

Standard error of observations is estimated to be 0.379

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	-308.	129.	-2.39	0.032
IC1	-0.003886	0.000619	-6.28	<.001
APP_N	-0.00365	0.00651	-0.56	0.584
P	0.0589	0.0120	4.89	<.001
RHn4	0.0969	0.0230	4.21	<.001
pH_H2O	-2.081	0.538	-3.87	0.002
DL1	28.9	11.8	2.45	0.028

===== Area 1 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	24.2	24.236	10.78	0.002
Residual	75	168.6	2.248		
Total	76	192.9	2.538		
Change	-1	-24.2	24.236	10.78	0.002

Percentage variance accounted for 11.4

Standard error of observations is estimated to be 1.50

*** Estimates of parameters ***

	estimate	s.e.	t(75)	t pr.
Constant	1.138	0.609	1.87	0.066
APP_N	0.02168	0.00660	3.28	0.002

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, APP_N, Resist

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	27.7	13.840	6.20	0.003
Residual	74	165.2	2.232		
Total	76	192.9	2.538		
Change	-1	-3.4	3.443	1.54	0.218

Percentage variance accounted for 12.0

Standard error of observations is estimated to be 1.49

*** Estimates of parameters ***

	estimate	s.e.	t(74)	t pr.
Constant	1.337	0.628	2.13	0.037
APP_N	0.02505	0.00712	3.52	<.001
Resist	-0.000224	0.000181	-1.24	0.218

===== Area 2 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	65.40	65.397	53.81	<.001
Residual	75	91.16	1.215		
Total	76	156.55	2.060		
Change	-1	-65.40	65.397	53.81	<.001

Percentage variance accounted for 41.0

Standard error of observations is estimated to be 1.10

*** Estimates of parameters ***

	estimate	s.e.	t(75)	t pr.
Constant	-14.52	2.47	-5.89	<.001
rad3	0.809	0.110	7.34	<.001

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rad3, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	81.99	40.994	40.68	<.001
Residual	74	74.57	1.008		
Total	76	156.55	2.060		
Change	-1	-16.59	16.590	16.46	<.001

Percentage variance accounted for 51.1

Standard error of observations is estimated to be 1.00

*** Estimates of parameters ***

	estimate	s.e.	t(74)	t pr.
Constant	-35.42	5.62	-6.30	<.001
rad3	1.049	0.117	9.00	<.001
WS3	6.24	1.54	4.06	<.001

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rad3, WS3, rain3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	86.33	28.7759	29.91	<.001
Residual	73	70.23	0.9620		
Total	76	156.55	2.0599		
Change	-1	-4.34	4.3407	4.51	0.037

Percentage variance accounted for 53.3

Standard error of observations is estimated to be 0.981

*** Estimates of parameters ***

	estimate	s.e.	t(73)	t pr.

Constant	-34.56	5.51	-6.28	<.001
rad3	1.012	0.115	8.79	<.001
WS3	5.77	1.52	3.80	<.001
rain3	0.00216	0.00101	2.12	0.037

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rad3, WS3, rain3, Tn2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	87.77	21.9435	22.97	<.001
Residual	72	68.78	0.9553		
Total	76	156.55	2.0599		
Change	-1	-1.45	1.4463	1.51	0.223

Percentage variance accounted for 53.6

Standard error of observations is estimated to be 0.977

*** Estimates of parameters ***

	estimate	s.e.	t(72)	t pr.
Constant	-34.22	5.49	-6.23	<.001

rad3	1.073	0.125	8.60	<.001
WS3	6.26	1.56	4.00	<.001
rain3	0.00335	0.00140	2.39	0.019
Tn2	-0.373	0.303	-1.23	0.223

===== Area 3 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, Mg

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	20.3	20.331	9.39	0.003
Residual	75	162.5	2.166		
Total	76	182.8	2.405		
Change	-1	-20.3	20.331	9.39	0.003

Percentage variance accounted for 9.9

Standard error of observations is estimated to be 1.47

*** Estimates of parameters ***

	estimate	s.e.	t(75)	t pr.
Constant	3.472	0.366	9.48	<.001
Mg	-0.02274	0.00742	-3.06	0.003

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, Mg, WS4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	23.6	11.795	5.48	0.006
Residual	74	159.2	2.151		
Total	76	182.8	2.405		
Change	-1	-3.3	3.259	1.51	0.222

Percentage variance accounted for 10.6

Standard error of observations is estimated to be 1.47

*** Estimates of parameters ***

	estimate	s.e.	t(74)	t pr.
Constant	9.92	5.25	1.89	0.063
Mg	-0.0144	0.0100	-1.43	0.156

WS4 -2.38 1.94 -1.23 0.222

===== Year 1 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, Tn2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	2.44	2.4420	3.63	0.066
Residual	31	20.85	0.6726		
Total	32	23.29	0.7279		
Change	-1	-2.44	2.4420	3.63	0.066

Percentage variance accounted for 7.6

Standard error of observations is estimated to be 0.820

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	-0.03	1.00	-0.03	0.973
Tn2	0.220	0.116	1.91	0.066

===== Year 2 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	0	0.00			*
Residual	32	28.17	0.8803		
Total	32	28.17	0.8803		
Change	0	0.00			*

Residual variance exceeds variance of response variate

Standard error of observations is estimated to be 0.938

*** Estimates of parameters ***

	estimate	s.e.	t(32)	t pr.
Constant	2.067	0.163	12.65	<.001

===== Year 3 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, rain2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	10.50	10.503	5.54	0.025
Residual	31	58.80	1.897		
Total	32	69.31	2.166		
Change	-1	-10.50	10.503	5.54	0.025

Percentage variance accounted for 12.4

Standard error of observations is estimated to be 1.38

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	4.812	0.712	6.76	<.001
rain2	-0.01629	0.00692	-2.35	0.025

===== Year 4 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, Eto4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	3.40	3.403	1.70	0.201
Residual	31	61.93	1.998		
Total	32	65.33	2.042		
Change	-1	-3.40	3.403	1.70	0.201

Percentage variance accounted for 2.2

Standard error of observations is estimated to be 1.41

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	-1.39	3.88	-0.36	0.722
Eto4	1.49	1.14	1.31	0.201

===== Year 5 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	13.71	13.713	4.86	0.035
Residual	31	87.47	2.822		
Total	32	101.18	3.162		
Change	-1	-13.71	13.713	4.86	0.035

Percentage variance accounted for 10.8

Standard error of observations is estimated to be 1.68

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	2.203	0.640	3.44	0.002
P	0.0644	0.0292	2.20	0.035

===== Year 6 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	32.42	32.416	11.42	0.002
Residual	31	87.96	2.837		
Total	32	120.38	3.762		
Change	-1	-32.42	32.416	11.42	0.002

Percentage variance accounted for 24.6

Standard error of observations is estimated to be 1.68

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	1.803	0.681	2.65	0.013
ETn4	0.930	0.275	3.38	0.002

===== Year 7 for Tfertclad =====

460.....

***** Regression Analysis *****

Response variate: Tfertclad

Fitted terms: Constant, Resist

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	3.03	3.027	2.03	0.164
Residual	31	46.19	1.490		
Total	32	49.21	1.538		
Change	-1	-3.03	3.027	2.03	0.164

Percentage variance accounted for 3.1

Standard error of observations is estimated to be 1.22

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	5.20	1.53	3.40	0.002
Resist	-0.000737	0.000517	-1.43	0.164

Appendix 3.9.3 Regression analysis on the number of fruit set for cultivars combined, individual cultivars, production year and areas

JPftotalFS.out

file is JPfyieldFS.gen

========== CACTUS PEAR ENVIRONMENTAL ADAPTIBILITY: FRUIT YIELD

===== FS regression model on all data for Tftotal =====

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	604.	603.842	61.86	<.001
Residual	226	2206.	9.762		
Total	227	2810.	12.379		
Change	-1	-604.	603.842	61.86	<.001

Percentage variance accounted for 21.1

Standard error of observations is estimated to be 3.12

*** Estimates of parameters ***

	estimate	s.e.	t(226)	t pr.
Constant	4.177	0.396	10.56	<.001
P	0.1499	0.0191	7.86	<.001

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	1222.	611.228	86.63	<.001
Residual	225	1588.	7.056		
Total	227	2810.	12.379		
Change	-1	-619.	618.614	87.67	<.001

Percentage variance accounted for 43.0

Standard error of observations is estimated to be 2.66

*** Estimates of parameters ***

	estimate	s.e.	t(225)	t pr.

Constant	-2.124	0.752	-2.82	0.005
P	0.1833	0.0166	11.04	<.001
APP_N	0.06091	0.00651	9.36	<.001

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N, rain4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	1290.	430.155	63.41	<.001
Residual	224	1520.	6.784		
Total	227	2810.	12.379		
Change	-1	-68.	68.010	10.03	0.002

Percentage variance accounted for 45.2

Standard error of observations is estimated to be 2.60

*** Estimates of parameters ***

	estimate	s.e.	t(224)	t pr.
Constant	-0.056	0.985	-0.06	0.954
P	0.1603	0.0178	9.00	<.001

APP_N 0.06606 0.00658 10.04 <.001

rain4 -0.003110 0.000982 -3.17 0.002

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N, rain4, Resist

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	1322.	330.420	49.51	<.001
Residual	223	1488.	6.674		
Total	227	2810.	12.379		
Change	-1	-31.	31.213	4.68	0.032

Percentage variance accounted for 46.1

Standard error of observations is estimated to be 2.58

*** Estimates of parameters ***

	estimate	s.e.	t(223)	t pr.
Constant	1.60	1.24	1.29	0.200
P	0.1431	0.0194	7.38	<.001
APP_N	0.06668	0.00654	10.20	<.001

rain4 -0.003423 0.000985 -3.48 <.001

Resist -0.000458 0.000212 -2.16 0.032

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N, rain4, Resist, WS4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	1365.	272.977	41.93	<.001
Residual	222	1445.	6.510		
Total	227	2810.	12.379		
Change	-1	-43.	43.205	6.64	0.011

Percentage variance accounted for 47.4

Standard error of observations is estimated to be 2.55

*** Estimates of parameters ***

	estimate	s.e.	t(222)	t pr.
Constant	-0.71	1.52	-0.47	0.640
P	0.1440	0.0191	7.52	<.001
APP_N	0.06643	0.00646	10.29	<.001

rain4	-0.00540	0.00124	-4.36	<.001
Resist	-0.000955	0.000284	-3.36	<.001
WS4	2.083	0.809	2.58	0.011

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N, rain4, Resist, WS4, RC4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	1493.	248.848	41.76	<.001
Residual	221	1317.	5.959		
Total	227	2810.	12.379		
Change	-1	-128.	128.204	21.51	<.001

Percentage variance accounted for 51.9

Standard error of observations is estimated to be 2.44

*** Estimates of parameters ***

	estimate	s.e.	t(221)	t pr.
Constant	-20.42	4.49	-4.55	<.001
P	0.1183	0.0191	6.18	<.001

APP_N	0.06292	0.00622	10.11	<.001
rain4	-0.00597	0.00119	-5.01	<.001
Resist	-0.001768	0.000324	-5.46	<.001
WS4	9.25	1.73	5.35	<.001
RC4	-0.001252	0.000270	-4.64	<.001

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N, rain4, Resist, WS4, RC4,

Rad2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	1529.	218.403	37.50	<.001
Residual	220	1281.	5.824		
Total	227	2810.	12.379		
Change	-1	-36.	35.736	6.14	0.014

Percentage variance accounted for 53.0

Standard error of observations is estimated to be 2.41

*** Estimates of parameters ***

	estimate	s.e.	t(220)	t pr.
Constant	-29.86	5.85	-5.10	<.001
P	0.0706	0.0270	2.62	0.009
APP_N	0.06070	0.00622	9.77	<.001
rain4	-0.00591	0.00118	-5.01	<.001
Resist	-0.001883	0.000323	-5.82	<.001
WS4	10.46	1.78	5.89	<.001
RC4	-0.001611	0.000304	-5.31	<.001
Rad2	0.385	0.156	2.48	0.014

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N, rain4, Resist, WS4, RC4,

Rad2, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	1539.	192.314	33.12	<.001
Residual	219	1272.	5.806		
Total	227	2810.	12.379		
Change	-1	-10.	9.689	1.67	0.198

Percentage variance accounted for 53.1

Standard error of observations is estimated to be 2.41

*** Estimates of parameters ***

	estimate	s.e.	t(219)	t pr.
Constant	-37.52	8.32	-4.51	<.001
P	0.0831	0.0286	2.90	0.004
APP_N	0.06672	0.00776	8.60	<.001
rain4	-0.00546	0.00123	-4.46	<.001
Resist	-0.001695	0.000354	-4.79	<.001
WS4	7.72	2.77	2.79	0.006
RC4	-0.001895	0.000375	-5.06	<.001
Rad2	0.384	0.155	2.47	0.014
WS3	4.33	3.35	1.29	0.198

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N, rain4, Resist, WS4, RC4,
Rad2, WS3, DL4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	1545.	171.673	29.58	<.001
Residual	218	1265.	5.803		
Total	227	2810.	12.379		

Change	-1	-7.	6.545	1.13	0.289

Percentage variance accounted for 53.1

Standard error of observations is estimated to be 2.41

*** Estimates of parameters ***

	estimate	s.e.	t(218)	t pr.
Constant	-650.	576.	-1.13	0.261
P	0.0866	0.0288	3.01	0.003
APP_N	0.06539	0.00786	8.32	<.001
rain4	-0.00443	0.00156	-2.84	0.005
Resist	-0.001571	0.000373	-4.21	<.001
WS4	6.96	2.86	2.44	0.016
RC4	-0.002182	0.000462	-4.73	<.001
Rad2	0.414	0.158	2.62	0.009
WS3	6.04	3.72	1.62	0.106
DL4	50.5	47.6	1.06	0.289

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N, rain4, Resist, WS4, RC4,

Rad2, WS3, DL4, ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	1557.	155.672	26.95	<.001
Residual	217	1253.	5.776		
Total	227	2810.	12.379		
Change	-1	-12.	11.659	2.02	0.157

Percentage variance accounted for 53.3

Standard error of observations is estimated to be 2.40

*** Estimates of parameters ***

	estimate	s.e.	t(217)	t pr.
Constant	-914.	604.	-1.51	0.132
P	0.0899	0.0288	3.12	0.002
APP_N	0.06105	0.00841	7.26	<.001
rain4	-0.00476	0.00158	-3.02	0.003
Resist	-0.001607	0.000373	-4.31	<.001
WS4	7.01	2.85	2.46	0.015
RC4	-0.001967	0.000485	-4.06	<.001
Rad2	0.374	0.160	2.34	0.020
WS3	5.79	3.71	1.56	0.121
DL4	72.8	50.0	1.46	0.147
ETn4	0.271	0.191	1.42	0.157

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N, rain4, Resist, WS4, RC4,

Rad2, WS3, DL4, ETn4, DL2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	11	1573.	143.032	24.98	<.001
Residual	216	1237.	5.725		
Total	227	2810.	12.379		
Change	-1	-17.	16.636	2.91	0.090

Percentage variance accounted for 53.7

Standard error of observations is estimated to be 2.39

*** Estimates of parameters ***

	estimate	s.e.	t(216)	t pr.
Constant	-1123.	614.	-1.83	0.069
P	0.1237	0.0349	3.55	<.001
APP_N	0.05602	0.00888	6.31	<.001
rain4	-0.00451	0.00158	-2.86	0.005
Resist	-0.001538	0.000373	-4.12	<.001
WS4	6.38	2.86	2.23	0.027
RC4	-0.002655	0.000629	-4.22	<.001
Rad2	0.390	0.160	2.44	0.016
WS3	6.28	3.71	1.69	0.092

DL4	131.7	60.6	2.17	0.031
ETn4	0.345	0.195	1.77	0.078
DL2	-46.0	27.0	-1.70	0.090

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N, rain4, Resist, WS4, RC4,

Rad2, WS3, DL4, ETn4, DL2, Ca

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	12	1586.	132.208	23.23	<.001
Residual	215	1224.	5.691		
Total	227	2810.	12.379		
Change	-1	-13.	13.148	2.31	0.130

Percentage variance accounted for 54.0

Standard error of observations is estimated to be 2.39

*** Estimates of parameters ***

	estimate	s.e.	t(215)	t pr.
Constant	-1222.	616.	-1.98	0.049

P	0.1545	0.0403	3.84	<.001
APP_N	0.0488	0.0101	4.85	<.001
rain4	-0.00337	0.00174	-1.93	0.055
Resist	-0.001555	0.000372	-4.17	<.001
WS4	2.03	4.04	0.50	0.617
RC4	-0.003229	0.000732	-4.41	<.001
Rad2	0.361	0.160	2.25	0.025
WS3	9.45	4.25	2.23	0.027
DL4	157.5	62.8	2.51	0.013
ETn4	0.442	0.205	2.16	0.032
DL2	-65.2	29.7	-2.19	0.029
Ca	-0.00439	0.00289	-1.52	0.130

===== Cultivar 1 for Tftotal =====

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, DL2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	54.17	54.169	13.96	0.001
Residual	19	73.71	3.880		
Total	20	127.88	6.394		

Change	-1	-54.17	54.169	13.96	0.001

Percentage variance accounted for 39.3

Standard error of observations is estimated to be 1.97

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-514.	139.	-3.70	0.002
DL2	47.5	12.7	3.74	0.001

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, DL2, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	88.43	44.217	20.18	<.001
Residual	18	39.45	2.191		
Total	20	127.88	6.394		

Change	-1	-34.26	34.265	15.64	<.001

Percentage variance accounted for 65.7

Standard error of observations is estimated to be 1.48

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-616.	107.	-5.73	<.001
DL2	56.44	9.82	5.75	<.001
APP_N	0.0472	0.0119	3.95	<.001

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, DL2, APP_N, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	100.93	33.643	21.22	<.001
Residual	17	26.95	1.585		
Total	20	127.88	6.394		
Change	-1	-12.49	12.494	7.88	0.012

Percentage variance accounted for 75.2

Standard error of observations is estimated to be 1.26

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-1380.	287.	-4.81	<.001
DL2	124.6	25.7	4.85	<.001
APP_N	0.0586	0.0109	5.36	<.001
WS3	7.14	2.54	2.81	0.012

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, DL2, APP_N, WS3, PC4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	106.60	26.651	20.04	<.001
Residual	16	21.28	1.330		
Total	20	127.88	6.394		
Change	-1	-5.68	5.676	4.27	0.055

Percentage variance accounted for 79.2

Standard error of observations is estimated to be 1.15

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-1092.	298.	-3.67	0.002
DL2	97.3	27.0	3.61	0.002
APP_N	0.0597	0.0100	5.95	<.001
WS3	11.79	3.24	3.64	0.002
PC4	-0.00514	0.00249	-2.07	0.055

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, DL2, APP_N, WS3, PC4, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	111.74	22.347	20.76	<.001
Residual	15	16.14	1.076		
Total	20	127.88	6.394		
Change	-1	-5.13	5.133	4.77	0.045

Percentage variance accounted for 83.2

Standard error of observations is estimated to be 1.04

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-772.	305.	-2.53	0.023
DL2	68.4	27.6	2.47	0.026
APP_N	0.05816	0.00904	6.43	<.001
WS3	9.94	3.03	3.28	0.005
PC4	-0.00499	0.00224	-2.23	0.041
P	0.0645	0.0295	2.18	0.045

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, DL2, APP_N, WS3, PC4, P, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	115.82	19.3026	22.40	<.001
Residual	14	12.06	0.8618		
Total	20	127.88	6.3940		
Change	-1	-4.08	4.0785	4.73	0.047

Percentage variance accounted for 86.5

Standard error of observations is estimated to be 0.928

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	-1056.	302.	-3.49	0.004
DL2	95.5	27.7	3.45	0.004
APP_N	0.04703	0.00957	4.91	<.001
WS3	10.47	2.73	3.84	0.002
PC4	-0.00600	0.00206	-2.92	0.011
P	0.0634	0.0264	2.40	0.031
pH_H2O	-2.25	1.04	-2.18	0.047

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, DL2, APP_N, WS3, PC4, P, pH_H2O,

RHn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	120.073	17.1533	28.56	<.001
Residual	13	7.807	0.6005		
Total	20	127.880	6.3940		
Change	-1	-4.258	4.2577	7.09	0.020

Percentage variance accounted for 90.6

Standard error of observations is estimated to be 0.775

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-910.	258.	-3.52	0.004
DL2	82.7	23.6	3.50	0.004
APP_N	0.0149	0.0145	1.03	0.323
WS3	9.56	2.30	4.15	0.001
PC4	-0.00818	0.00190	-4.30	<.001
P	0.0869	0.0238	3.66	0.003
pH_H2O	-3.523	0.987	-3.57	0.003
RHn4	0.1360	0.0511	2.66	0.020

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, DL2, APP_N, WS3, PC4, P, pH_H2O,
RHn4, HU0_3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	122.380	15.2975	33.38	<.001
Residual	12	5.500	0.4583		

Total 20 127.880 6.3940

Change -1 -2.307 2.3069 5.03 0.045

Percentage variance accounted for 92.8

Standard error of observations is estimated to be 0.677

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	-603.	264.	-2.29	0.041
DL2	53.3	24.4	2.18	0.050
APP_N	0.0070	0.0131	0.53	0.604
WS3	10.96	2.10	5.21	<.001
PC4	-0.00851	0.00167	-5.10	<.001
P	0.1326	0.0291	4.56	<.001
pH_H2O	-4.050	0.894	-4.53	<.001
RHn4	0.1837	0.0494	3.72	0.003
HU0_3	0.002179	0.000971	2.24	0.045

===== Cultivar 2 for Tftotal =====

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	106.23	106.229	52.66	<.001
Residual	19	38.33	2.017		
Total	20	144.56	7.228		
Change	-1	-106.23	106.229	52.66	<.001

Percentage variance accounted for 72.1

Standard error of observations is estimated to be 1.42

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-1.33	1.08	-1.23	0.235
APP_N	0.0808	0.0111	7.26	<.001

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, rad4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	124.74	62.369	56.64	<.001
Residual	18	19.82	1.101		
Total	20	144.56	7.228		
Change	-1	-18.51	18.508	16.81	<.001

Percentage variance accounted for 84.8

Standard error of observations is estimated to be 1.05

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-11.12	2.52	-4.42	<.001
APP_N	0.07931	0.00824	9.63	<.001
rad4	0.529	0.129	4.10	<.001

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, rad4, rain2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	129.20	43.0659	47.67	<.001

Residual	17	15.36	0.9035		
Total	20	144.56	7.2279		
Change	-1	-4.46	4.4597	4.94	0.040

Percentage variance accounted for 87.5

Standard error of observations is estimated to be 0.951

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-12.36	2.35	-5.26	<.001
APP_N	0.08915	0.00868	10.28	<.001
rad4	0.581	0.119	4.87	<.001
rain2	-0.00995	0.00448	-2.22	0.040

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, rad4, rain2, Rad2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	130.91	32.7279	38.38	<.001
Residual	16	13.65	0.8528		

Total	20	144.56	7.2279		
Change	-1	-1.71	1.7142	2.01	0.175

Percentage variance accounted for 88.2

Standard error of observations is estimated to be 0.923

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-12.24	2.28	-5.36	<.001
APP_N	0.08991	0.00845	10.65	<.001
rad4	1.034	0.340	3.04	0.008
rain2	-0.01255	0.00472	-2.66	0.017
Rad2	-0.533	0.376	-1.42	0.175

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, rad4, rain2, Rad2, ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	132.51	26.5028	33.01	<.001
Residual	15	12.04	0.8029		

Total 20 144.56 7.2279

Change -1 -1.60 1.6023 2.00 0.178

Percentage variance accounted for 88.9

Standard error of observations is estimated to be 0.896

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-12.66	2.24	-5.66	<.001
APP_N	0.08610	0.00863	9.98	<.001
rad4	1.156	0.341	3.39	0.004
rain2	-0.01045	0.00482	-2.17	0.047
Rad2	-0.651	0.374	-1.74	0.102
ETn4	0.210	0.149	1.41	0.178

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, rad4, rain2, Rad2, ETn4,

frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.

Regression	6	135.285	22.5474	34.04 <.001
Residual	14	9.273	0.6623	
Total	20	144.557	7.2279	
Change	-1	-2.771	2.7707	4.18 0.060

Percentage variance accounted for 90.8

Standard error of observations is estimated to be 0.814

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	-14.30	2.18	-6.55	<.001
APP_N	0.08726	0.00785	11.11	<.001
rad4	1.323	0.320	4.13	0.001
rain2	-0.01032	0.00438	-2.36	0.033
Rad2	-0.780	0.346	-2.26	0.041
ETn4	0.453	0.180	2.52	0.025
frost4	1.012	0.495	2.05	0.060

===== Cultivar 3 for Tftotal =====

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	70.37	70.375	18.10	<.001
Residual	18	70.00	3.889		
Total	19	140.37	7.388		
Change	-1	-70.37	70.375	18.10	<.001

Percentage variance accounted for 47.4

Standard error of observations is estimated to be 1.97

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-0.92	1.59	-0.58	0.568
APP_N	0.0683	0.0160	4.25	<.001

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	110.63	55.315	31.62	<.001
Residual	17	29.74	1.750		
Total	19	140.37	7.388		
Change	-1	-40.26	40.255	23.01	<.001

Percentage variance accounted for 76.3

Standard error of observations is estimated to be 1.32

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-4.48	1.30	-3.45	0.003
APP_N	0.0809	0.0111	7.30	<.001
P	0.1321	0.0275	4.80	<.001

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	117.11	39.035	26.84	<.001

Residual	16	23.27	1.454		
Total	19	140.37	7.388		
Change	-1	-6.47	6.475	4.45	0.051

Percentage variance accounted for 80.3

Standard error of observations is estimated to be 1.21

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-6.19	1.43	-4.31	<.001
APP_N	0.0854	0.0103	8.27	<.001
P	0.1362	0.0252	5.41	<.001
K	0.01170	0.00554	2.11	0.051

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, K, Eto4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	121.31	30.329	23.87	<.001
Residual	15	19.06	1.271		

Total	19	140.37	7.388		
Change	-1	-4.21	4.210	3.31	0.089

Percentage variance accounted for 82.8

Standard error of observations is estimated to be 1.13

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	0.26	3.79	0.07	0.946
APP_N	0.0725	0.0120	6.06	<.001
P	0.1684	0.0295	5.72	<.001
K	0.01219	0.00519	2.35	0.033
Eto4	-1.699	0.933	-1.82	0.089

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, K, Eto4, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	124.84	24.967	22.50	<.001
Residual	14	15.54	1.110		

Total	19	140.37	7.388		
Change	-1	-3.52	3.521	3.17	0.097

Percentage variance accounted for 85.0

Standard error of observations is estimated to be 1.05

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	-1.60	3.69	-0.43	0.671
APP_N	0.0803	0.0120	6.68	<.001
P	0.1904	0.0302	6.31	<.001
K	0.01554	0.00520	2.99	0.010
Eto4	-1.647	0.873	-1.89	0.080
frost4	1.019	0.572	1.78	0.097

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, K, Eto4, frost4, ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	128.08	21.3471	22.58	<.001

Residual	13	12.29	0.9454	
Total	19	140.37	7.3881	
Change	-1	-3.25	3.2470	3.43 0.087

Percentage variance accounted for 87.2

Standard error of observations is estimated to be 0.972

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-2.60	3.45	-0.75	0.465
APP_N	0.0791	0.0111	7.12	<.001
P	0.1762	0.0289	6.10	<.001
K	0.01498	0.00481	3.11	0.008
Eto4	-1.375	0.819	-1.68	0.117
frost4	1.616	0.619	2.61	0.021
ETn4	0.386	0.208	1.85	0.087

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, K, Eto4, frost4, ETn4,

pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	130.408	18.6297	22.43	<.001
Residual	12	9.966	0.8305		
Total	19	140.373	7.3881		
Change	-1	-2.325	2.3247	2.80	0.120

Percentage variance accounted for 88.8

Standard error of observations is estimated to be 0.911

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	4.08	5.13	0.79	0.443
APP_N	0.0695	0.0119	5.84	<.001
P	0.2036	0.0317	6.43	<.001
K	0.01808	0.00488	3.71	0.003
Eto4	-1.431	0.768	-1.86	0.087
frost4	1.526	0.582	2.62	0.022
ETn4	0.620	0.240	2.58	0.024
pH_H2O	-1.203	0.719	-1.67	0.120

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, K, Eto4, frost4, ETn4,

pH_H2O, Mg

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	133.037	16.6296	24.93	<.001
Residual	11	7.336	0.6669		
Total	19	140.373	7.3881		
Change	-1	-2.629	2.6294	3.94	0.073

Percentage variance accounted for 91.0

Standard error of observations is estimated to be 0.817

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	10.50	5.62	1.87	0.089
APP_N	0.0835	0.0128	6.53	<.001
P	0.1896	0.0292	6.48	<.001
K	0.01729	0.00439	3.94	0.002
Eto4	-1.984	0.743	-2.67	0.022
frost4	1.615	0.524	3.08	0.010
ETn4	0.771	0.228	3.38	0.006
pH_H2O	-2.76	1.01	-2.72	0.020
Mg	0.0284	0.0143	1.99	0.073

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, K, Eto4, frost4, ETn4,
pH_H2O, Mg, Alt

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	135.835	15.0927	33.25	<.001
Residual	10	4.539	0.4539		
Total	19	140.373	7.3881		
Change	-1	-2.798	2.7976	6.16	0.032

Percentage variance accounted for 93.9

Standard error of observations is estimated to be 0.674

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	-0.69	6.47	-0.11	0.917
APP_N	0.1090	0.0147	7.40	<.001
P	0.1421	0.0308	4.62	<.001
K	0.02397	0.00451	5.32	<.001
Eto4	-1.414	0.654	-2.16	0.056
frost4	2.101	0.474	4.43	0.001
ETn4	1.178	0.249	4.72	<.001
pH_H2O	-2.522	0.842	-3.00	0.013

Mg	0.0528	0.0154	3.44	0.006
Alt	0.002451	0.000987	2.48	0.032

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, K, Eto4, frost4, ETn4,
pH_H2O, Mg, Alt, RC1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	138.609	13.8609	70.69	<.001
Residual	9	1.765	0.1961		
Total	19	140.373	7.3881		
Change	-1	-2.774	2.7739	14.15	0.004

Percentage variance accounted for 97.3

Standard error of observations is estimated to be 0.443

*** Estimates of parameters ***

	estimate	s.e.	t(9)	t pr.
Constant	0.03	4.26	0.01	0.995
APP_N	0.0942	0.0105	9.01	<.001

P	0.1258	0.0207	6.08	<.001
K	0.02029	0.00312	6.50	<.001
Eto4	-1.508	0.431	-3.50	0.007
frost4	1.816	0.321	5.66	<.001
ETn4	0.893	0.181	4.94	<.001
pH_H2O	-2.667	0.554	-4.81	<.001
Mg	0.0464	0.0102	4.53	0.001
Alt	0.004968	0.000932	5.33	<.001
RC1	-0.002468	0.000656	-3.76	0.004

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, K, Eto4, frost4, ETn4,

pH_H2O, Mg, Alt, RC1, RHx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	11	139.309	12.6645	95.23	<.001
Residual	8	1.064	0.1330		
Total	19	140.373	7.3881		
Change	-1	-0.701	0.7009	5.27	0.051

Percentage variance accounted for 98.2

Standard error of observations is estimated to be 0.365

*** Estimates of parameters ***

	estimate	s.e.	t(8)	t pr.
Constant	-6.67	4.56	-1.46	0.182
APP_N	0.08758	0.00907	9.65	<.001
P	0.1320	0.0173	7.65	<.001
K	0.01941	0.00260	7.47	<.001
Eto4	-1.499	0.355	-4.23	0.003
frost4	1.698	0.269	6.31	<.001
ETn4	0.836	0.151	5.54	<.001
pH_H2O	-3.028	0.483	-6.27	<.001
Mg	0.04744	0.00845	5.62	<.001
Alt	0.005790	0.000847	6.84	<.001
RC1	-0.003233	0.000635	-5.09	<.001
RHx4	0.0919	0.0400	2.30	0.051

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, K, Eto4, frost4, ETn4,

pH_H2O, Mg, Alt, RC1, RHx4, ETx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.

Regression	12	139.6565	11.6380	113.65 <.001
Residual	7	0.7168	0.1024	
Total	19	140.3733	7.3881	
Change	-1	-0.3471	0.3471	3.39 0.108

Percentage variance accounted for 98.6

Standard error of observations is estimated to be 0.320

*** Estimates of parameters ***

	estimate	s.e.	t(7)	t pr.
Constant	-13.78	5.56	-2.48	0.042
APP_N	0.08499	0.00809	10.51	<.001
P	0.1440	0.0165	8.73	<.001
K	0.02084	0.00241	8.65	<.001
Eto4	-1.626	0.319	-5.10	0.001
frost4	1.706	0.236	7.22	<.001
ETn4	0.902	0.137	6.58	<.001
pH_H2O	-3.438	0.479	-7.18	<.001
Mg	0.04890	0.00745	6.56	<.001
Alt	0.006704	0.000894	7.50	<.001
RC1	-0.003076	0.000563	-5.46	<.001
RHx4	0.1303	0.0409	3.19	0.015
ETx4	0.1413	0.0768	1.84	0.108

===== Cultivar 4 for Tftotal =====

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	102.1	102.060	12.81	0.002
Residual	19	151.4	7.969		
Total	20	253.5	12.673		
Change	-1	-102.1	102.060	12.81	0.002

Percentage variance accounted for 37.1

Standard error of observations is estimated to be 2.82

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-0.29	2.16	-0.13	0.895
APP_N	0.0792	0.0221	3.58	0.002

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	193.70	96.849	29.17	<.001
Residual	18	59.77	3.320		
Total	20	253.47	12.673		
Change	-1	-91.64	91.637	27.60	<.001

Percentage variance accounted for 73.8

Standard error of observations is estimated to be 1.82

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-5.15	1.67	-3.08	0.006
APP_N	0.0944	0.0146	6.47	<.001
P	0.1963	0.0374	5.25	<.001

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	197.52	65.840	20.01	<.001
Residual	17	55.95	3.291		
Total	20	253.47	12.673		
Change	-1	-3.82	3.822	1.16	0.296

Percentage variance accounted for 74.0

Standard error of observations is estimated to be 1.81

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-6.49	2.08	-3.12	0.006
APP_N	0.0980	0.0149	6.58	<.001
P	0.1997	0.0373	5.35	<.001
K	0.00898	0.00833	1.08	0.296

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, K, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	208.37	52.094	18.48	<.001
Residual	16	45.09	2.818		
Total	20	253.47	12.673		
Change	-1	-10.86	10.856	3.85	0.067

Percentage variance accounted for 77.8

Standard error of observations is estimated to be 1.68

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-16.50	5.45	-3.03	0.008
APP_N	0.1023	0.0140	7.33	<.001
P	0.2508	0.0433	5.80	<.001
K	0.01818	0.00903	2.01	0.061
WS3	2.96	1.51	1.96	0.067

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, K, WS3, ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	221.06	44.212	20.46	<.001
Residual	15	32.41	2.160		
Total	20	253.47	12.673		
Change	-1	-12.68	12.683	5.87	0.029

Percentage variance accounted for 83.0

Standard error of observations is estimated to be 1.47

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-24.02	5.69	-4.22	<.001
APP_N	0.0973	0.0124	7.86	<.001
P	0.2614	0.0381	6.85	<.001
K	0.02121	0.00800	2.65	0.018
WS3	5.53	1.69	3.26	0.005
ETn4	0.718	0.296	2.42	0.029

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, K, WS3, ETn4, DL4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	226.85	37.809	19.89	<.001
Residual	14	26.61	1.901		
Total	20	253.47	12.673		
Change	-1	-5.80	5.796	3.05	0.103

Percentage variance accounted for 85.0

Standard error of observations is estimated to be 1.38

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	-1731.	977.	-1.77	0.098
APP_N	0.0880	0.0128	6.88	<.001
P	0.2694	0.0361	7.47	<.001
K	0.02549	0.00790	3.23	0.006
WS3	6.56	1.69	3.87	0.002
ETn4	1.113	0.358	3.11	0.008
DL4	142.0	81.3	1.75	0.103

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, K, WS3, ETn4, DL4, Tx2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	239.74	34.249	32.44	<.001
Residual	13	13.73	1.056		
Total	20	253.47	12.673		
Change	-1	-12.89	12.886	12.20	0.004

Percentage variance accounted for 91.7

Standard error of observations is estimated to be 1.03

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-3000.	814.	-3.69	0.003
APP_N	0.09110	0.00957	9.52	<.001
P	0.2794	0.0270	10.34	<.001
K	0.01909	0.00616	3.10	0.008
WS3	13.38	2.33	5.75	<.001
ETn4	1.013	0.268	3.77	0.002
DL4	244.8	67.4	3.63	0.003
Tx2	0.750	0.215	3.49	0.004

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, K, WS3, ETn4, DL4, Tx2,
ETx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	244.508	30.5635	40.95	<.001
Residual	12	8.957	0.7464		
Total	20	253.465	12.6733		
Change	-1	-4.768	4.7681	6.39	0.027

Percentage variance accounted for 94.1

Standard error of observations is estimated to be 0.864

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	-2449.	718.	-3.41	0.005
APP_N	0.08324	0.00863	9.65	<.001
P	0.2390	0.0278	8.60	<.001
K	0.01533	0.00539	2.84	0.015
WS3	8.98	2.62	3.42	0.005
ETn4	0.894	0.231	3.87	0.002
DL4	201.0	59.2	3.39	0.005
Tx2	0.985	0.203	4.85	<.001

ETx4 -0.448 0.177 -2.53 0.027

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, K, WS3, ETn4, DL4, Tx2,

ETx4, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	246.685	27.4094	44.47	<.001
Residual	11	6.780	0.6164		
Total	20	253.465	12.6733		
Change	-1	-2.177	2.1773	3.53	0.087

Percentage variance accounted for 95.1

Standard error of observations is estimated to be 0.785

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	-2399.	653.	-3.67	0.004
APP_N	0.08179	0.00788	10.38	<.001
P	0.2038	0.0314	6.48	<.001

K	0.01318	0.00503	2.62	0.024
WS3	9.78	2.42	4.04	0.002
ETn4	0.868	0.210	4.13	0.002
DL4	195.9	53.9	3.63	0.004
Tx2	1.130	0.200	5.65	<.001
ETx4	-0.424	0.162	-2.62	0.024
rad3	0.263	0.140	1.88	0.087

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, K, WS3, ETn4, DL4, Tx2,

ETx4, rad3, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	248.598	24.8598	51.08	<.001
Residual	10	4.867	0.4867		
Total	20	253.465	12.6733		
Change	-1	-1.913	1.9130	3.93	0.076

Percentage variance accounted for 96.2

Standard error of observations is estimated to be 0.698

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	-2259.	585.	-3.86	0.003
APP_N	0.08495	0.00718	11.83	<.001
P	0.2111	0.0282	7.49	<.001
K	0.01572	0.00465	3.38	0.007
WS3	8.97	2.19	4.10	0.002
ETn4	1.026	0.203	5.06	<.001
DL4	184.5	48.2	3.82	0.003
Tx2	1.057	0.181	5.82	<.001
ETx4	-0.427	0.144	-2.97	0.014
rad3	0.283	0.125	2.27	0.047
frost4	0.915	0.461	1.98	0.076

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, K, WS3, ETn4, DL4, Tx2,
ETx4, rad3, frost4, HU15_4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	11	249.874	22.7158	56.93	<.001
Residual	9	3.591	0.3990		
Total	20	253.465	12.6733		

Change	-1	-1.276	1.2760	3.20	0.107

Percentage variance accounted for 96.9

Standard error of observations is estimated to be 0.632

*** Estimates of parameters ***

	estimate	s.e.	t(9)	t pr.
Constant	-1914.	563.	-3.40	0.008
APP_N	0.08446	0.00651	12.98	<.001
P	0.1908	0.0279	6.84	<.001
K	0.01055	0.00510	2.07	0.069
WS3	8.46	2.00	4.23	0.002
ETn4	0.867	0.204	4.25	0.002
DL4	156.6	46.4	3.37	0.008
Tx2	0.900	0.186	4.83	<.001
ETx4	-0.697	0.199	-3.50	0.007
rad3	0.370	0.123	3.01	0.015
frost4	0.774	0.425	1.82	0.102
HU15_4	0.00251	0.00140	1.79	0.107

===== Cultivar 5 for Tftotal =====

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	192.8	192.825	26.31	<.001
Residual	19	139.3	7.330		
Total	20	332.1	16.605		
Change	-1	-192.8	192.825	26.31	<.001

Percentage variance accounted for 55.9

Standard error of observations is estimated to be 2.71

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	1.25	1.12	1.11	0.281
P	0.2790	0.0544	5.13	<.001

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, Tave3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	230.0	115.002	20.28	<.001
Residual	18	102.1	5.671		
Total	20	332.1	16.605		
Change	-1	-37.2	37.179	6.56	0.020

Percentage variance accounted for 65.8

Standard error of observations is estimated to be 2.38

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-8.41	3.90	-2.16	0.045
P	0.2259	0.0522	4.33	<.001
Tave3	0.502	0.196	2.56	0.020

===== Cultivar 6 for Tftotal =====

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	84.2	84.196	11.78	0.003
Residual	19	135.8	7.147		
Total	20	220.0	10.999		
Change	-1	-84.2	84.196	11.78	0.003

Percentage variance accounted for 35.0

Standard error of observations is estimated to be 2.67

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	2.16	2.04	1.06	0.303
APP_N	0.0719	0.0210	3.43	0.003

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, rad4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.

Regression	2	115.1	57.537	9.87	0.001
Residual	18	104.9	5.828		
Total	20	220.0	10.999		
Change	-1	-30.9	30.878	5.30	0.034

Percentage variance accounted for 47.0

Standard error of observations is estimated to be 2.41

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-10.49	5.80	-1.81	0.087
APP_N	0.0700	0.0189	3.69	0.002
rad4	0.684	0.297	2.30	0.034

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, rad4, RHx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	134.98	44.993	9.00	<.001
Residual	17	85.01	5.000		

Total	20	219.98	10.999		
Change	-1	-19.90	19.904	3.98	0.062

Percentage variance accounted for 54.5

Standard error of observations is estimated to be 2.24

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	19.4	15.9	1.22	0.240
APP_N	0.0865	0.0194	4.46	<.001
rad4	0.680	0.275	2.47	0.024
RHx4	-0.356	0.178	-2.00	0.062

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, rad4, RHx4, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	161.88	40.469	11.14	<.001
Residual	16	58.11	3.632		
Total	20	219.98	10.999		

Change	-1	-26.90	26.897	7.41	0.015

Percentage variance accounted for 67.0

Standard error of observations is estimated to be 1.91

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	24.0	13.6	1.76	0.098
APP_N	0.0977	0.0170	5.74	<.001
rad4	0.725	0.235	3.08	0.007
RHx4	-0.435	0.155	-2.81	0.013
frost4	2.352	0.864	2.72	0.015

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, rad4, RHx4, frost4, Resist

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	184.29	36.857	15.49	<.001
Residual	15	35.70	2.380		
Total	20	219.98	10.999		

Change	-1	-22.41	22.411	9.42	0.008

Percentage variance accounted for 78.4

Standard error of observations is estimated to be 1.54

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	43.2	12.7	3.40	0.004
APP_N	0.1131	0.0147	7.71	<.001
rad4	0.620	0.193	3.20	0.006
RHx4	-0.608	0.137	-4.43	<.001
frost4	3.498	0.793	4.41	<.001
Resist	-0.001403	0.000457	-3.07	0.008

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, rad4, RHx4, frost4, Resist,

rain2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	188.47	31.412	13.95	<.001

Residual	14	31.51	2.251		
Total	20	219.98	10.999		
Change	-1	-4.18	4.184	1.86	0.194

Percentage variance accounted for 79.5

Standard error of observations is estimated to be 1.50

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	34.6	13.9	2.49	0.026
APP_N	0.1199	0.0151	7.93	<.001
rad4	0.688	0.195	3.53	0.003
RHx4	-0.527	0.146	-3.61	0.003
frost4	3.555	0.773	4.60	<.001
Resist	-0.001285	0.000453	-2.84	0.013
rain2	-0.01081	0.00793	-1.36	0.194

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, rad4, RHx4, frost4, Resist,

rain2, DL4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	196.57	28.081	15.59	<.001
Residual	13	23.42	1.801		
Total	20	219.98	10.999		
Change	-1	-8.10	8.099	4.50	0.054

Percentage variance accounted for 83.6

Standard error of observations is estimated to be 1.34

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-2096.	1005.	-2.09	0.057
APP_N	0.1149	0.0137	8.37	<.001
rad4	0.633	0.176	3.59	0.003
RHx4	-0.443	0.137	-3.24	0.007
frost4	2.859	0.765	3.74	0.002
Resist	-0.001082	0.000416	-2.60	0.022
rain2	-0.02247	0.00897	-2.50	0.026
DL4	177.1	83.5	2.12	0.054

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, rad4, RHx4, frost4, Resist,

rain2, DL4, C1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	201.13	25.141	16.00	<.001
Residual	12	18.85	1.571		
Total	20	219.98	10.999		
Change	-1	-4.56	4.561	2.90	0.114

Percentage variance accounted for 85.7

Standard error of observations is estimated to be 1.25

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	-2067.	939.	-2.20	0.048
APP_N	0.1154	0.0128	9.00	<.001
rad4	0.569	0.169	3.37	0.006
RHx4	-0.487	0.130	-3.73	0.003
frost4	2.214	0.809	2.74	0.018
Resist	-0.001377	0.000426	-3.23	0.007
rain2	-0.02529	0.00854	-2.96	0.012
DL4	175.1	78.0	2.24	0.044
C1	0.00176	0.00103	1.70	0.114

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, rad4, RHx4, frost4, Resist,
rain2, DL4, C1, RC1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	214.150	23.7944	44.86	<.001
Residual	11	5.835	0.5304		
Total	20	219.985	10.9992		
Change	-1	-13.020	13.0200	24.55	<.001

Percentage variance accounted for 95.2

Standard error of observations is estimated to be 0.728

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	-3648.	632.	-5.77	<.001
APP_N	0.09710	0.00832	11.67	<.001
rad4	1.296	0.176	7.35	<.001
RHx4	-0.5186	0.0760	-6.82	<.001
frost4	1.065	0.524	2.03	0.067
Resist	-0.001371	0.000247	-5.54	<.001
rain2	-0.02057	0.00506	-4.07	0.002
DL4	305.3	52.4	5.83	<.001

C1	0.01921	0.00357	5.38	<.001
RC1	-0.00909	0.00183	-4.95	<.001

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, rad4, RHx4, frost4, Resist,

rain2, DL4, C1, RC1, Eto4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	215.055	21.5055	43.63	<.001
Residual	10	4.929	0.4929		
Total	20	219.985	10.9992		
Change	-1	-0.906	0.9056	1.84	0.205

Percentage variance accounted for 95.5

Standard error of observations is estimated to be 0.702

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	-3517.	617.	-5.70	<.001
APP_N	0.10305	0.00914	11.27	<.001

rad4	1.222	0.179	6.84	<.001
RHx4	-0.4705	0.0814	-5.78	<.001
frost4	0.965	0.511	1.89	0.088
Resist	-0.001245	0.000256	-4.86	<.001
rain2	-0.02092	0.00488	-4.29	0.002
DL4	293.8	51.2	5.74	<.001
C1	0.01954	0.00345	5.66	<.001
RC1	-0.00910	0.00177	-5.15	<.001
Eto4	0.954	0.704	1.36	0.205

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, rad4, RHx4, frost4, Resist,

rain2, DL4, C1, RC1, Eto4, RHn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	11	216.972	19.7247	58.93	<.001
Residual	9	3.012	0.3347		
Total	20	219.985	10.9992		
Change	-1	-1.917	1.9168	5.73	0.040

Percentage variance accounted for 97.0

Standard error of observations is estimated to be 0.579

*** Estimates of parameters ***

	estimate	s.e.	t(9)	t pr.
Constant	-3371.	512.	-6.59	<.001
APP_N	0.09177	0.00889	10.33	<.001
rad4	1.055	0.163	6.47	<.001
RHx4	-0.6302	0.0946	-6.66	<.001
frost4	0.822	0.425	1.93	0.085
Resist	-0.001304	0.000212	-6.14	<.001
rain2	-0.01943	0.00407	-4.78	0.001
DL4	281.8	42.5	6.63	<.001
C1	0.01967	0.00285	6.91	<.001
RC1	-0.00934	0.00146	-6.40	<.001
Eto4	2.836	0.977	2.90	0.018
RHn4	0.1844	0.0771	2.39	0.040

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, rad4, RHx4, frost4, Resist,

rain2, DL4, C1, RC1, Eto4, RHn4, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.

Regression	12	218.857	18.2381	129.41	<.001
Residual	8	1.127	0.1409		
Total	20	219.985	10.9992		
Change	-1	-1.885	1.8849	13.37	0.006

Percentage variance accounted for 98.7

Standard error of observations is estimated to be 0.375

*** Estimates of parameters ***

	estimate	s.e.	t(8)	t pr.
Constant	-3644.	340.	-10.70	<.001
APP_N	0.09132	0.00577	15.83	<.001
rad4	0.968	0.108	8.92	<.001
RHx4	-0.6172	0.0615	-10.04	<.001
frost4	0.783	0.276	2.84	0.022
Resist	-0.001318	0.000138	-9.56	<.001
rain2	-0.01808	0.00267	-6.78	<.001
DL4	303.3	28.2	10.76	<.001
C1	0.01706	0.00198	8.62	<.001
RC1	-0.009852	0.000958	-10.29	<.001
Eto4	3.709	0.678	5.47	<.001
RHn4	0.2196	0.0509	4.31	0.003
WS3	4.51	1.23	3.66	0.006

===== Cultivar 7 for Tftotal =====

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	74.85	74.855	25.74	<.001
Residual	17	49.44	2.908		
Total	18	124.30	6.905		
Change	-1	-74.85	74.855	25.74	<.001

Percentage variance accounted for 57.9

Standard error of observations is estimated to be 1.71

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-0.87	1.50	-0.58	0.571
APP_N	0.0759	0.0150	5.07	<.001

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	91.34	45.672	22.18	<.001
Residual	16	32.95	2.059		
Total	18	124.30	6.905		
Change	-1	-16.49	16.490	8.01	0.012

Percentage variance accounted for 70.2

Standard error of observations is estimated to be 1.44

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-1.63	1.29	-1.26	0.225
APP_N	0.0872	0.0132	6.60	<.001
frost4	-3.19	1.13	-2.83	0.012

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, frost4, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	98.36	32.788	18.96	<.001
Residual	15	25.93	1.729		
Total	18	124.30	6.905		
Change	-1	-7.02	7.019	4.06	0.062

Percentage variance accounted for 75.0

Standard error of observations is estimated to be 1.31

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-3.73	1.58	-2.37	0.032
APP_N	0.0947	0.0127	7.48	<.001
frost4	-2.31	1.12	-2.07	0.057
P	0.0681	0.0338	2.01	0.062

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, frost4, P, Eto4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	103.16	25.789	17.08	<.001
Residual	14	21.14	1.510		
Total	18	124.30	6.905		
Change	-1	-4.79	4.793	3.17	0.097

Percentage variance accounted for 78.1

Standard error of observations is estimated to be 1.23

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	3.85	4.50	0.86	0.407
APP_N	0.0776	0.0152	5.10	<.001
frost4	-2.04	1.06	-1.93	0.074
P	0.0996	0.0362	2.75	0.016
Eto4	-1.89	1.06	-1.78	0.097

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, frost4, P, Eto4, RHn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	106.23	21.247	15.29	<.001
Residual	13	18.06	1.389		
Total	18	124.30	6.905		
Change	-1	-3.08	3.078	2.22	0.161

Percentage variance accounted for 79.9

Standard error of observations is estimated to be 1.18

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	12.15	7.05	1.72	0.109
APP_N	0.0926	0.0177	5.22	<.001
frost4	-1.86	1.02	-1.82	0.092
P	0.1072	0.0351	3.06	0.009
Eto4	-3.10	1.30	-2.38	0.033
RHn4	-0.1167	0.0784	-1.49	0.161

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, frost4, P, Eto4, RHn4, Rad2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	108.59	18.098	13.82	<.001
Residual	12	15.71	1.309		
Total	18	124.30	6.905		
Change	-1	-2.35	2.352	1.80	0.205

Percentage variance accounted for 81.0

Standard error of observations is estimated to be 1.14

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	15.00	7.17	2.09	0.058
APP_N	0.0856	0.0180	4.76	<.001
frost4	-1.54	1.02	-1.51	0.157
P	0.0864	0.0374	2.31	0.040
Eto4	-4.54	1.66	-2.74	0.018
RHn4	-0.1722	0.0866	-1.99	0.070
Rad2	0.369	0.275	1.34	0.205

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, frost4, P, Eto4, RHn4, Rad2,

Resist

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	110.18	15.740	12.27	<.001
Residual	11	14.11	1.283		
Total	18	124.30	6.905		
Change	-1	-1.60	1.595	1.24	0.289

Percentage variance accounted for 81.4

Standard error of observations is estimated to be 1.13

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	19.25	8.05	2.39	0.036
APP_N	0.0870	0.0179	4.87	<.001
frost4	-1.25	1.04	-1.20	0.256
P	0.0797	0.0376	2.12	0.057
Eto4	-5.36	1.80	-2.98	0.013
RHn4	-0.2104	0.0924	-2.28	0.044
Rad2	0.458	0.284	1.61	0.135
Resist	-0.000393	0.000353	-1.12	0.289

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, frost4, P, Eto4, RHn4, Rad2,
Resist, DL4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	112.02	14.002	11.40	<.001
Residual	10	12.28	1.228		
Total	18	124.30	6.905		
Change	-1	-1.84	1.836	1.49	0.249

Percentage variance accounted for 82.2

Standard error of observations is estimated to be 1.11

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	-919.	767.	-1.20	0.259
APP_N	0.0845	0.0176	4.81	<.001
frost4	-1.88	1.14	-1.64	0.131
P	0.0813	0.0368	2.21	0.051
Eto4	-6.27	1.91	-3.28	0.008
RHn4	-0.2526	0.0967	-2.61	0.026
Rad2	0.488	0.279	1.75	0.110

Resist -0.000426 0.000346 -1.23 0.246

DL4 78.6 64.3 1.22 0.249

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, frost4, P, Eto4, RHn4, Rad2,

Resist, DL4, ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	114.06	12.673	11.14	<.001
Residual	9	10.24	1.138		
Total	18	124.30	6.905		
Change	-1	-2.04	2.038	1.79	0.214

Percentage variance accounted for 83.5

Standard error of observations is estimated to be 1.07

*** Estimates of parameters ***

	estimate	s.e.	t(9)	t pr.
Constant	-1324.	798.	-1.66	0.132
APP_N	0.0808	0.0172	4.71	0.001

frost4	-1.15	1.23	-0.94	0.372
P	0.0721	0.0361	2.00	0.077
Eto4	-6.36	1.84	-3.45	0.007
RHn4	-0.2605	0.0933	-2.79	0.021
Rad2	0.574	0.276	2.08	0.067
Resist	-0.000431	0.000333	-1.29	0.228
DL4	112.3	66.8	1.68	0.127
ETn4	0.331	0.248	1.34	0.214

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, frost4, P, Eto4, RHn4, Rad2,
Resist, DL4, ETn4, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	119.068	11.9068	18.22	<.001
Residual	8	5.228	0.6535		
Total	18	124.296	6.9054		
Change	-1	-5.013	5.0132	7.67	0.024

Percentage variance accounted for 90.5

Standard error of observations is estimated to be 0.808

*** Estimates of parameters ***

	estimate	s.e.	t(8)	t pr.
Constant	-1575.	612.	-2.57	0.033
APP_N	0.0556	0.0159	3.51	0.008
frost4	-1.255	0.930	-1.35	0.214
P	0.1171	0.0318	3.68	0.006
Eto4	-6.70	1.40	-4.78	0.001
RHn4	-0.2630	0.0707	-3.72	0.006
Rad2	0.438	0.215	2.04	0.075
Resist	-0.000493	0.000253	-1.95	0.088
DL4	134.5	51.3	2.62	0.030
ETn4	0.740	0.239	3.10	0.015
pH_H2O	-1.986	0.717	-2.77	0.024

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, frost4, P, Eto4, RHn4, Rad2,

Resist, DL4, ETn4, pH_H2O, HU15_2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	11	120.491	10.9537	20.15	<.001
Residual	7	3.805	0.5436		

Total 18 124.296 6.9054

Change -1 -1.423 1.4225 2.62 0.150

Percentage variance accounted for 92.1

Standard error of observations is estimated to be 0.737

*** Estimates of parameters ***

	estimate	s.e.	t(7)	t pr.
Constant	-1863.	586.	-3.18	0.015
APP_N	0.0390	0.0177	2.20	0.064
frost4	-1.429	0.855	-1.67	0.138
P	0.1292	0.0299	4.31	0.004
Eto4	-6.10	1.33	-4.59	0.003
RHn4	-0.1703	0.0863	-1.97	0.089
Rad2	0.508	0.200	2.53	0.039
Resist	-0.000300	0.000260	-1.15	0.286
DL4	158.2	49.0	3.23	0.014
ETn4	0.590	0.237	2.49	0.042
pH_H2O	-2.671	0.779	-3.43	0.011
HU15_2	0.00362	0.00224	1.62	0.150

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, frost4, P, Eto4, RHn4, Rad2,

Resist, DL4, ETn4, pH_H2O, HU15_2, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	12	123.083	10.2570	50.74	<.001
Residual	6	1.213	0.2021		
Total	18	124.296	6.9054		
Change	-1	-2.593	2.5925	12.83	0.012

Percentage variance accounted for 97.1

Standard error of observations is estimated to be 0.450

*** Estimates of parameters ***

	estimate	s.e.	t(6)	t pr.
Constant	-2524.	402.	-6.28	<.001
APP_N	0.0534	0.0115	4.63	0.004
frost4	-1.826	0.533	-3.43	0.014
P	0.1170	0.0186	6.30	<.001
Eto4	-5.330	0.839	-6.35	<.001
RHn4	-0.1709	0.0526	-3.25	0.018
Rad2	0.519	0.122	4.24	0.005
Resist	-0.000412	0.000162	-2.55	0.044
DL4	211.3	33.3	6.34	<.001
ETn4	0.590	0.144	4.09	0.006
pH_H2O	-1.319	0.607	-2.17	0.073
HU15_2	0.00694	0.00165	4.21	0.006
WS3	4.64	1.29	3.58	0.012

===== Cultivar 8 for Tftotal =====

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	139.5	139.467	24.93	<.001
Residual	19	106.3	5.594		
Total	20	245.8	12.288		
Change	-1	-139.5	139.467	24.93	<.001

Percentage variance accounted for 54.5

Standard error of observations is estimated to be 2.37

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	2.872	0.981	2.93	0.009
P	0.2373	0.0475	4.99	<.001

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	185.67	92.834	27.81	<.001
Residual	18	60.09	3.339		
Total	20	245.76	12.288		
Change	-1	-46.20	46.201	13.84	0.002

Percentage variance accounted for 72.8

Standard error of observations is estimated to be 1.83

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-2.69	1.68	-1.60	0.126
P	0.2649	0.0375	7.07	<.001
APP_N	0.0544	0.0146	3.72	0.002

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	198.46	66.155	23.78	<.001
Residual	17	47.30	2.782		
Total	20	245.76	12.288		
Change	-1	-12.80	12.796	4.60	0.047

Percentage variance accounted for 77.4

Standard error of observations is estimated to be 1.67

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-5.14	1.91	-2.69	0.015
P	0.2712	0.0343	7.90	<.001
APP_N	0.0610	0.0137	4.46	<.001
K	0.01643	0.00766	2.14	0.047

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N, K, rain4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	203.98	50.995	19.53	<.001
Residual	16	41.78	2.611		
Total	20	245.76	12.288		
Change	-1	-5.51	5.515	2.11	0.165

Percentage variance accounted for 78.7

Standard error of observations is estimated to be 1.62

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-2.74	2.48	-1.10	0.286
P	0.2474	0.0370	6.68	<.001
APP_N	0.0648	0.0135	4.79	<.001
K	0.01386	0.00763	1.82	0.088
rain4	-0.00299	0.00206	-1.45	0.165

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N, K, rain4, ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	207.29	41.459	16.17	<.001
Residual	15	38.47	2.565		
Total	20	245.76	12.288		
Change	-1	-3.31	3.313	1.29	0.274

Percentage variance accounted for 79.1

Standard error of observations is estimated to be 1.60

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-2.44	2.47	-0.98	0.340
P	0.2355	0.0382	6.17	<.001
APP_N	0.0611	0.0138	4.43	<.001
K	0.01205	0.00773	1.56	0.140
rain4	-0.00279	0.00205	-1.36	0.193
ETn4	0.287	0.253	1.14	0.274

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N, K, rain4, ETn4, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	214.95	35.826	16.28	<.001
Residual	14	30.81	2.201		
Total	20	245.76	12.288		
Change	-1	-7.66	7.662	3.48	0.083

Percentage variance accounted for 82.1

Standard error of observations is estimated to be 1.48

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	10.02	7.06	1.42	0.178
P	0.2788	0.0423	6.59	<.001
APP_N	0.0451	0.0154	2.92	0.011
K	0.01740	0.00771	2.26	0.041
rain4	-0.00358	0.00195	-1.84	0.087
ETn4	0.759	0.344	2.20	0.045
pH_H2O	-2.22	1.19	-1.87	0.083

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N, K, rain4, ETn4, pH_H2O,

Mg

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	221.87	31.696	17.25	<.001
Residual	13	23.89	1.838		
Total	20	245.76	12.288		
Change	-1	-6.92	6.917	3.76	0.074

Percentage variance accounted for 85.0

Standard error of observations is estimated to be 1.36

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	14.90	6.92	2.15	0.051
P	0.2370	0.0442	5.36	<.001
APP_N	0.0707	0.0193	3.66	0.003
K	0.01571	0.00710	2.21	0.046
rain4	-0.00197	0.00196	-1.01	0.333

ETn4	1.021	0.343	2.98	0.011
pH_H2O	-4.47	1.59	-2.81	0.015
Mg	0.0456	0.0235	1.94	0.074

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N, K, rain4, ETn4, pH_H2O,
Mg, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	228.65	28.582	20.05	<.001
Residual	12	17.11	1.426		
Total	20	245.76	12.288		
Change	-1	-6.78	6.782	4.76	0.050

Percentage variance accounted for 88.4

Standard error of observations is estimated to be 1.19

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	-7.9	12.1	-0.65	0.526

P	0.2184	0.0399	5.48	<.001
APP_N	0.1023	0.0224	4.58	<.001
K	0.01973	0.00652	3.02	0.011
rain4	-0.00286	0.00177	-1.61	0.133
ETn4	1.244	0.319	3.90	0.002
pH_H2O	-3.59	1.45	-2.47	0.030
Mg	0.0690	0.0233	2.96	0.012
WS3	4.96	2.27	2.18	0.050

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N, K, rain4, ETn4, pH_H2O, Mg, WS3, rad4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	233.09	25.899	22.49	<.001
Residual	11	12.67	1.152		
Total	20	245.76	12.288		
Change	-1	-4.44	4.441	3.86	0.075

Percentage variance accounted for 90.6

Standard error of observations is estimated to be 1.07

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	-14.7	11.4	-1.29	0.224
P	0.1527	0.0491	3.11	0.010
APP_N	0.1076	0.0203	5.31	<.001
K	0.01969	0.00586	3.36	0.006
rain4	-0.00277	0.00160	-1.73	0.111
ETn4	1.370	0.293	4.67	<.001
pH_H2O	-3.73	1.31	-2.85	0.016
Mg	0.0801	0.0217	3.69	0.004
WS3	4.77	2.04	2.33	0.040
rad4	0.393	0.200	1.96	0.075

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N, K, rain4, ETn4, pH_H2O,
Mg, WS3, rad4, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	238.822	23.8822	34.41	<.001
Residual	10	6.941	0.6941		
Total	20	245.763	12.2881		

Change	-1	-5.728	5.7280	8.25	0.017

Percentage variance accounted for 94.4

Standard error of observations is estimated to be 0.833

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	-21.43	9.17	-2.34	0.042
P	0.1422	0.0383	3.72	0.004
APP_N	0.1254	0.0169	7.42	<.001
K	0.02310	0.00470	4.91	<.001
rain4	-0.00202	0.00127	-1.60	0.142
ETn4	1.706	0.256	6.66	<.001
pH_H2O	-3.92	1.02	-3.85	0.003
Mg	0.0951	0.0176	5.39	<.001
WS3	5.17	1.59	3.25	0.009
rad4	0.510	0.161	3.18	0.010
frost4	1.628	0.567	2.87	0.017

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, APP_N, K, rain4, ETn4, pH_H2O,

Mg, WS3, rad4, frost4, RHn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	11	242.256	22.0233	56.52	<.001
Residual	9	3.507	0.3896		
Total	20	245.763	12.2881		
Change	-1	-3.434	3.4339	8.81	0.016

Percentage variance accounted for 96.8

Standard error of observations is estimated to be 0.624

*** Estimates of parameters ***

	estimate	s.e.	t(9)	t pr.
Constant	-30.60	7.53	-4.06	0.003
P	0.1166	0.0299	3.90	0.004
APP_N	0.1543	0.0160	9.65	<.001
K	0.02335	0.00352	6.63	<.001
rain4	-0.00054	0.00107	-0.50	0.628
ETn4	1.771	0.193	9.17	<.001
pH_H2O	-2.763	0.857	-3.22	0.010
Mg	0.0937	0.0132	7.08	<.001
WS3	6.79	1.31	5.17	<.001
rad4	0.617	0.126	4.92	<.001
frost4	2.185	0.464	4.71	0.001
RHn4	-0.1373	0.0463	-2.97	0.016

===== Cultivar 10 for Tftotal =====

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	65.5	65.531	11.52	0.003
Residual	19	108.1	5.691		
Total	20	173.7	8.683		
Change	-1	-65.5	65.531	11.52	0.003

Percentage variance accounted for 34.5

Standard error of observations is estimated to be 2.39

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	2.20	1.82	1.21	0.243
APP_N	0.0635	0.0187	3.39	0.003

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, Long

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	100.92	50.461	12.49	<.001
Residual	18	72.73	4.041		
Total	20	173.65	8.683		
Change	-1	-35.39	35.390	8.76	0.008

Percentage variance accounted for 53.5

Standard error of observations is estimated to be 2.01

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	51.5	16.7	3.08	0.006
APP_N	0.0624	0.0158	3.96	<.001
Long	-1.649	0.557	-2.96	0.008

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, Long, Eto4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	117.40	39.132	11.83	<.001
Residual	17	56.26	3.309		
Total	20	173.65	8.683		
Change	-1	-16.47	16.474	4.98	0.039

Percentage variance accounted for 61.9

Standard error of observations is estimated to be 1.82

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	32.5	17.4	1.87	0.079
APP_N	0.0851	0.0175	4.86	<.001
Long	-1.386	0.518	-2.68	0.016
Eto4	2.64	1.18	2.23	0.039

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, Long, Eto4, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	126.03	31.507	10.59	<.001
Residual	16	47.62	2.976		
Total	20	173.65	8.683		
Change	-1	-8.63	8.633	2.90	0.108

Percentage variance accounted for 65.7

Standard error of observations is estimated to be 1.73

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	26.4	16.9	1.56	0.138
APP_N	0.0943	0.0175	5.40	<.001
Long	-1.283	0.495	-2.59	0.020
Eto4	3.19	1.17	2.73	0.015
frost4	1.361	0.799	1.70	0.108

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, Long, Eto4, frost4, RHx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	133.56	26.712	9.99	<.001
Residual	15	40.09	2.673		
Total	20	173.65	8.683		
Change	-1	-7.53	7.534	2.82	0.114

Percentage variance accounted for 69.2

Standard error of observations is estimated to be 1.63

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	44.4	19.3	2.31	0.036
APP_N	0.1019	0.0172	5.94	<.001
Long	-1.165	0.474	-2.46	0.027
Eto4	2.73	1.14	2.39	0.031
frost4	1.534	0.764	2.01	0.063
RHx4	-0.235	0.140	-1.68	0.114

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, Long, Eto4, frost4, RHx4,

Resist

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	141.14	23.523	10.13	<.001
Residual	14	32.52	2.323		
Total	20	173.65	8.683		
Change	-1	-7.57	7.574	3.26	0.092

Percentage variance accounted for 73.3

Standard error of observations is estimated to be 1.52

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	69.0	22.5	3.06	0.008
APP_N	0.1024	0.0160	6.40	<.001
Long	-1.315	0.450	-2.92	0.011
Eto4	1.48	1.27	1.16	0.265
frost4	2.134	0.786	2.72	0.017
RHx4	-0.388	0.156	-2.49	0.026
Resist	-0.000959	0.000531	-1.81	0.092

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, Long, Eto4, frost4, RHx4,
Resist, Ca

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	145.27	20.753	9.51	<.001
Residual	13	28.38	2.183		
Total	20	173.65	8.683		
Change	-1	-4.13	4.134	1.89	0.192

Percentage variance accounted for 74.9

Standard error of observations is estimated to be 1.48

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	58.4	23.2	2.52	0.026
APP_N	0.0959	0.0162	5.91	<.001
Long	-0.846	0.554	-1.53	0.150
Eto4	2.13	1.32	1.62	0.130
frost4	1.471	0.902	1.63	0.127
RHx4	-0.410	0.152	-2.70	0.018
Resist	-0.001361	0.000592	-2.30	0.039

Ca	-0.00349	0.00254	-1.38	0.192

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, Long, Eto4, frost4, RHx4,
Resist, Ca, HU0_3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	157.53	19.691	14.66	<.001
Residual	12	16.12	1.343		
Total	20	173.65	8.683		
Change	-1	-12.26	12.261	9.13	0.011

Percentage variance accounted for 84.5

Standard error of observations is estimated to be 1.16

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	55.2	18.2	3.03	0.010
APP_N	0.0852	0.0132	6.45	<.001
Long	-1.136	0.445	-2.55	0.025

Eto4	2.06	1.04	1.99	0.070
frost4	1.577	0.708	2.23	0.046
RHx4	-0.358	0.120	-2.98	0.012
Resist	-0.001859	0.000493	-3.77	0.003
Ca	-0.00983	0.00289	-3.40	0.005
HU0_3	0.002585	0.000856	3.02	0.011

===== Cultivar 11 for Tftotal =====

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	154.2	154.221	28.56	<.001
Residual	19	102.6	5.400		
Total	20	256.8	12.841		
Change	-1	-154.2	154.221	28.56	<.001

Percentage variance accounted for 57.9

Standard error of observations is estimated to be 2.32

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	2.380	0.964	2.47	0.023
P	0.2496	0.0467	5.34	<.001

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, Tave3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	179.60	89.801	20.93	<.001
Residual	18	77.23	4.290		
Total	20	256.83	12.841		
Change	-1	-25.38	25.380	5.92	0.026

Percentage variance accounted for 66.6

Standard error of observations is estimated to be 2.07

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.

Constant	-5.60	3.39	-1.65	0.116
P	0.2057	0.0454	4.53	<.001
Tave3	0.414	0.170	2.43	0.026

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, Tave3, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	212.09	70.697	26.86	<.001
Residual	17	44.74	2.632		
Total	20	256.83	12.841		
Change	-1	-32.49	32.489	12.35	0.003

Percentage variance accounted for 79.5

Standard error of observations is estimated to be 1.62

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	3.30	3.67	0.90	0.381
P	0.2878	0.0425	6.77	<.001

Tave3	1.134	0.244	4.64	<.001
pH_H2O	-4.64	1.32	-3.51	0.003

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, Tave3, pH_H2O, Long

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	223.36	55.841	26.70	<.001
Residual	16	33.47	2.092		
Total	20	256.83	12.841		
Change	-1	-11.27	11.274	5.39	0.034

Percentage variance accounted for 83.7

Standard error of observations is estimated to be 1.45

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	54.4	22.3	2.44	0.026
P	0.1973	0.0544	3.63	0.002
Tave3	1.667	0.316	5.27	<.001

pH_H2O	-5.49	1.23	-4.45	<.001
Long	-1.879	0.809	-2.32	0.034

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, Tave3, pH_H2O, Long, ETx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	231.60	46.320	27.54	<.001
Residual	15	25.23	1.682		
Total	20	256.83	12.841		
Change	-1	-8.24	8.236	4.90	0.043

Percentage variance accounted for 86.9

Standard error of observations is estimated to be 1.30

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	51.6	20.0	2.58	0.021
P	0.1858	0.0490	3.79	0.002
Tave3	2.694	0.544	4.95	<.001

pH_H2O	-5.07	1.12	-4.53	<.001
Long	-1.734	0.729	-2.38	0.031
ETx4	-0.696	0.315	-2.21	0.043

===== Cultivar 12 for Tftotal =====

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	295.8	295.848	33.21	<.001
Residual	19	169.3	8.909		
Total	20	465.1	23.256		
Change	-1	-295.8	295.848	33.21	<.001

Percentage variance accounted for 61.7

Standard error of observations is estimated to be 2.98

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.

Constant	2.12	1.24	1.71	0.104
P	0.3456	0.0600	5.76	<.001

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, RC1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	354.6	177.300	28.87	<.001
Residual	18	110.5	6.140		
Total	20	465.1	23.256		
Change	-1	-58.8	58.751	9.57	0.006

Percentage variance accounted for 73.6

Standard error of observations is estimated to be 2.48

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	2.71	1.05	2.59	0.018
P	0.2738	0.0550	4.98	<.001
RC1	-0.002237	0.000723	-3.09	0.006

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, RC1, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	375.45	125.149	23.72	<.001
Residual	17	89.68	5.275		
Total	20	465.13	23.256		
Change	-1	-20.85	20.847	3.95	0.063

Percentage variance accounted for 77.3

Standard error of observations is estimated to be 2.30

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-11.06	6.99	-1.58	0.132
P	0.1727	0.0720	2.40	0.028
RC1	-0.003422	0.000897	-3.82	0.001
rad3	0.745	0.375	1.99	0.063

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, RC1, rad3, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	389.76	97.440	20.69	<.001
Residual	16	75.37	4.710		
Total	20	465.13	23.256		
Change	-1	-14.31	14.314	3.04	0.100

Percentage variance accounted for 79.7

Standard error of observations is estimated to be 2.17

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-38.6	17.1	-2.25	0.039
P	0.1819	0.0682	2.67	0.017
RC1	-0.00674	0.00208	-3.24	0.005
rad3	0.965	0.376	2.57	0.021
WS3	8.39	4.81	1.74	0.100

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, RC1, rad3, WS3, DL4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	421.84	84.368	29.23	<.001
Residual	15	43.29	2.886		
Total	20	465.13	23.256		
Change	-1	-32.08	32.078	11.11	0.005

Percentage variance accounted for 87.6

Standard error of observations is estimated to be 1.70

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-3976.	1181.	-3.37	0.004
P	0.2151	0.0543	3.96	0.001
RC1	-0.01066	0.00201	-5.30	<.001
rad3	0.950	0.294	3.23	0.006
WS3	16.65	4.51	3.69	0.002
DL4	326.2	97.8	3.33	0.005

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, RC1, rad3, WS3, DL4, Tn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	434.97	72.494	33.65	<.001
Residual	14	30.16	2.154		
Total	20	465.13	23.256		
Change	-1	-13.13	13.129	6.09	0.027

Percentage variance accounted for 90.7

Standard error of observations is estimated to be 1.47

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	-4006.	1021.	-3.93	0.002
P	0.2381	0.0478	4.98	<.001
RC1	-0.00613	0.00253	-2.43	0.029
rad3	1.213	0.276	4.40	<.001
WS3	20.28	4.16	4.87	<.001

DL4	324.8	84.5	3.84	0.002
Tn4	2.414	0.978	2.47	0.027

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, RC1, rad3, WS3, DL4, Tn4, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	447.22	63.889	46.39	<.001
Residual	13	17.90	1.377		
Total	20	465.13	23.256		
Change	-1	-12.26	12.257	8.90	0.011

Percentage variance accounted for 94.1

Standard error of observations is estimated to be 1.17

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-3371.	843.	-4.00	0.002
P	0.2923	0.0423	6.90	<.001
RC1	-0.00471	0.00207	-2.27	0.041

rad3	1.280	0.222	5.78	<.001
WS3	19.07	3.35	5.69	<.001
DL4	272.2	69.8	3.90	0.002
Tn4	3.388	0.847	4.00	0.002
pH_H2O	-2.968	0.995	-2.98	0.011

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, RC1, rad3, WS3, DL4, Tn4, pH_H2O,
DL3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	454.95	56.8694	67.08	<.001
Residual	12	10.17	0.8477		
Total	20	465.13	23.2564		
Change	-1	-7.73	7.7317	9.12	0.011

Percentage variance accounted for 96.4

Standard error of observations is estimated to be 0.921

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	-1471.	913.	-1.61	0.133
P	0.2231	0.0403	5.53	<.001
RC1	-0.00269	0.00176	-1.53	0.153
rad3	1.238	0.174	7.10	<.001
WS3	18.44	2.64	6.99	<.001
DL4	287.5	55.0	5.22	<.001
Tn4	3.182	0.668	4.76	<.001
pH_H2O	-5.37	1.11	-4.82	<.001
DL3	-164.1	54.3	-3.02	0.011

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, RC1, rad3, WS3, DL4, Tn4, pH_H2O,
DL3, ETx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	460.466	51.1629	120.73	<.001
Residual	11	4.662	0.4238		
Total	20	465.128	23.2564		
Change	-1	-5.511	5.5114	13.01	0.004

Percentage variance accounted for 98.2

Standard error of observations is estimated to be 0.651

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	-360.	715.	-0.50	0.625
P	0.1917	0.0298	6.43	<.001
RC1	-0.00075	0.00136	-0.55	0.593
rad3	1.227	0.123	9.95	<.001
WS3	14.71	2.13	6.89	<.001
DL4	240.3	41.0	5.85	<.001
Tn4	4.206	0.551	7.63	<.001
pH_H2O	-5.727	0.794	-7.21	<.001
DL3	-205.9	40.1	-5.13	<.001
ETx4	-0.530	0.147	-3.61	0.004

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P, RC1, rad3, WS3, DL4, Tn4, pH_H2O,

DL3, ETx4, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	462.017	46.2017	148.52	<.001

Residual	10	3.111	0.3111		
Total	20	465.128	23.2564		
Change	-1	-1.551	1.5507	4.98	0.050

Percentage variance accounted for 98.7

Standard error of observations is estimated to be 0.558

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	-94.	624.	-0.15	0.884
P	0.1894	0.0256	7.41	<.001
RC1	-0.00025	0.00118	-0.21	0.834
rad3	1.166	0.109	10.68	<.001
WS3	15.48	1.86	8.31	<.001
DL4	235.9	35.2	6.70	<.001
Tn4	4.022	0.479	8.39	<.001
pH_H2O	-5.220	0.717	-7.28	<.001
DL3	-223.3	35.3	-6.33	<.001
ETx4	-0.440	0.132	-3.32	0.008
APP_N	0.01487	0.00666	2.23	0.050

===== Area 1 for Tftotal =====

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	110.4	110.381	25.40	<.001
Residual	74	321.5	4.345		
Total	75	431.9	5.759		
Change	-1	-110.4	110.381	25.40	<.001

Percentage variance accounted for 24.6

Standard error of observations is estimated to be 2.08

*** Estimates of parameters ***

	estimate	s.e.	t(74)	t pr.
Constant	2.387	0.857	2.78	0.007
APP_N	0.04665	0.00926	5.04	<.001

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, Tx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	168.0	83.993	23.23	<.001
Residual	73	263.9	3.615		
Total	75	431.9	5.759		
Change	-1	-57.6	57.605	15.93	<.001

Percentage variance accounted for 37.2

Standard error of observations is estimated to be 1.90

*** Estimates of parameters ***

	estimate	s.e.	t(73)	t pr.
Constant	-48.5	12.8	-3.80	<.001
APP_N	0.05428	0.00866	6.27	<.001
Tx4	1.722	0.431	3.99	<.001

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, Tx4, rain4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	185.4	61.795	18.05	<.001
Residual	72	246.5	3.424		
Total	75	431.9	5.759		
Change	-1	-17.4	17.399	5.08	0.027

Percentage variance accounted for 40.5

Standard error of observations is estimated to be 1.85

*** Estimates of parameters ***

	estimate	s.e.	t(72)	t pr.
Constant	-84.9	20.4	-4.16	<.001
APP_N	0.05761	0.00855	6.74	<.001
Tx4	2.880	0.663	4.34	<.001
rain4	0.00393	0.00174	2.25	0.027

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, Tx4, rain4, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	193.8	48.438	14.44	<.001
Residual	71	238.2	3.354		
Total	75	431.9	5.759		
Change	-1	-8.4	8.367	2.49	0.119

Percentage variance accounted for 41.8

Standard error of observations is estimated to be 1.83

*** Estimates of parameters ***

	estimate	s.e.	t(71)	t pr.
Constant	-89.0	20.3	-4.37	<.001
APP_N	0.06080	0.00870	6.99	<.001
Tx4	2.971	0.659	4.51	<.001
rain4	0.00435	0.00175	2.49	0.015
K	0.00569	0.00360	1.58	0.119

===== Area 2 for Tftotal =====

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	367.3	367.343	36.99	<.001
Residual	75	744.9	9.932		
Total	76	1112.2	14.634		
Change	-1	-367.3	367.343	36.99	<.001

Percentage variance accounted for 32.1

Standard error of observations is estimated to be 3.15

*** Estimates of parameters ***

	estimate	s.e.	t(75)	t pr.
Constant	1.25	1.28	0.98	0.332
APP_N	0.0844	0.0139	6.08	<.001

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.

Regression	2	644.7	322.337	51.02	<.001
Residual	74	467.5	6.318		
Total	76	1112.2	14.634		
Change	-1	-277.3	277.330	43.89	<.001

Percentage variance accounted for 56.8

Standard error of observations is estimated to be 2.51

*** Estimates of parameters ***

	estimate	s.e.	t(74)	t pr.
Constant	-8.80	1.83	-4.81	<.001
APP_N	0.0985	0.0113	8.74	<.001
P	0.2944	0.0444	6.63	<.001

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, Resist

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	705.5	235.173	42.21	<.001
Residual	73	406.7	5.571		

Total	76	1112.2	14.634		
Change	-1	-60.8	60.845	10.92	0.001

Percentage variance accounted for 61.9

Standard error of observations is estimated to be 2.36

*** Estimates of parameters ***

	estimate	s.e.	t(73)	t pr.
Constant	-3.60	2.33	-1.55	0.126
APP_N	0.0857	0.0113	7.60	<.001
P	0.2829	0.0419	6.76	<.001
Resist	-0.001533	0.000464	-3.30	0.001

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, P, Resist, Tx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	725.2	181.300	33.73	<.001
Residual	72	387.0	5.375		
Total	76	1112.2	14.634		

Change	-1	-19.7	19.681	3.66	0.060

Percentage variance accounted for 63.3

Standard error of observations is estimated to be 2.32

*** Estimates of parameters ***

	estimate	s.e.	t(72)	t pr.
Constant	-55.5	27.2	-2.04	0.045
APP_N	0.0449	0.0240	1.87	0.065
P	0.1494	0.0810	1.84	0.069
Resist	-0.00350	0.00113	-3.11	0.003
Tx4	2.49	1.30	1.91	0.060

===== Area 3 for Tftotal =====

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	164.0	164.018	19.56	<.001

Residual	73	612.2	8.387		
Total	74	776.2	10.490		
Change	-1	-164.0	164.018	19.56	<.001

Percentage variance accounted for 20.0

Standard error of observations is estimated to be 2.90

*** Estimates of parameters ***

	estimate	s.e.	t(73)	t pr.
Constant	-0.23	1.27	-0.18	0.858
APP_N	0.0519	0.0117	4.42	<.001

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, APP_N, rain4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	179.7	89.827	10.84	<.001
Residual	72	596.6	8.286		
Total	74	776.2	10.490		

Change	-1	-15.6	15.637	1.89	0.174

Percentage variance accounted for 21.0

Standard error of observations is estimated to be 2.88

*** Estimates of parameters ***

	estimate	s.e.	t(72)	t pr.
Constant	2.35	2.26	1.04	0.302
APP_N	0.0551	0.0119	4.63	<.001
rain4	-0.00331	0.00241	-1.37	0.174

===== Year 1 for Tftotal =====

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, rain3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	82.9	82.86	8.11	0.008
Residual	30	306.4	10.21		
Total	31	389.3	12.56		

Change	-1	-82.9	82.86	8.11	0.008

Percentage variance accounted for 18.7

Standard error of observations is estimated to be 3.20

*** Estimates of parameters ***

	estimate	s.e.	t(30)	t pr.
Constant	10.77	2.25	4.79	<.001
rain3	-0.01255	0.00441	-2.85	0.008

===== Year 2 for Tftotal =====

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, IC1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	17.12	17.122	13.82	<.001
Residual	29	35.92	1.239		
Total	30	53.04	1.768		

Change	-1	-17.12	17.122	13.82	<.001

Percentage variance accounted for 29.9

Standard error of observations is estimated to be 1.11

*** Estimates of parameters ***

	estimate	s.e.	t(29)	t pr.
Constant	5.558	0.471	11.80	<.001
IC1	-0.002003	0.000539	-3.72	<.001

===== Year 3 for Tftotal =====

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	96.7	96.713	15.87	<.001
Residual	31	188.9	6.095		
Total	32	285.7	8.927		

Change	-1	-96.7	96.713	15.87	<.001

Percentage variance accounted for 31.7

Standard error of observations is estimated to be 2.47

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	4.744	0.851	5.57	<.001
P	0.2190	0.0550	3.98	<.001

===== Year 4 for Tftotal =====

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, RHx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	153.6	153.623	26.50	<.001
Residual	31	179.7	5.797		
Total	32	333.3	10.417		
Change	-1	-153.6	153.623	26.50	<.001

Percentage variance accounted for 44.3

Standard error of observations is estimated to be 2.41

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	141.4	25.7	5.51	<.001
RHx4	-1.508	0.293	-5.15	<.001

===== Year 5 for Tftotal =====

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	76.4	76.397	15.46	<.001
Residual	31	153.2	4.941		
Total	32	229.6	7.174		
Change	-1	-76.4	76.397	15.46	<.001

Percentage variance accounted for 31.1

Standard error of observations is estimated to be 2.22

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	4.664	0.847	5.51	<.001
P	0.1521	0.0387	3.93	<.001

===== Year 6 for Tftotal =====

479.....

***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, RHx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	345.7	345.670	52.94	<.001
Residual	31	202.4	6.529		
Total	32	548.1	17.127		
Change	-1	-345.7	345.670	52.94	<.001

Percentage variance accounted for 61.9

Standard error of observations is estimated to be 2.56

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	231.9	30.7	7.56	<.001
RHx4	-2.486	0.342	-7.28	<.001

===== Year 7 for Tftotal =====

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***** Regression Analysis *****

Response variate: Tftotal

Fitted terms: Constant, HU15_2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	14.7	14.698	2.96	0.095
Residual	31	153.8	4.962		
Total	32	168.5	5.266		
Change	-1	-14.7	14.698	2.96	0.095

Percentage variance accounted for 5.8

Standard error of observations is estimated to be 2.23

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	6.765	0.684	9.88	<.001
HU15_2	-0.00357	0.00207	-1.72	0.095

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Appendix 3.9.4 Regression analysis on the number of fruit left after thinning for cultivars combined, individual cultivars, production year and areas

JPfnoatFS.out

file is JPfyieldFS.gen

========== CACTUS PEAR ENVIRONMENTAL ADAPTIBILITY: FRUIT YIELD

===== FS regression model on all data for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	361.	360.809	38.84	<.001
Residual	226	2099.	9.289		
Total	227	2460.	10.838		
Change	-1	-361.	360.809	38.84	<.001

Percentage variance accounted for 14.3

Standard error of observations is estimated to be 3.05

*** Estimates of parameters ***

	estimate	s.e.	t(226)	t pr.
Constant	3.165	0.386	8.20	<.001
P	0.1159	0.0186	6.23	<.001

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, P, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	542.	270.792	31.76	<.001
Residual	225	1919.	8.527		
Total	227	2460.	10.838		
Change	-1	-181.	180.776	21.20	<.001

Percentage variance accounted for 21.3

Standard error of observations is estimated to be 2.92

*** Estimates of parameters ***

	estimate	s.e.	t(225)	t pr.

Constant	-0.241	0.827	-0.29	0.771
P	0.1339	0.0182	7.34	<.001
APP_N	0.03293	0.00715	4.60	<.001

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, P, APP_N, rain4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	567.	188.929	22.35	<.001
Residual	224	1893.	8.453		
Total	227	2460.	10.838		
Change	-1	-25.	25.203	2.98	0.086

Percentage variance accounted for 22.0

Standard error of observations is estimated to be 2.91

*** Estimates of parameters ***

	estimate	s.e.	t(224)	t pr.
Constant	1.02	1.10	0.93	0.356
P	0.1199	0.0199	6.03	<.001

APP_N 0.03606 0.00735 4.91 <.001

rain4 -0.00189 0.00110 -1.73 0.086

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, P, APP_N, rain4, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	578.	144.552	17.13	<.001
Residual	223	1882.	8.439		
Total	227	2460.	10.838		
Change	-1	-11.	11.422	1.35	0.246

Percentage variance accounted for 22.1

Standard error of observations is estimated to be 2.91

*** Estimates of parameters ***

	estimate	s.e.	t(223)	t pr.
Constant	0.08	1.36	0.06	0.951
P	0.1242	0.0202	6.15	<.001
APP_N	0.03760	0.00746	5.04	<.001

rain4 -0.00159 0.00113 -1.41 0.160

K 0.00482 0.00415 1.16 0.246

===== Cultivar 1 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	33.14	33.136	22.39	<.001
Residual	19	28.11	1.480		
Total	20	61.25	3.062		
Change	-1	-33.14	33.136	22.39	<.001

Percentage variance accounted for 51.7

Standard error of observations is estimated to be 1.22

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	0.539	0.505	1.07	0.299

P 0.1157 0.0244 4.73 <.001

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, P, DL4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	45.49	22.7473	25.99	<.001
Residual	18	15.76	0.8753		
Total	20	61.25	3.0625		
Change	-1	-12.36	12.3592	14.12	0.001

Percentage variance accounted for 71.4

Standard error of observations is estimated to be 0.936

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-1774.	472.	-3.76	0.001
P	0.1273	0.0191	6.68	<.001
DL4	147.8	39.3	3.76	0.001

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, P, DL4, ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	48.92	16.3056	22.48	<.001
Residual	17	12.33	0.7255		
Total	20	61.25	3.0625		
Change	-1	-3.42	3.4220	4.72	0.044

Percentage variance accounted for 76.3

Standard error of observations is estimated to be 0.852

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-2336.	502.	-4.66	<.001
P	0.1181	0.0179	6.61	<.001
DL4	194.7	41.8	4.66	<.001
ETn4	0.325	0.150	2.17	0.044

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, P, DL4, ETn4, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	52.594	13.1484	24.30	<.001
Residual	16	8.656	0.5410		
Total	20	61.250	3.0625		
Change	-1	-3.677	3.6769	6.80	0.019

Percentage variance accounted for 82.3

Standard error of observations is estimated to be 0.736

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-2011.	451.	-4.46	<.001
P	0.0896	0.0189	4.74	<.001
DL4	167.2	37.6	4.44	<.001
ETn4	0.414	0.134	3.10	0.007
rad3	0.269	0.103	2.61	0.019

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, P, DL4, ETn4, rad3, Tn1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	53.483	10.6966	20.66	<.001
Residual	15	7.767	0.5178		
Total	20	61.250	3.0625		
Change	-1	-0.889	0.8892	1.72	0.210

Percentage variance accounted for 83.1

Standard error of observations is estimated to be 0.720

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-1972.	442.	-4.46	<.001
P	0.0779	0.0205	3.79	0.002
DL4	163.5	36.9	4.43	<.001
ETn4	0.210	0.204	1.03	0.319
rad3	0.367	0.126	2.92	0.011
Tn1	0.349	0.266	1.31	0.210

===== Cultivar 2 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	4.98	4.9777	6.59	0.019
Residual	19	14.35	0.7551		
Total	20	19.32	0.9662		
Change	-1	-4.98	4.9777	6.59	0.019

Percentage variance accounted for 21.9

Standard error of observations is estimated to be 0.869

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-154.8	61.3	-2.53	0.021
DL2	14.41	5.61	2.57	0.019

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL2, Mg

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	11.623	5.8117	13.58	<.001
Residual	18	7.701	0.4278		
Total	20	19.324	0.9662		
Change	-1	-6.646	6.6456	15.53	<.001

Percentage variance accounted for 55.7

Standard error of observations is estimated to be 0.654

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-402.3	77.9	-5.16	<.001
DL2	37.26	7.17	5.19	<.001
Mg	-0.01956	0.00496	-3.94	<.001

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL2, Mg, C1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	13.263	4.4209	12.40	<.001
Residual	17	6.062	0.3566		
Total	20	19.324	0.9662		
Change	-1	-1.639	1.6393	4.60	0.047

Percentage variance accounted for 63.1

Standard error of observations is estimated to be 0.597

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-711.	160.	-4.43	<.001
DL2	65.4	14.7	4.46	<.001
Mg	-0.02275	0.00477	-4.77	<.001
C1	0.002128	0.000993	2.14	0.047

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL2, Mg, C1, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	14.051	3.5128	10.66	<.001
Residual	16	5.273	0.3296		
Total	20	19.324	0.9662		
Change	-1	-0.788	0.7885	2.39	0.141

Percentage variance accounted for 65.9

Standard error of observations is estimated to be 0.574

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-783.	161.	-4.86	<.001
DL2	72.5	14.8	4.89	<.001
Mg	-0.01867	0.00529	-3.53	0.003
C1	0.001794	0.000978	1.83	0.085
pH_H2O	-0.935	0.604	-1.55	0.141

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL2, Mg, C1, pH_H2O, DL3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	15.126	3.0251	10.81	<.001
Residual	15	4.199	0.2799		
Total	20	19.324	0.9662		
Change	-1	-1.075	1.0745	3.84	0.069

Percentage variance accounted for 71.0

Standard error of observations is estimated to be 0.529

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-145.	358.	-0.41	0.691
DL2	69.4	13.8	5.04	<.001
Mg	-0.02130	0.00506	-4.21	<.001
C1	0.00303	0.00110	2.75	0.015
pH_H2O	-1.545	0.638	-2.42	0.029
DL3	-47.7	24.4	-1.96	0.069

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL2, Mg, C1, pH_H2O, DL3, rain2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	16.097	2.6828	11.64	<.001
Residual	14	3.228	0.2306		
Total	20	19.324	0.9662		
Change	-1	-0.971	0.9709	4.21	0.059

Percentage variance accounted for 76.1

Standard error of observations is estimated to be 0.480

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	403.	420.	0.96	0.354
DL2	54.9	14.4	3.82	0.002
Mg	-0.01830	0.00482	-3.80	0.002
C1	0.00341	0.00102	3.36	0.005
pH_H2O	-1.563	0.579	-2.70	0.017
DL3	-78.8	26.8	-2.94	0.011
rain2	0.00646	0.00315	2.05	0.059

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL2, Mg, C1, pH_H2O, DL3, rain2,

frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	17.312	2.4731	15.97	<.001
Residual	13	2.013	0.1548		
Total	20	19.324	0.9662		
Change	-1	-1.215	1.2151	7.85	0.015

Percentage variance accounted for 84.0

Standard error of observations is estimated to be 0.393

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	619.	353.	1.75	0.103
DL2	50.4	11.9	4.25	<.001
Mg	-0.02049	0.00402	-5.09	<.001
C1	0.003134	0.000839	3.74	0.002
pH_H2O	-1.464	0.476	-3.08	0.009
DL3	-92.2	22.5	-4.10	0.001

rain2 0.00836 0.00267 3.13 0.008

frost4 0.655 0.234 2.80 0.015

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL2, Mg, C1, pH_H2O, DL3, rain2,

frost4, DL4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	18.033	2.2542	20.95	<.001
Residual	12	1.291	0.1076		
Total	20	19.324	0.9662		
Change	-1	-0.722	0.7216	6.71	0.024

Percentage variance accounted for 88.9

Standard error of observations is estimated to be 0.328

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	1058.	340.	3.11	0.009
DL2	65.0	11.4	5.71	<.001

Mg	-0.01732	0.00357	-4.85	<.001
C1	0.003439	0.000709	4.85	<.001
pH_H2O	-1.807	0.418	-4.32	<.001
DL3	-78.1	19.5	-4.01	0.002
rain2	0.01130	0.00250	4.53	<.001
frost4	0.726	0.197	3.69	0.003
DL4	-64.4	24.9	-2.59	0.024

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL2, Mg, C1, pH_H2O, DL3, rain2,
frost4, DL4, RHn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	18.3521	2.03912	23.07	<.001
Residual	11	0.9724	0.08840		
Total	20	19.3245	0.96622		
Change	-1	-0.3188	0.31882	3.61	0.084

Percentage variance accounted for 90.9

Standard error of observations is estimated to be 0.297

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	1147.	311.	3.68	0.004
DL2	60.3	10.6	5.69	<.001
Mg	-0.00827	0.00576	-1.44	0.179
C1	0.002669	0.000760	3.51	0.005
pH_H2O	-2.149	0.420	-5.12	<.001
DL3	-69.6	18.2	-3.82	0.003
rain2	0.01093	0.00227	4.81	<.001
frost4	0.712	0.179	3.99	0.002
DL4	-76.5	23.4	-3.27	0.008
RHn4	0.0394	0.0207	1.90	0.084

===== Cultivar 3 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, rad4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	19.84	19.835	10.82	0.004
Residual	18	32.99	1.833		
Total	19	52.82	2.780		

Change	-1	-19.84	19.835	10.82	0.004

Percentage variance accounted for 34.1

Standard error of observations is estimated to be 1.35

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-7.96	3.23	-2.46	0.024
rad4	0.562	0.171	3.29	0.004

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, rad4, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	29.61	14.806	10.84	<.001
Residual	17	23.21	1.365		
Total	19	52.82	2.780		

Change	-1	-9.78	9.776	7.16	0.016

Percentage variance accounted for 50.9

Standard error of observations is estimated to be 1.17

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-10.50	2.95	-3.56	0.002
rad4	0.568	0.147	3.85	0.001
APP_N	0.02545	0.00951	2.68	0.016

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, rad4, APP_N, Mg

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	37.80	12.6008	13.42	<.001
Residual	16	15.02	0.9388		
Total	19	52.82	2.7801		
Change	-1	-8.19	8.1908	8.72	0.009

Percentage variance accounted for 66.2

Standard error of observations is estimated to be 0.969

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-13.96	2.71	-5.15	<.001
rad4	0.549	0.122	4.49	<.001
APP_N	0.0471	0.0108	4.37	<.001
Mg	0.01768	0.00598	2.95	0.009

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, rad4, APP_N, Mg, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	39.99	9.9973	11.69	<.001
Residual	15	12.83	0.8556		
Total	19	52.82	2.7801		
Change	-1	-2.19	2.1870	2.56	0.131

Percentage variance accounted for 69.2

Standard error of observations is estimated to be 0.925

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-16.17	2.93	-5.51	<.001
rad4	0.566	0.117	4.83	<.001
APP_N	0.0585	0.0125	4.68	<.001
Mg	0.02421	0.00703	3.45	0.004
frost4	0.821	0.513	1.60	0.131

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, rad4, APP_N, Mg, frost4, ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	42.51	8.5011	11.54	<.001
Residual	14	10.32	0.7369		
Total	19	52.82	2.7801		
Change	-1	-2.52	2.5160	3.41	0.086

Percentage variance accounted for 73.5

Standard error of observations is estimated to be 0.858

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	-16.59	2.73	-6.08	<.001
rad4	0.621	0.113	5.50	<.001
APP_N	0.0515	0.0122	4.22	<.001
Mg	0.02034	0.00685	2.97	0.010
frost4	1.318	0.547	2.41	0.030
ETn4	0.356	0.193	1.85	0.086

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, rad4, APP_N, Mg, frost4, ETn4, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	46.874	7.8124	17.07	<.001
Residual	13	5.948	0.4576		
Total	19	52.823	2.7801		
Change	-1	-4.369	4.3690	9.55	0.009

Percentage variance accounted for 83.5

Standard error of observations is estimated to be 0.676

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-6.84	3.82	-1.79	0.097
rad4	0.6158	0.0889	6.92	<.001
APP_N	0.05901	0.00991	5.96	<.001
Mg	0.04581	0.00985	4.65	<.001
frost4	1.315	0.431	3.05	0.009
ETn4	0.714	0.191	3.74	0.002
pH_H2O	-2.422	0.784	-3.09	0.009

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, rad4, APP_N, Mg, frost4, ETn4, pH_H2O,
Ca

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	49.459	7.0656	25.21	<.001
Residual	12	3.363	0.2803		
Total	19	52.823	2.7801		
Change	-1	-2.585	2.5850	9.22	0.010

Percentage variance accounted for 89.9

Standard error of observations is estimated to be 0.529

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	-5.21	3.04	-1.71	0.112
rad4	0.5283	0.0753	7.01	<.001
APP_N	0.06242	0.00784	7.97	<.001
Mg	0.06046	0.00910	6.65	<.001
frost4	1.199	0.340	3.53	0.004
ETn4	0.926	0.165	5.61	<.001
pH_H2O	-2.458	0.613	-4.01	0.002
Ca	-0.00322	0.00106	-3.04	0.010

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, rad4, APP_N, Mg, frost4, ETn4, pH_H2O,

Ca, Tn1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	49.780	6.2225	22.50	<.001

Residual	11	3.043	0.2766		
Total	19	52.823	2.7801		
Change	-1	-0.321	0.3206	1.16	0.305

Percentage variance accounted for 90.1

Standard error of observations is estimated to be 0.526

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	-7.06	3.47	-2.03	0.067
rad4	0.5957	0.0976	6.10	<.001
APP_N	0.05670	0.00943	6.01	<.001
Mg	0.05852	0.00922	6.35	<.001
frost4	1.190	0.338	3.53	0.005
ETn4	0.842	0.182	4.63	<.001
pH_H2O	-2.644	0.633	-4.17	0.002
Ca	-0.00346	0.00108	-3.21	0.008
Tn1	0.304	0.282	1.08	0.305

===== Cultivar 4 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	100.14	100.141	19.37	<.001
Residual	19	98.22	5.170		
Total	20	198.36	9.918		
Change	-1	-100.14	100.141	19.37	<.001

Percentage variance accounted for 47.9

Standard error of observations is estimated to be 2.27

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-1.15	1.74	-0.66	0.516
APP_N	0.0785	0.0178	4.40	<.001

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, Rad2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	135.54	67.771	19.42	<.001
Residual	18	62.82	3.490		
Total	20	198.36	9.918		
Change	-1	-35.40	35.401	10.14	0.005

Percentage variance accounted for 64.8

Standard error of observations is estimated to be 1.87

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-14.41	4.40	-3.27	0.004
APP_N	0.0793	0.0147	5.42	<.001
Rad2	0.826	0.259	3.18	0.005

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, Rad2, rain2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.

Regression	3	144.28	48.092	15.12	<.001
Residual	17	54.09	3.182		
Total	20	198.36	9.918		
Change	-1	-8.73	8.734	2.75	0.116

Percentage variance accounted for 67.9

Standard error of observations is estimated to be 1.78

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-15.06	4.22	-3.57	0.002
APP_N	0.0931	0.0163	5.72	<.001
Rad2	0.842	0.248	3.40	0.003
rain2	-0.01368	0.00825	-1.66	0.116

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, Rad2, rain2, ETx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	162.93	40.731	18.39	<.001

Residual	16	35.44	2.215		
Total	20	198.36	9.918		
Change	-1	-18.65	18.649	8.42	0.010

Percentage variance accounted for 77.7

Standard error of observations is estimated to be 1.49

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-3.98	5.20	-0.77	0.454
APP_N	0.0935	0.0136	6.89	<.001
Rad2	0.712	0.212	3.36	0.004
rain2	-0.02279	0.00757	-3.01	0.008
ETx4	-0.2323	0.0801	-2.90	0.010

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, Rad2, rain2, ETx4, HU0_2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	177.65	35.530	25.73	<.001

Residual	15	20.72	1.381		
Total	20	198.36	9.918		
Change	-1	-14.72	14.723	10.66	0.005

Percentage variance accounted for 86.1

Standard error of observations is estimated to be 1.18

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-0.52	4.24	-0.12	0.904
APP_N	0.0803	0.0115	7.01	<.001
Rad2	0.679	0.167	4.06	0.001
rain2	-0.01555	0.00638	-2.44	0.028
ETx4	-0.761	0.174	-4.38	<.001
HU0_2	0.00695	0.00213	3.27	0.005

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, Rad2, rain2, ETx4, HU0_2,

RHx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	184.99	30.8316	32.27	<.001
Residual	14	13.37	0.9553		
Total	20	198.36	9.9182		
Change	-1	-7.34	7.3409	7.68	0.015

Percentage variance accounted for 90.4

Standard error of observations is estimated to be 0.977

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	20.65	8.41	2.45	0.028
APP_N	0.08475	0.00966	8.77	<.001
Rad2	0.644	0.140	4.61	<.001
rain2	-0.01003	0.00566	-1.77	0.099
ETx4	-0.817	0.146	-5.59	<.001
HU0_2	0.00755	0.00178	4.23	<.001
RHx4	-0.2368	0.0854	-2.77	0.015

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, Rad2, rain2, ETx4, HU0_2,

RHx4, WS4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	191.557	27.3653	52.26	<.001
Residual	13	6.807	0.5236		
Total	20	198.364	9.9182		
Change	-1	-6.567	6.5674	12.54	0.004

Percentage variance accounted for 94.7

Standard error of observations is estimated to be 0.724

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	53.8	11.2	4.79	<.001
APP_N	0.09605	0.00783	12.26	<.001
Rad2	0.456	0.116	3.92	0.002
rain2	-0.01605	0.00453	-3.55	0.004
ETx4	-0.981	0.118	-8.34	<.001
HU0_2	0.00492	0.00151	3.25	0.006
RHx4	-0.3197	0.0674	-4.74	<.001
WS4	-4.66	1.32	-3.54	0.004

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, Rad2, rain2, ETx4, HU0_2,
RHx4, WS4, HU15_2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	192.788	24.0985	51.86	<.001
Residual	12	5.576	0.4647		
Total	20	198.364	9.9182		
Change	-1	-1.231	1.2308	2.65	0.130

Percentage variance accounted for 95.3

Standard error of observations is estimated to be 0.682

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	66.2	13.0	5.07	<.001
APP_N	0.09796	0.00747	13.11	<.001
Rad2	0.560	0.127	4.41	<.001
rain2	-0.01415	0.00442	-3.20	0.008
ETx4	-0.981	0.111	-8.86	<.001
HU0_2	-0.00012	0.00341	-0.04	0.972
RHx4	-0.3481	0.0659	-5.28	<.001
WS4	-5.53	1.35	-4.10	0.001
HU15_2	0.00787	0.00484	1.63	0.130

===== Cultivar 5 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	129.63	129.629	37.27	<.001
Residual	19	66.09	3.478		
Total	20	195.72	9.786		
Change	-1	-129.63	129.629	37.27	<.001

Percentage variance accounted for 64.5

Standard error of observations is estimated to be 1.86

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-845.	140.	-6.06	<.001
DL1	76.6	12.5	6.10	<.001

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL1, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	154.33	77.167	33.57	<.001
Residual	18	41.38	2.299		
Total	20	195.72	9.786		
Change	-1	-24.71	24.705	10.75	0.004

Percentage variance accounted for 76.5

Standard error of observations is estimated to be 1.52

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-1806.	314.	-5.75	<.001
DL1	165.4	29.0	5.71	<.001
pH_H2O	-5.01	1.53	-3.28	0.004

===== Cultivar 6 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	44.94	44.937	9.98	0.005
Residual	19	85.57	4.504		
Total	20	130.51	6.525		
Change	-1	-44.94	44.937	9.98	0.005

Percentage variance accounted for 31.0

Standard error of observations is estimated to be 2.12

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	2.03	1.62	1.25	0.225
APP_N	0.0526	0.0166	3.16	0.005

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, Long

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	66.60	33.299	9.38	0.002
Residual	18	63.91	3.550		
Total	20	130.51	6.525		
Change	-1	-21.66	21.662	6.10	0.024

Percentage variance accounted for 45.6

Standard error of observations is estimated to be 1.88

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	40.6	15.7	2.59	0.019
APP_N	0.0517	0.0148	3.50	0.003
Long	-1.290	0.522	-2.47	0.024

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, Long, RHx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	80.48	26.826	9.12	<.001
Residual	17	50.03	2.943		
Total	20	130.51	6.525		
Change	-1	-13.88	13.879	4.72	0.044

Percentage variance accounted for 54.9

Standard error of observations is estimated to be 1.72

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	59.9	16.8	3.56	0.002
APP_N	0.0659	0.0149	4.41	<.001
Long	-1.086	0.485	-2.24	0.039
RHx4	-0.303	0.139	-2.17	0.044

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, Long, RHx4, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	96.08	24.020	11.16	<.001
Residual	16	34.43	2.152		
Total	20	130.51	6.525		
Change	-1	-15.60	15.601	7.25	0.016

Percentage variance accounted for 67.0

Standard error of observations is estimated to be 1.47

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	68.5	14.7	4.65	<.001
APP_N	0.0539	0.0135	3.98	0.001
Long	-0.896	0.420	-2.13	0.049
RHx4	-0.354	0.121	-2.93	0.010
pH_H2O	-1.575	0.585	-2.69	0.016

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, Long, RHx4, pH_H2O, Resist

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	115.23	23.047	22.64	<.001
Residual	15	15.27	1.018		
Total	20	130.51	6.525		
Change	-1	-19.16	19.156	18.82	<.001

Percentage variance accounted for 84.4

Standard error of observations is estimated to be 1.01

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	89.6	11.2	7.97	<.001
APP_N	0.05536	0.00931	5.94	<.001
Long	-0.911	0.289	-3.15	0.007
RHx4	-0.4976	0.0894	-5.57	<.001
pH_H2O	-2.461	0.451	-5.45	<.001
Resist	-0.001265	0.000292	-4.34	<.001

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, Long, RHx4, pH_H2O, Resist,
frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	118.45	19.7416	22.92	<.001
Residual	14	12.06	0.8612		
Total	20	130.51	6.5253		
Change	-1	-3.21	3.2147	3.73	0.074

Percentage variance accounted for 86.8

Standard error of observations is estimated to be 0.928

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	89.6	10.3	8.66	<.001
APP_N	0.0656	0.0101	6.51	<.001
Long	-0.919	0.266	-3.46	0.004
RHx4	-0.5346	0.0844	-6.33	<.001
pH_H2O	-1.958	0.490	-4.00	0.001
Resist	-0.001408	0.000278	-5.06	<.001
frost4	1.090	0.564	1.93	0.074

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, Long, RHx4, pH_H2O, Resist,
frost4, rain2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	120.43	17.2038	22.19	<.001
Residual	13	10.08	0.7753		
Total	20	130.51	6.5253		
Change	-1	-1.98	1.9774	2.55	0.134

Percentage variance accounted for 88.1

Standard error of observations is estimated to be 0.881

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	89.85	9.81	9.16	<.001
APP_N	0.06754	0.00963	7.01	<.001
Long	-1.037	0.263	-3.94	0.002
RHx4	-0.4747	0.0884	-5.37	<.001
pH_H2O	-2.268	0.504	-4.50	<.001
Resist	-0.001388	0.000264	-5.25	<.001
frost4	0.932	0.544	1.71	0.110
rain2	-0.00818	0.00512	-1.60	0.134

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, Long, RHx4, pH_H2O, Resist,

frost4, rain2, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	122.369	15.2962	22.56	<.001
Residual	12	8.137	0.6781		
Total	20	130.506	6.5253		
Change	-1	-1.942	1.9423	2.86	0.116

Percentage variance accounted for 89.6

Standard error of observations is estimated to be 0.823

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	64.0	17.8	3.58	0.004
APP_N	0.06827	0.00902	7.57	<.001
Long	-0.358	0.471	-0.76	0.461
RHx4	-0.4974	0.0838	-5.94	<.001
pH_H2O	-2.157	0.475	-4.54	<.001

Resist	-0.001181	0.000276	-4.28	0.001
frost4	1.035	0.513	2.02	0.066
rain2	-0.00866	0.00480	-1.80	0.096
rad3	0.314	0.186	1.69	0.116

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, Long, RHx4, pH_H2O, Resist,
frost4, rain2, rad3, DL4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	123.935	13.7705	23.05	<.001
Residual	11	6.571	0.5974		
Total	20	130.506	6.5253		
Change	-1	-1.565	1.5654	2.62	0.134

Percentage variance accounted for 90.8

Standard error of observations is estimated to be 0.773

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.

Constant	-1133.	740.	-1.53	0.154
APP_N	0.06511	0.00869	7.49	<.001
Long	0.176	0.552	0.32	0.755
RHx4	-0.4768	0.0797	-5.99	<.001
pH_H2O	-2.200	0.447	-4.92	<.001
Resist	-0.000965	0.000291	-3.31	0.007
frost4	0.657	0.535	1.23	0.244
rain2	-0.01484	0.00591	-2.51	0.029
rad3	0.462	0.197	2.35	0.039
DL4	98.1	60.6	1.62	0.134

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, Long, RHx4, pH_H2O, Resist,

frost4, rain2, rad3, DL4, ETx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	126.585	12.6585	32.28	<.001
Residual	10	3.921	0.3921		
Total	20	130.506	6.5253		
Change	-1	-2.650	2.6500	6.76	0.027

Percentage variance accounted for 94.0

Standard error of observations is estimated to be 0.626

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	-2117.	709.	-2.99	0.014
APP_N	0.07562	0.00812	9.32	<.001
Long	1.935	0.811	2.39	0.038
RHx4	-0.6188	0.0845	-7.32	<.001
pH_H2O	0.106	0.958	0.11	0.914
Resist	-0.000712	0.000255	-2.79	0.019
frost4	0.679	0.433	1.57	0.148
rain2	-0.01589	0.00480	-3.31	0.008
rad3	0.780	0.201	3.88	0.003
DL4	175.9	57.5	3.06	0.012
ETx4	-0.332	0.128	-2.60	0.027

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, Long, RHx4, pH_H2O, Resist,

frost4, rain2, rad3, DL4, ETx4, HU15_3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.

Regression	11	127.944	11.6312	40.86 <.001
Residual	9	2.562	0.2847	
Total	20	130.506	6.5253	
Change	-1	-1.359	1.3591	4.77 0.057

Percentage variance accounted for 95.6

Standard error of observations is estimated to be 0.534

*** Estimates of parameters ***

	estimate	s.e.	t(9)	t pr.
Constant	-1703.	633.	-2.69	0.025
APP_N	0.07238	0.00707	10.23	<.001
Long	1.648	0.703	2.34	0.044
RHx4	-0.6217	0.0720	-8.63	<.001
pH_H2O	-0.443	0.854	-0.52	0.616
Resist	-0.000648	0.000219	-2.95	0.016
frost4	0.725	0.370	1.96	0.081
rain2	-0.01327	0.00426	-3.11	0.012
rad3	0.749	0.172	4.36	0.002
DL4	142.9	51.3	2.79	0.021
ETx4	-0.569	0.154	-3.70	0.005
HU15_3	0.00238	0.00109	2.18	0.057

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, Long, RHx4, pH_H2O, Resist,

frost4, rain2, rad3, DL4, ETx4, HU15_3, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	12	128.802	10.7335	50.38	<.001
Residual	8	1.704	0.2130		
Total	20	130.506	6.5253		
Change	-1	-0.858	0.8578	4.03	0.080

Percentage variance accounted for 96.7

Standard error of observations is estimated to be 0.462

*** Estimates of parameters ***

	estimate	s.e.	t(8)	t pr.
Constant	-1826.	551.	-3.32	0.011
APP_N	0.07084	0.00617	11.49	<.001
Long	2.119	0.652	3.25	0.012
RHx4	-0.6551	0.0645	-10.15	<.001
pH_H2O	-0.207	0.748	-0.28	0.789
Resist	-0.000631	0.000190	-3.32	0.010
frost4	0.671	0.321	2.09	0.070
rain2	-0.01229	0.00372	-3.30	0.011
rad3	0.836	0.155	5.40	<.001
DL4	152.3	44.6	3.42	0.009
ETx4	-0.678	0.144	-4.72	0.001

HU15_3 0.003028 0.000996 3.04 0.016

K -0.00598 0.00298 -2.01 0.080

===== Cultivar 7 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	10.60	10.5980	15.51	0.001
Residual	17	11.61	0.6831		
Total	18	22.21	1.2340		
Change	-1	-10.60	10.5980	15.51	0.001

Percentage variance accounted for 44.6

Standard error of observations is estimated to be 0.827

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-5.31	1.85	-2.86	0.011

rad3 0.3551 0.0902 3.94 0.001

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, rad3, DL2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	13.051	6.5257	11.40	<.001
Residual	16	9.160	0.5725		
Total	18	22.211	1.2340		
Change	-1	-2.453	2.4533	4.29	0.055

Percentage variance accounted for 53.6

Standard error of observations is estimated to be 0.757

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-130.9	60.7	-2.16	0.047
rad3	0.3758	0.0831	4.52	<.001
DL2	11.46	5.53	2.07	0.055

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, rad3, DL2, DL4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	16.552	5.5173	14.62	<.001
Residual	15	5.659	0.3773		
Total	18	22.211	1.2340		
Change	-1	-3.501	3.5007	9.28	0.008

Percentage variance accounted for 69.4

Standard error of observations is estimated to be 0.614

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-1202.	355.	-3.39	0.004
rad3	0.3152	0.0704	4.48	<.001
DL2	15.72	4.71	3.34	0.004
DL4	85.5	28.1	3.05	0.008

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, rad3, DL2, DL4, ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	18.709	4.6772	18.69	<.001
Residual	14	3.503	0.2502		
Total	18	22.211	1.2340		
Change	-1	-2.157	2.1566	8.62	0.011

Percentage variance accounted for 79.7

Standard error of observations is estimated to be 0.500

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	-1602.	320.	-5.01	<.001
rad3	0.3402	0.0579	5.87	<.001
DL2	8.79	4.50	1.95	0.071
DL4	125.0	26.5	4.71	<.001
ETn4	0.345	0.117	2.94	0.011

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, rad3, DL2, DL4, ETn4, DL1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	19.220	3.8439	16.70	<.001
Residual	13	2.992	0.2301		
Total	18	22.211	1.2340		
Change	-1	-0.511	0.5109	2.22	0.160

Percentage variance accounted for 81.3

Standard error of observations is estimated to be 0.480

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-1257.	384.	-3.27	0.006
rad3	0.3550	0.0564	6.29	<.001
DL2	58.5	33.6	1.74	0.106
DL4	100.2	30.4	3.29	0.006
ETn4	0.328	0.113	2.90	0.012
DL1	-53.0	35.6	-1.49	0.160

===== Cultivar 8 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	113.48	113.479	37.87	<.001
Residual	19	56.93	2.996		
Total	20	170.41	8.520		
Change	-1	-113.48	113.479	37.87	<.001

Percentage variance accounted for 64.8

Standard error of observations is estimated to be 1.73

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-791.	130.	-6.11	<.001
DL1	71.6	11.6	6.15	<.001

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL1, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	133.01	66.505	32.01	<.001
Residual	18	37.40	2.078		
Total	20	170.41	8.520		
Change	-1	-19.53	19.531	9.40	0.007

Percentage variance accounted for 75.6

Standard error of observations is estimated to be 1.44

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-481.	148.	-3.25	0.004
DL1	43.5	13.3	3.26	0.004
P	0.1222	0.0399	3.07	0.007

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL1, P, Mg

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	149.88	49.959	41.36	<.001
Residual	17	20.53	1.208		
Total	20	170.41	8.520		
Change	-1	-16.87	16.867	13.96	0.002

Percentage variance accounted for 85.8

Standard error of observations is estimated to be 1.10

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-877.	155.	-5.66	<.001
DL1	79.4	14.0	5.68	<.001
P	0.1465	0.0311	4.71	<.001
Mg	-0.03333	0.00892	-3.74	0.002

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL1, P, Mg, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	154.82	38.7056	39.73	<.001
Residual	16	15.59	0.9742		
Total	20	170.41	8.5205		
Change	-1	-4.95	4.9452	5.08	0.039

Percentage variance accounted for 88.6

Standard error of observations is estimated to be 0.987

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-746.	151.	-4.95	<.001
DL1	67.5	13.6	4.96	<.001
P	0.1795	0.0315	5.69	<.001
Mg	-0.03554	0.00807	-4.40	<.001
K	0.01217	0.00540	2.25	0.039

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL1, P, Mg, K, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	158.22	31.6446	38.95	<.001
Residual	15	12.19	0.8125		
Total	20	170.41	8.5205		
Change	-1	-3.40	3.4006	4.19	0.059

Percentage variance accounted for 90.5

Standard error of observations is estimated to be 0.901

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-1106.	223.	-4.96	<.001
DL1	100.9	20.5	4.92	<.001
P	0.1607	0.0302	5.31	<.001
Mg	-0.02797	0.00825	-3.39	0.004
K	0.01058	0.00499	2.12	0.051
pH_H2O	-2.11	1.03	-2.05	0.059

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL1, P, Mg, K, pH_H2O, ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	162.692	27.1154	49.19	<.001
Residual	14	7.717	0.5512		
Total	20	170.410	8.5205		
Change	-1	-4.470	4.4696	8.11	0.013

Percentage variance accounted for 93.5

Standard error of observations is estimated to be 0.742

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	-863.	203.	-4.26	<.001
DL1	79.4	18.5	4.30	<.001
P	0.1732	0.0253	6.85	<.001
Mg	-0.01082	0.00908	-1.19	0.253
K	0.01320	0.00421	3.13	0.007
pH_H2O	-3.329	0.952	-3.50	0.004
ETn4	0.579	0.203	2.85	0.013

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL1, P, Mg, K, pH_H2O, ETn4, WS4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	166.446	23.7780	77.99	<.001
Residual	13	3.964	0.3049		
Total	20	170.410	8.5205		
Change	-1	-3.754	3.7536	12.31	0.004

Percentage variance accounted for 96.4

Standard error of observations is estimated to be 0.552

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-1333.	202.	-6.61	<.001
DL1	121.3	18.2	6.66	<.001
P	0.1442	0.0206	7.02	<.001
Mg	-0.00531	0.00693	-0.77	0.458
K	0.01378	0.00314	4.39	<.001
pH_H2O	-4.064	0.738	-5.50	<.001
ETn4	0.645	0.152	4.23	<.001

WS4 3.077 0.877 3.51 0.004

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL1, P, Mg, K, pH_H2O, ETn4, WS4,

Resist

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	167.758	20.9697	94.88	<.001
Residual	12	2.652	0.2210		
Total	20	170.410	8.5205		
Change	-1	-1.312	1.3116	5.93	0.031

Percentage variance accounted for 97.4

Standard error of observations is estimated to be 0.470

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	-1634.	211.	-7.73	<.001
DL1	148.2	19.0	7.79	<.001
P	0.1113	0.0221	5.04	<.001

Mg	-0.00681	0.00593	-1.15	0.273
K	0.01061	0.00297	3.57	0.004
pH_H2O	-4.131	0.629	-6.57	<.001
ETn4	0.592	0.132	4.50	<.001
WS4	4.94	1.07	4.62	<.001
Resist	-0.000499	0.000205	-2.44	0.031

===== Cultivar 10 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	55.91	55.910	19.30	<.001
Residual	19	55.05	2.897		
Total	20	110.96	5.548		
Change	-1	-55.91	55.910	19.30	<.001

Percentage variance accounted for 47.8

Standard error of observations is estimated to be 1.70

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	2.31	1.30	1.78	0.091
APP_N	0.0586	0.0133	4.39	<.001

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	73.36	36.680	17.56	<.001
Residual	18	37.59	2.089		
Total	20	110.96	5.548		
Change	-1	-17.45	17.450	8.35	0.010

Percentage variance accounted for 62.4

Standard error of observations is estimated to be 1.45

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.

Constant	-6.68	3.30	-2.02	0.058
APP_N	0.0556	0.0114	4.88	<.001
rad3	0.455	0.158	2.89	0.010

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, rad3, RHx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	88.27	29.422	22.04	<.001
Residual	17	22.69	1.335		
Total	20	110.96	5.548		
Change	-1	-14.91	14.906	11.17	0.004

Percentage variance accounted for 75.9

Standard error of observations is estimated to be 1.16

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	18.84	8.08	2.33	0.032
APP_N	0.0697	0.0100	6.95	<.001

rad3	0.468	0.126	3.72	0.002
RHx4	-0.3081	0.0922	-3.34	0.004

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, rad3, RHx4, rad4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	91.56	22.890	18.88	<.001
Residual	16	19.39	1.212		
Total	20	110.96	5.548		
Change	-1	-3.29	3.295	2.72	0.119

Percentage variance accounted for 78.2

Standard error of observations is estimated to be 1.10

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	23.71	8.25	2.87	0.011
APP_N	0.06676	0.00973	6.86	<.001
rad3	1.806	0.820	2.20	0.043

RHx4 -0.3448 0.0906 -3.80 0.002

rad4 -1.526 0.926 -1.65 0.119

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, rad3, RHx4, rad4, rain4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	94.36	18.873	17.06	<.001
Residual	15	16.59	1.106		
Total	20	110.96	5.548		
Change	-1	-2.80	2.804	2.54	0.132

Percentage variance accounted for 80.1

Standard error of observations is estimated to be 1.05

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	19.56	8.30	2.36	0.032
APP_N	0.06773	0.00932	7.27	<.001
rad3	2.023	0.795	2.54	0.022

RHx4 -0.2788 0.0960 -2.90 0.011

rad4 -1.775 0.898 -1.98 0.067

rain4 -0.00217 0.00136 -1.59 0.132

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, rad3, RHx4, rad4, rain4,

K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	96.85	16.142	16.03	<.001
Residual	14	14.10	1.007		
Total	20	110.96	5.548		
Change	-1	-2.49	2.489	2.47	0.138

Percentage variance accounted for 81.8

Standard error of observations is estimated to be 1.00

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	20.00	7.92	2.52	0.024

APP_N	0.06451	0.00913	7.07	<.001
rad3	2.171	0.765	2.84	0.013
RHx4	-0.2526	0.0931	-2.71	0.017
rad4	-2.000	0.869	-2.30	0.037
rain4	-0.00276	0.00135	-2.04	0.061
K	-0.00786	0.00500	-1.57	0.138

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, rad3, RHx4, rad4, rain4,

K, Long

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	99.57	14.2239	16.24	<.001
Residual	13	11.39	0.8760		
Total	20	110.96	5.5478		
Change	-1	-2.71	2.7141	3.10	0.102

Percentage variance accounted for 84.2

Standard error of observations is estimated to be 0.936

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-9.3	18.2	-0.51	0.618
APP_N	0.06331	0.00854	7.42	<.001
rad3	2.705	0.775	3.49	0.004
RHx4	-0.3139	0.0936	-3.36	0.005
rad4	-2.282	0.826	-2.76	0.016
rain4	-0.00278	0.00126	-2.20	0.047
K	-0.01298	0.00550	-2.36	0.034
Long	0.996	0.566	1.76	0.102

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, rad3, RHx4, rad4, rain4,
K, Long, Tx2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	100.70	12.5880	14.74	<.001
Residual	12	10.25	0.8543		
Total	20	110.96	5.5478		
Change	-1	-1.14	1.1363	1.33	0.271

Percentage variance accounted for 84.6

Standard error of observations is estimated to be 0.924

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	-15.6	18.8	-0.83	0.423
APP_N	0.06475	0.00852	7.60	<.001
rad3	2.465	0.793	3.11	0.009
RHx4	-0.3243	0.0928	-3.49	0.004
rad4	-1.962	0.862	-2.28	0.042
rain4	-0.00360	0.00144	-2.50	0.028
K	-0.01124	0.00563	-2.00	0.069
Long	1.288	0.614	2.10	0.058
Tx2	-0.1050	0.0911	-1.15	0.271

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, rad3, RHx4, rad4, rain4,

K, Long, Tx2, DL3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	103.105	11.4561	16.05	<.001
Residual	11	7.850	0.7136		

Total	20	110.955	5.5478	
Change	-1	-2.401	2.4013	3.36 0.094

Percentage variance accounted for 87.1

Standard error of observations is estimated to be 0.845

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	945.	524.	1.80	0.099
APP_N	0.0766	0.0101	7.57	<.001
rad3	2.092	0.753	2.78	0.018
RHx4	-0.3651	0.0877	-4.16	0.002
rad4	-1.455	0.835	-1.74	0.109
rain4	-0.00404	0.00134	-3.02	0.012
K	-0.00939	0.00524	-1.79	0.101
Long	2.264	0.773	2.93	0.014
Tx2	-0.663	0.315	-2.10	0.059
DL3	-77.7	42.4	-1.83	0.094

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, rad3, RHx4, rad4, rain4,

K, Long, Tx2, DL3, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	105.397	10.5397	18.96	<.001
Residual	10	5.558	0.5558		
Total	20	110.955	5.5478		
Change	-1	-2.292	2.2923	4.12	0.070

Percentage variance accounted for 90.0

Standard error of observations is estimated to be 0.746

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	1848.	641.	2.88	0.016
APP_N	0.0642	0.0108	5.94	<.001
rad3	2.921	0.780	3.75	0.004
RHx4	-0.3159	0.0811	-3.90	0.003
rad4	-2.557	0.915	-2.79	0.019
rain4	-0.00359	0.00120	-2.99	0.014
K	-0.01020	0.00465	-2.19	0.053
Long	1.720	0.733	2.35	0.041
Tx2	-0.626	0.279	-2.24	0.049
DL3	-147.1	50.6	-2.90	0.016
pH_H2O	-2.64	1.30	-2.03	0.070

===== Cultivar 11 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	144.98	144.978	42.96	<.001
Residual	19	64.12	3.375		
Total	20	209.10	10.455		
Change	-1	-144.98	144.978	42.96	<.001

Percentage variance accounted for 67.7

Standard error of observations is estimated to be 1.84

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-894.	137.	-6.51	<.001
DL1	81.0	12.4	6.55	<.001

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL1, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	170.43	85.216	39.67	<.001
Residual	18	38.66	2.148		
Total	20	209.10	10.455		
Change	-1	-25.45	25.453	11.85	0.003

Percentage variance accounted for 79.5

Standard error of observations is estimated to be 1.47

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-1870.	304.	-6.15	<.001
DL1	171.1	28.0	6.11	<.001
pH_H2O	-5.08	1.48	-3.44	0.003

===== Cultivar 12 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	173.25	173.249	41.37	<.001
Residual	19	79.57	4.188		
Total	20	252.82	12.641		
Change	-1	-173.25	173.249	41.37	<.001

Percentage variance accounted for 66.9

Standard error of observations is estimated to be 2.05

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-978.	153.	-6.38	<.001
DL1	88.5	13.8	6.43	<.001

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL1, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	202.44	101.220	36.17	<.001
Residual	18	50.38	2.799		
Total	20	252.82	12.641		
Change	-1	-29.19	29.191	10.43	0.005

Percentage variance accounted for 77.9

Standard error of observations is estimated to be 1.67

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-598.	172.	-3.48	0.003
DL1	54.2	15.5	3.50	0.003
P	0.1494	0.0463	3.23	0.005

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL1, P, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	221.40	73.799	39.93	<.001
Residual	17	31.42	1.848		
Total	20	252.82	12.641		
Change	-1	-18.96	18.959	10.26	0.005

Percentage variance accounted for 85.4

Standard error of observations is estimated to be 1.36

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-1500.	314.	-4.77	<.001
DL1	137.4	28.9	4.76	<.001
P	0.1300	0.0381	3.41	0.003
pH_H2O	-4.44	1.39	-3.20	0.005

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL1, P, pH_H2O, Tn1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	235.67	58.918	54.98	<.001
Residual	16	17.15	1.072		
Total	20	252.82	12.641		
Change	-1	-14.27	14.272	13.32	0.002

Percentage variance accounted for 91.5

Standard error of observations is estimated to be 1.04

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-943.	284.	-3.32	0.004
DL1	86.4	26.1	3.32	0.004
P	0.1985	0.0345	5.75	<.001
pH_H2O	-4.47	1.06	-4.23	<.001
Tn1	1.157	0.317	3.65	0.002

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL1, P, pH_H2O, Tn1, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	239.97	47.9935	56.03	<.001
Residual	15	12.85	0.8566		
Total	20	252.82	12.6409		
Change	-1	-4.30	4.2971	5.02	0.041

Percentage variance accounted for 93.2

Standard error of observations is estimated to be 0.926

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-1610.	391.	-4.11	<.001
DL1	145.5	35.2	4.13	<.001
P	0.1740	0.0328	5.31	<.001
pH_H2O	-5.27	1.01	-5.22	<.001
Tn1	1.362	0.298	4.57	<.001
WS3	4.77	2.13	2.24	0.041

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, DL1, P, pH_H2O, Tn1, WS3, Resist

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	244.861	40.8102	71.82	<.001
Residual	14	7.956	0.5683		
Total	20	252.817	12.6409		
Change	-1	-4.894	4.8939	8.61	0.011

Percentage variance accounted for 95.5

Standard error of observations is estimated to be 0.754

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	-1813.	326.	-5.56	<.001
DL1	163.5	29.3	5.57	<.001
P	0.1544	0.0275	5.61	<.001
pH_H2O	-5.480	0.825	-6.64	<.001
Tn1	1.486	0.246	6.03	<.001
WS3	7.03	1.90	3.70	0.002
Resist	-0.000672	0.000229	-2.93	0.011

===== Area 1 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	52.4	52.421	6.19	0.015
Residual	74	626.4	8.465		
Total	75	678.8	9.051		
Change	-1	-52.4	52.421	6.19	0.015

Percentage variance accounted for 6.5

Standard error of observations is estimated to be 2.91

*** Estimates of parameters ***

	estimate	s.e.	t(74)	t pr.
Constant	2.23	1.20	1.87	0.066
APP_N	0.0322	0.0129	2.49	0.015

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N, Tx2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	65.0	32.514	3.87	0.025
Residual	73	613.8	8.408		
Total	75	678.8	9.051		
Change	-1	-12.6	12.606	1.50	0.225

Percentage variance accounted for 7.1

Standard error of observations is estimated to be 2.90

*** Estimates of parameters ***

	estimate	s.e.	t(73)	t pr.
Constant	-11.2	11.0	-1.01	0.314
APP_N	0.0335	0.0129	2.59	0.012
Tx2	0.496	0.405	1.22	0.225

===== Area 2 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, rad4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	106.6	106.577	11.46	0.001
Residual	75	697.4	9.298		
Total	76	804.0	10.578		
Change	-1	-106.6	106.577	11.46	0.001

Percentage variance accounted for 12.1

Standard error of observations is estimated to be 3.05

*** Estimates of parameters ***

	estimate	s.e.	t(75)	t pr.
Constant	-15.58	6.57	-2.37	0.020
rad4	1.082	0.320	3.39	0.001

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, rad4, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	188.4	94.186	11.32	<.001
Residual	74	615.6	8.319		
Total	76	804.0	10.578		
Change	-1	-81.8	81.795	9.83	0.002

Percentage variance accounted for 21.4

Standard error of observations is estimated to be 2.88

*** Estimates of parameters ***

	estimate	s.e.	t(74)	t pr.
Constant	-58.6	15.1	-3.89	<.001
rad4	1.558	0.338	4.61	<.001
WS3	13.36	4.26	3.14	0.002

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, rad4, WS3, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.

Regression	3	222.6	74.187	9.31	<.001
Residual	73	581.4	7.964		
Total	76	804.0	10.578		
Change	-1	-34.2	34.191	4.29	0.042

Percentage variance accounted for 24.7

Standard error of observations is estimated to be 2.82

*** Estimates of parameters ***

	estimate	s.e.	t(73)	t pr.
Constant	-75.4	16.8	-4.48	<.001
rad4	1.973	0.387	5.10	<.001
WS3	17.70	4.66	3.79	<.001
K	-0.0283	0.0137	-2.07	0.042

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, rad4, WS3, K, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	233.8	58.453	7.38	<.001

Residual	72	570.1	7.919		
Total	76	804.0	10.578		
Change	-1	-11.3	11.251	1.42	0.237

Percentage variance accounted for 25.1

Standard error of observations is estimated to be 2.81

*** Estimates of parameters ***

	estimate	s.e.	t(72)	t pr.
Constant	-89.9	20.7	-4.34	<.001
rad4	2.549	0.618	4.12	<.001
WS3	19.98	5.03	3.97	<.001
K	-0.0382	0.0159	-2.39	0.019
APP_N	-0.0243	0.0204	-1.19	0.237

===== Area 3 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	55.3	55.320	6.33	0.014
Residual	73	637.5	8.733		
Total	74	692.8	9.362		
Change	-1	-55.3	55.320	6.33	0.014

Percentage variance accounted for 6.7

Standard error of observations is estimated to be 2.96

*** Estimates of parameters ***

	estimate	s.e.	t(73)	t pr.
Constant	0.76	1.29	0.59	0.560
APP_N	0.0302	0.0120	2.52	0.014

===== Year 1 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	89.3	89.302	12.03	0.002
Residual	30	222.7	7.422		
Total	31	312.0	10.063		
Change	-1	-89.3	89.302	12.03	0.002

Percentage variance accounted for 26.2

Standard error of observations is estimated to be 2.72

*** Estimates of parameters ***

	estimate	s.e.	t(30)	t pr.
Constant	1.147	0.986	1.16	0.254
P	0.1331	0.0384	3.47	0.002

===== Year 2 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, IC1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.

Regression	1	5.42	5.420	1.65	0.210
Residual	29	95.45	3.292		
Total	30	100.87	3.362		
Change	-1	-5.42	5.420	1.65	0.210

Percentage variance accounted for 2.1

Standard error of observations is estimated to be 1.81

*** Estimates of parameters ***

	estimate	s.e.	t(29)	t pr.
Constant	4.310	0.768	5.61	<.001
IC1	-0.001127	0.000878	-1.28	0.210

===== Year 3 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, Mg

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	48.0	47.961	6.50	0.016

Residual	31	228.8	7.381		
Total	32	276.8	8.650		
Change	-1	-48.0	47.961	6.50	0.016

Percentage variance accounted for 14.7

Standard error of observations is estimated to be 2.72

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	2.64	1.17	2.26	0.031
Mg	0.0285	0.0112	2.55	0.016

===== Year 4 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, RHx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	33.6	33.63	2.93	0.097
Residual	31	355.6	11.47		

Total	32	389.3	12.16		
Change	-1	-33.6	33.63	2.93	0.097

Percentage variance accounted for 5.7

Standard error of observations is estimated to be 3.39

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	68.3	36.1	1.89	0.068
RHx4	-0.706	0.412	-1.71	0.097

===== Year 5 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	50.0	50.01	4.41	0.044
Residual	31	351.5	11.34		
Total	32	401.5	12.55		

Change	-1	-50.0	50.01	4.41	0.044

Percentage variance accounted for 9.6

Standard error of observations is estimated to be 3.37

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	3.42	1.28	2.67	0.012
P	0.1231	0.0586	2.10	0.044

===== Year 6 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, RHx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	161.9	161.88	14.08	<.001
Residual	31	356.3	11.49		
Total	32	518.2	16.19		

Change	-1	-161.9	161.88	14.08	<.001

Percentage variance accounted for 29.0

Standard error of observations is estimated to be 3.39

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	159.2	40.7	3.91	<.001
RHx4	-1.701	0.453	-3.75	<.001

===== Year 7 for Tfnoat =====

88.....

***** Regression Analysis *****

Response variate: Tfnoat

Fitted terms: Constant, Rad2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	8.0	8.038	1.31	0.262
Residual	31	190.9	6.157		
Total	32	198.9	6.216		

Change	-1	-8.0	8.038	1.31	0.262

Percentage variance accounted for 0.9

Standard error of observations is estimated to be 2.48

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	0.01	4.13	0.00	0.998
Rad2	0.299	0.262	1.14	0.262

1

Appendix 3.9.5 Regression analysis on fruit yield for cultivars combined, individual cultivars, production year and areas

JPfyieldFS.out

file is JPfyieldFS.gen

========== CACTUS PEAR ENVIRONMENTAL ADAPTIBILITY: FRUIT YIELD

===== FS regression model on all data for FRUIT yield =====

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	1543.	1542.56	48.18	<.001
Residual	229	7332.	32.02		
Total	230	8875.	38.59		
Change	-1	-1543.	1542.56	48.18	<.001

Percentage variance accounted for 17.0

Standard error of observations is estimated to be 5.66

*** Estimates of parameters ***

	estimate	s.e.	t(229)	t pr.
Constant	1.109	0.708	1.57	0.118
P	0.2380	0.0343	6.94	<.001

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	2299.	1149.66	39.86	<.001
Residual	228	6575.	28.84		
Total	230	8875.	38.59		
Change	-1	-757.	756.76	26.24	<.001

Percentage variance accounted for 25.3

Standard error of observations is estimated to be 5.37

*** Estimates of parameters ***

	estimate	s.e.	t(228)	t pr.

Constant	-5.67	1.48	-3.82	<.001
P	0.2716	0.0332	8.18	<.001
APP_N	0.0663	0.0130	5.12	<.001

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, APP_N, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	2341.	780.24	27.11	<.001
Residual	227	6534.	28.78		
Total	230	8875.	38.59		
Change	-1	-41.	41.42	1.44	0.232

Percentage variance accounted for 25.4

Standard error of observations is estimated to be 5.37

*** Estimates of parameters ***

	estimate	s.e.	t(227)	t pr.
Constant	-0.46	4.60	-0.10	0.921

P	0.3002	0.0408	7.35	<.001
APP_N	0.0600	0.0140	4.29	<.001
pH_H2O	-0.931	0.777	-1.20	0.232

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, APP_N, pH_H2O, DL3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	2527.	631.69	22.49	<.001
Residual	226	6348.	28.09		
Total	230	8875.	38.59		
Change	-1	-186.	186.02	6.62	0.011

Percentage variance accounted for 27.2

Standard error of observations is estimated to be 5.30

*** Estimates of parameters ***

	estimate	s.e.	t(226)	t pr.
Constant	1670.	649.	2.57	0.011
P	0.2671	0.0423	6.31	<.001

APP_N	0.0496	0.0144	3.44	<.001
pH_H2O	-5.35	1.88	-2.84	0.005
DL3	-130.8	50.8	-2.57	0.011

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, APP_N, pH_H2O, DL3, ETx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	2641.	528.17	19.06	<.001
Residual	225	6234.	27.71		
Total	230	8875.	38.59		
Change	-1	-114.	114.11	4.12	0.044

Percentage variance accounted for 28.2

Standard error of observations is estimated to be 5.26

*** Estimates of parameters ***

	estimate	s.e.	t(225)	t pr.
Constant	3087.	950.	3.25	0.001
P	0.1904	0.0565	3.37	<.001

APP_N	0.0536	0.0144	3.71	<.001
pH_H2O	-5.47	1.87	-2.92	0.004
DL3	-242.1	74.5	-3.25	0.001
ETx4	-0.453	0.223	-2.03	0.044

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, APP_N, pH_H2O, DL3, ETx4, RC4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	2715.	452.48	16.45	<.001
Residual	224	6160.	27.50		
Total	230	8875.	38.59		
Change	-1	-74.	74.04	2.69	0.102

Percentage variance accounted for 28.7

Standard error of observations is estimated to be 5.24

*** Estimates of parameters ***

	estimate	s.e.	t(224)	t pr.
Constant	1975.	1164.	1.70	0.091

P	0.2005	0.0567	3.54	<.001
APP_N	0.0418	0.0161	2.61	0.010
pH_H2O	-5.40	1.86	-2.90	0.004
DL3	-153.3	91.9	-1.67	0.097
ETx4	-0.808	0.310	-2.60	0.010
RC4	-0.00180	0.00110	-1.64	0.102

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, APP_N, pH_H2O, DL3, ETx4, RC4,

Alt

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	2806.	400.88	14.73	<.001
Residual	223	6069.	27.21		
Total	230	8875.	38.59		
Change	-1	-91.	91.23	3.35	0.068

Percentage variance accounted for 29.5

Standard error of observations is estimated to be 5.22

*** Estimates of parameters ***

	estimate	s.e.	t(223)	t pr.
Constant	2380.	1179.	2.02	0.045
P	0.1311	0.0679	1.93	0.055
APP_N	0.0329	0.0167	1.97	0.050
pH_H2O	-6.31	1.92	-3.29	0.001
DL3	-186.3	93.2	-2.00	0.047
ETx4	-0.746	0.310	-2.41	0.017
RC4	-0.00352	0.00144	-2.44	0.015
Alt	0.00681	0.00372	1.83	0.068

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, APP_N, pH_H2O, DL3, ETx4, RC4,

Alt, Tave3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	2867.	358.38	13.24	<.001
Residual	222	6008.	27.06		
Total	230	8875.	38.59		
Change	-1	-61.	60.94	2.25	0.135

Percentage variance accounted for 29.9

Standard error of observations is estimated to be 5.20

*** Estimates of parameters ***

	estimate	s.e.	t(222)	t pr.
Constant	2448.	1177.	2.08	0.039
P	0.1160	0.0685	1.69	0.092
APP_N	0.0307	0.0167	1.84	0.068
pH_H2O	-6.53	1.92	-3.40	<.001
DL3	-193.1	93.0	-2.08	0.039
ETx4	-1.121	0.398	-2.82	0.005
RC4	-0.00316	0.00145	-2.18	0.031
Alt	0.01011	0.00431	2.34	0.020
Tave3	1.443	0.962	1.50	0.135

===== Cultivar 1 for FRUIT yield =====

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	44.44	44.439	17.47	<.001

Residual	19	48.32	2.543		
Total	20	92.76	4.638		
Change	-1	-44.44	44.439	17.47	<.001

Percentage variance accounted for 45.2

Standard error of observations is estimated to be 1.59

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-0.912	0.661	-1.38	0.184
P	0.1340	0.0320	4.18	<.001

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, rain2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	61.01	30.505	17.29	<.001
Residual	18	31.75	1.764		
Total	20	92.76	4.638		

Change	-1	-16.57	16.572	9.39	0.007

Percentage variance accounted for 62.0

Standard error of observations is estimated to be 1.33

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-2.757	0.816	-3.38	0.003
P	0.1725	0.0295	5.85	<.001
rain2	0.01791	0.00584	3.07	0.007

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, rain2, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	64.50	21.502	12.94	<.001
Residual	17	28.26	1.662		
Total	20	92.76	4.638		

Change	-1	-3.49	3.494	2.10	0.165

Percentage variance accounted for 64.2

Standard error of observations is estimated to be 1.29

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-7.46	3.34	-2.23	0.039
P	0.1360	0.0382	3.56	0.002
rain2	0.01198	0.00699	1.71	0.105
rad3	0.281	0.194	1.45	0.165

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, rain2, rad3, ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	69.36	17.340	11.86	<.001
Residual	16	23.40	1.463		
Total	20	92.76	4.638		
Change	-1	-4.85	4.855	3.32	0.087

Percentage variance accounted for 68.5

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-10.06	3.44	-2.92	0.010
P	0.1090	0.0387	2.82	0.012
rain2	0.01147	0.00657	1.75	0.100
rad3	0.414	0.196	2.11	0.051
ETn4	0.366	0.201	1.82	0.087

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, rain2, rad3, ETn4, DL4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	76.44	15.288	14.05	<.001
Residual	15	16.32	1.088		
Total	20	92.76	4.638		
Change	-1	-7.08	7.083	6.51	0.022

Percentage variance accounted for 76.5

Standard error of observations is estimated to be 1.04

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-2086.	813.	-2.56	0.022
P	0.0830	0.0349	2.38	0.031
rain2	0.00015	0.00720	0.02	0.983
rad3	0.470	0.170	2.76	0.015
ETn4	0.632	0.202	3.12	0.007
DL4	172.9	67.8	2.55	0.022

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, rain2, rad3, ETn4, DL4, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	79.32	13.2208	13.78	<.001
Residual	14	13.44	0.9597		
Total	20	92.76	4.6380		
Change	-1	-2.88	2.8824	3.00	0.105

Percentage variance accounted for 79.3

Standard error of observations is estimated to be 0.980

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	-1891.	772.	-2.45	0.028
P	0.0989	0.0341	2.90	0.012
rain2	0.00345	0.00702	0.49	0.631
rad3	0.472	0.160	2.95	0.011
ETn4	0.830	0.222	3.74	0.002
DL4	156.6	64.3	2.43	0.029
frost4	1.057	0.610	1.73	0.105

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, rain2, rad3, ETn4, DL4, frost4,

K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	80.58	11.5121	12.29	<.001
Residual	13	12.18	0.9366		
Total	20	92.76	4.6380		

Change -1 -1.26 1.2601 1.35 0.267

Percentage variance accounted for 79.8

Standard error of observations is estimated to be 0.968

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-2040.	774.	-2.64	0.021
P	0.0993	0.0336	2.95	0.011
rain2	0.00347	0.00694	0.50	0.625
rad3	0.509	0.161	3.15	0.008
ETn4	0.875	0.222	3.93	0.002
DL4	168.9	64.5	2.62	0.021
frost4	1.251	0.625	2.00	0.067
K	0.00557	0.00481	1.16	0.267

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, rain2, rad3, ETn4, DL4, frost4,

K, ETx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.

Regression	8	83.361	10.4201	13.30 <.001
Residual	12	9.400	0.7833	
Total	20	92.761	4.6380	
Change	-1	-2.776	2.7760	3.54 0.084

Percentage variance accounted for 83.1

Standard error of observations is estimated to be 0.885

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	-2220.	714.	-3.11	0.009
P	0.1238	0.0334	3.71	0.003
rain2	0.00260	0.00636	0.41	0.690
rad3	0.385	0.162	2.39	0.034
ETn4	1.064	0.227	4.69	<.001
DL4	184.5	59.5	3.10	0.009
frost4	1.239	0.572	2.17	0.051
K	0.00999	0.00498	2.01	0.068
ETx4	-0.1409	0.0749	-1.88	0.084

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, rain2, rad3, ETn4, DL4, frost4,

K, ETx4, RC4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	88.247	9.8052	23.89	<.001
Residual	11	4.514	0.4104		
Total	20	92.761	4.6380		
Change	-1	-4.886	4.8859	11.91	0.005

Percentage variance accounted for 91.2

Standard error of observations is estimated to be 0.641

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	-1246.	589.	-2.12	0.058
P	0.0413	0.0340	1.22	0.250
rain2	0.00237	0.00460	0.51	0.617
rad3	0.529	0.124	4.26	0.001
ETn4	0.516	0.228	2.26	0.045
DL4	104.1	49.0	2.13	0.057
frost4	0.949	0.422	2.25	0.046
K	-0.00087	0.00479	-0.18	0.859
ETx4	-0.630	0.152	-4.15	0.002
RC4	-0.001755	0.000509	-3.45	0.005

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, rain2, rad3, ETn4, DL4, frost4,

K, ETx4, RC4, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	89.175	8.9175	24.87	<.001
Residual	10	3.586	0.3586		
Total	20	92.761	4.6380		
Change	-1	-0.928	0.9280	2.59	0.139

Percentage variance accounted for 92.3

Standard error of observations is estimated to be 0.599

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	-1362.	555.	-2.45	0.034
P	0.0551	0.0329	1.67	0.125
rain2	0.00602	0.00487	1.24	0.244
rad3	0.535	0.116	4.61	<.001
ETn4	0.498	0.214	2.33	0.042
DL4	112.6	46.1	2.44	0.035

frost4	0.825	0.402	2.05	0.068
K	-0.00159	0.00450	-0.35	0.731
ETx4	-0.546	0.151	-3.62	0.005
RC4	-0.002165	0.000539	-4.01	0.002
WS3	3.48	2.17	1.61	0.139

===== Cultivar 2 for FRUIT yield =====

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, DL2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	2.792	2.7922	6.18	0.022
Residual	19	8.583	0.4518		
Total	20	11.376	0.5688		
Change	-1	-2.792	2.7922	6.18	0.022

Percentage variance accounted for 20.6

Standard error of observations is estimated to be 0.672

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-116.9	47.4	-2.47	0.023
DL2	10.79	4.34	2.49	0.022

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, DL2, RHn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	6.140	3.0702	10.56	<.001
Residual	18	5.235	0.2908		
Total	20	11.376	0.5688		
Change	-1	-3.348	3.3482	11.51	0.003

Percentage variance accounted for 48.9

Standard error of observations is estimated to be 0.539

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.

Constant	-197.1	44.8	-4.40	<.001
DL2	17.86	4.06	4.40	<.001
RHn4	0.0629	0.0185	3.39	0.003

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, DL2, RHn4, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	7.839	2.6129	12.56	<.001
Residual	17	3.537	0.2080		
Total	20	11.376	0.5688		
Change	-1	-1.698	1.6984	8.16	0.011

Percentage variance accounted for 63.4

Standard error of observations is estimated to be 0.456

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-400.9	80.8	-4.96	<.001
DL2	37.18	7.58	4.90	<.001

RHn4 0.0539 0.0160 3.37 0.004

pH_H2O -1.212 0.424 -2.86 0.011

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, DL2, RHn4, pH_H2O, Rad2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	8.982	2.2454	15.01	<.001
Residual	16	2.394	0.1496		
Total	20	11.376	0.5688		
Change	-1	-1.143	1.1427	7.64	0.014

Percentage variance accounted for 73.7

Standard error of observations is estimated to be 0.387

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-380.1	68.9	-5.52	<.001
DL2	34.96	6.48	5.39	<.001

RHn4	0.0579	0.0136	4.24	<.001
pH_H2O	-1.075	0.363	-2.96	0.009
Rad2	0.1504	0.0544	2.76	0.014

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, DL2, RHn4, pH_H2O, Rad2, DL3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	9.193	1.8386	12.64	<.001
Residual	15	2.183	0.1455		
Total	20	11.376	0.5688		
Change	-1	-0.211	0.2114	1.45	0.247

Percentage variance accounted for 74.4

Standard error of observations is estimated to be 0.381

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-85.	254.	-0.33	0.743
DL2	28.60	8.29	3.45	0.004

RHn4	0.0613	0.0137	4.46	<.001
pH_H2O	-1.356	0.427	-3.17	0.006
Rad2	0.1443	0.0539	2.68	0.017
DL3	-17.8	14.8	-1.21	0.247

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, DL2, RHn4, pH_H2O, Rad2, DL3, rain2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	9.763	1.6271	14.12	<.001
Residual	14	1.613	0.1152		
Total	20	11.376	0.5688		
Change	-1	-0.570	0.5696	4.94	0.043

Percentage variance accounted for 79.7

Standard error of observations is estimated to be 0.339

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	258.	274.	0.94	0.362

DL2	17.22	8.98	1.92	0.076
RHn4	0.0507	0.0131	3.87	0.002
pH_H2O	-1.226	0.385	-3.19	0.007
Rad2	0.1333	0.0482	2.76	0.015
DL3	-35.3	15.3	-2.30	0.037
rain2	0.00478	0.00215	2.22	0.043

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, DL2, RHn4, pH_H2O, Rad2, DL3, rain2,
frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	10.4022	1.48602	19.85	<.001
Residual	13	0.9734	0.07488		
Total	20	11.3756	0.56878		
Change	-1	-0.6396	0.63962	8.54	0.012

Percentage variance accounted for 86.8

Standard error of observations is estimated to be 0.274

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	473.	233.	2.03	0.063
DL2	13.71	7.33	1.87	0.084
RHn4	0.0537	0.0106	5.05	<.001
pH_H2O	-1.250	0.310	-4.03	0.001
Rad2	0.1387	0.0389	3.56	0.003
DL3	-49.4	13.3	-3.72	0.003
rain2	0.00656	0.00184	3.57	0.003
frost4	0.459	0.157	2.92	0.012

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, DL2, RHn4, pH_H2O, Rad2, DL3, rain2,

frost4, WS4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	10.6232	1.32790	21.18	<.001
Residual	12	0.7524	0.06270		
Total	20	11.3756	0.56878		
Change	-1	-0.2210	0.22102	3.53	0.085

Percentage variance accounted for 89.0

Standard error of observations is estimated to be 0.250

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	591.	222.	2.66	0.021
DL2	16.44	6.87	2.39	0.034
RHn4	0.0458	0.0106	4.32	<.001
pH_H2O	-1.375	0.292	-4.72	<.001
Rad2	0.1166	0.0375	3.11	0.009
DL3	-61.2	13.7	-4.47	<.001
rain2	0.00810	0.00187	4.33	<.001
frost4	0.438	0.144	3.03	0.010
WS4	0.833	0.444	1.88	0.085

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, DL2, RHn4, pH_H2O, Rad2, DL3, rain2,
frost4, WS4, DL4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	10.8230	1.20255	23.94	<.001

Residual	11	0.5526	0.05023		
Total	20	11.3756	0.56878		
Change	-1	-0.1998	0.19980	3.98	0.071

Percentage variance accounted for 91.2

Standard error of observations is estimated to be 0.224

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	757.	215.	3.51	0.005
DL2	24.03	7.23	3.32	0.007
RHn4	0.04417	0.00952	4.64	<.001
pH_H2O	-1.445	0.263	-5.49	<.001
Rad2	0.1242	0.0338	3.67	0.004
DL3	-51.3	13.2	-3.89	0.003
rain2	0.00918	0.00176	5.22	<.001
frost4	0.502	0.133	3.77	0.003
WS4	0.863	0.398	2.17	0.053
DL4	-31.0	15.6	-1.99	0.071

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, DL2, RHn4, pH_H2O, Rad2, DL3, rain2,

frost4, WS4, DL4, RC1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	10.9921	1.09921	28.67	<.001
Residual	10	0.3834	0.03834		
Total	20	11.3756	0.56878		
Change	-1	-0.1691	0.16914	4.41	0.062

Percentage variance accounted for 93.3

Standard error of observations is estimated to be 0.196

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	1080.	243.	4.44	0.001
DL2	27.81	6.57	4.23	0.002
RHn4	0.04570	0.00835	5.47	<.001
pH_H2O	-1.727	0.266	-6.48	<.001
Rad2	0.0715	0.0388	1.85	0.095
DL3	-66.3	13.6	-4.89	<.001
rain2	0.00991	0.00158	6.29	<.001
frost4	0.536	0.117	4.56	0.001
WS4	0.638	0.363	1.76	0.110
DL4	-45.4	15.2	-2.98	0.014
RC1	0.000479	0.000228	2.10	0.062

===== Cultivar 3 for FRUIT yield =====

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	25.38	25.378	15.01	0.001
Residual	19	32.12	1.690		
Total	20	57.49	2.875		
Change	-1	-25.38	25.378	15.01	0.001

Percentage variance accounted for 41.2

Standard error of observations is estimated to be 1.30

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-10.48	3.01	-3.48	0.003
rad4	0.619	0.160	3.87	0.001

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad4, Tn1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	35.21	17.604	14.22	<.001
Residual	18	22.29	1.238		
Total	20	57.49	2.875		
Change	-1	-9.83	9.829	7.94	0.011

Percentage variance accounted for 56.9

Standard error of observations is estimated to be 1.11

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-18.87	3.94	-4.79	<.001
rad4	0.805	0.152	5.30	<.001
Tn1	0.577	0.205	2.82	0.011

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad4, Tn1, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	39.36	13.120	12.30	<.001
Residual	17	18.14	1.067		
Total	20	57.49	2.875		
Change	-1	-4.15	4.152	3.89	0.065

Percentage variance accounted for 62.9

Standard error of observations is estimated to be 1.03

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-19.86	3.69	-5.38	<.001
rad4	0.788	0.141	5.58	<.001
Tn1	0.557	0.190	2.93	0.009
APP_N	0.01601	0.00812	1.97	0.065

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad4, Tn1, APP_N, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	42.36	10.5909	11.20	<.001
Residual	16	15.13	0.9457		
Total	20	57.49	2.8747		
Change	-1	-3.00	3.0045	3.18	0.094

Percentage variance accounted for 67.1

Standard error of observations is estimated to be 0.972

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-24.68	4.40	-5.61	<.001
rad4	0.896	0.146	6.13	<.001
Tn1	0.831	0.236	3.52	0.003
APP_N	0.01867	0.00779	2.40	0.029
frost4	1.018	0.571	1.78	0.094

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad4, Tn1, APP_N, frost4, Mg

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	44.01	8.8017	9.79	<.001
Residual	15	13.49	0.8991		
Total	20	57.49	2.8747		
Change	-1	-1.64	1.6448	1.83	0.196

Percentage variance accounted for 68.7

Standard error of observations is estimated to be 0.948

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-23.71	4.35	-5.45	<.001
rad4	0.808	0.157	5.15	<.001
Tn1	0.598	0.288	2.08	0.055
APP_N	0.0341	0.0137	2.49	0.025
frost4	1.141	0.564	2.02	0.061
Mg	0.01199	0.00887	1.35	0.196

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad4, Tn1, APP_N, frost4, Mg, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	48.458	8.0763	12.51	<.001
Residual	14	9.037	0.6455		
Total	20	57.495	2.8747		
Change	-1	-4.450	4.4497	6.89	0.020

Percentage variance accounted for 77.5

Standard error of observations is estimated to be 0.803

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	-42.53	8.06	-5.28	<.001
rad4	0.851	0.134	6.35	<.001
Tn1	1.100	0.310	3.55	0.003
APP_N	0.0524	0.0135	3.87	0.002
frost4	1.147	0.478	2.40	0.031
Mg	0.0311	0.0105	2.97	0.010
WS3	3.87	1.47	2.63	0.020

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad4, Tn1, APP_N, frost4, Mg, WS3,
ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	51.796	7.3994	16.88	<.001
Residual	13	5.699	0.4384		
Total	20	57.495	2.8747		
Change	-1	-3.337	3.3375	7.61	0.016

Percentage variance accounted for 84.7

Standard error of observations is estimated to be 0.662

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-38.41	6.81	-5.64	<.001
rad4	0.745	0.117	6.37	<.001
Tn1	0.498	0.336	1.48	0.162
APP_N	0.0613	0.0116	5.28	<.001
frost4	1.565	0.422	3.71	0.003
Mg	0.03942	0.00913	4.31	<.001
WS3	4.11	1.22	3.38	0.005
ETn4	0.565	0.205	2.76	0.016

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad4, Tn1, APP_N, frost4, Mg, WS3,
ETn4, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	54.633	6.8291	28.64	<.001
Residual	12	2.862	0.2385		
Total	20	57.495	2.8747		
Change	-1	-2.838	2.8376	11.90	0.005

Percentage variance accounted for 91.7

Standard error of observations is estimated to be 0.488

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	-29.77	5.61	-5.30	<.001
rad4	0.7987	0.0877	9.11	<.001
Tn1	0.697	0.254	2.74	0.018
APP_N	0.05859	0.00861	6.81	<.001

frost4	1.559	0.311	5.01	<.001
Mg	0.05358	0.00789	6.79	<.001
WS3	3.558	0.912	3.90	0.002
ETn4	0.763	0.162	4.72	<.001
pH_H2O	-2.049	0.594	-3.45	0.005

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad4, Tn1, APP_N, frost4, Mg, WS3,
ETn4, pH_H2O, DL2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	56.215	6.2461	53.67	<.001
Residual	11	1.280	0.1164		
Total	20	57.495	2.8747		
Change	-1	-1.581	1.5815	13.59	0.004

Percentage variance accounted for 96.0

Standard error of observations is estimated to be 0.341

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	-469.	119.	-3.93	0.002
rad4	0.7591	0.0622	12.21	<.001
Tn1	0.686	0.178	3.86	0.003
APP_N	0.04769	0.00670	7.12	<.001
frost4	1.454	0.219	6.63	<.001
Mg	0.04098	0.00649	6.32	<.001
WS3	5.198	0.777	6.69	<.001
ETn4	0.700	0.114	6.13	<.001
pH_H2O	-2.633	0.444	-5.93	<.001
DL2	40.5	11.0	3.69	0.004

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad4, Tn1, APP_N, frost4, Mg, WS3,
ETn4, pH_H2O, DL2, rain2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	56.452	5.6452	54.16	<.001
Residual	10	1.042	0.1042		
Total	20	57.495	2.8747		
Change	-1	-0.238	0.2378	2.28	0.162

Percentage variance accounted for 96.4

Standard error of observations is estimated to be 0.323

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	-433.	115.	-3.75	0.004
rad4	0.7523	0.0590	12.74	<.001
Tn1	0.714	0.169	4.22	0.002
APP_N	0.04937	0.00644	7.67	<.001
frost4	1.530	0.214	7.16	<.001
Mg	0.04529	0.00677	6.69	<.001
WS3	5.429	0.751	7.23	<.001
ETn4	0.749	0.113	6.64	<.001
pH_H2O	-2.560	0.423	-6.05	<.001
DL2	37.0	10.6	3.47	0.006
rain2	0.00292	0.00193	1.51	0.162

===== Cultivar 4 for FRUIT yield =====

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	518.	518.42	9.04	0.007
Residual	19	1090.	57.36		
Total	20	1608.	80.41		
Change	-1	-518.	518.42	9.04	0.007

Percentage variance accounted for 28.7

Standard error of observations is estimated to be 7.57

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-7.26	5.78	-1.26	0.224
APP_N	0.1785	0.0594	3.01	0.007

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, Rad2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	991.1	495.53	14.45	<.001

Residual	18	617.2	34.29		
Total	20	1608.2	80.41		
Change	-1	-472.6	472.64	13.78	0.002

Percentage variance accounted for 57.4

Standard error of observations is estimated to be 5.86

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-55.7	13.8	-4.04	<.001
APP_N	0.1817	0.0459	3.96	<.001
Rad2	3.017	0.813	3.71	0.002

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, Rad2, ETx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	1067.6	355.87	11.19	<.001
Residual	17	540.6	31.80		
Total	20	1608.2	80.41		

Change	-1	-76.5	76.54	2.41	0.139

Percentage variance accounted for 60.5

Standard error of observations is estimated to be 5.64

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-34.5	19.1	-1.81	0.088
APP_N	0.1656	0.0454	3.64	0.002
Rad2	2.757	0.801	3.44	0.003
ETx4	-0.428	0.276	-1.55	0.139

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, Rad2, ETx4, RC1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	1442.9	360.74	34.92	<.001
Residual	16	165.3	10.33		
Total	20	1608.2	80.41		

Change	-1	-375.3	375.34	36.33	<.001

Percentage variance accounted for 87.2

Standard error of observations is estimated to be 3.21

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	73.4	20.9	3.50	0.003
APP_N	0.1149	0.0272	4.22	<.001
Rad2	2.476	0.459	5.40	<.001
ETx4	-3.281	0.499	-6.58	<.001
RC1	-0.01659	0.00275	-6.03	<.001

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, Rad2, ETx4, RC1, rain2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	1496.3	299.253	40.09	<.001
Residual	15	112.0	7.464		
Total	20	1608.2	80.411		

Change	-1	-53.3	53.316	7.14	0.017

Percentage variance accounted for 90.7

Standard error of observations is estimated to be 2.73

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	67.7	17.9	3.78	0.002
APP_N	0.1532	0.0272	5.63	<.001
Rad2	2.450	0.390	6.28	<.001
ETx4	-3.127	0.428	-7.31	<.001
RC1	-0.01470	0.00244	-6.02	<.001
rain2	-0.0388	0.0145	-2.67	0.017

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, Rad2, ETx4, RC1, rain2, RHn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	1521.83	253.638	41.10	<.001
Residual	14	86.40	6.172		

Total	20	1608.23	80.411		
Change	-1	-25.56	25.564	4.14	0.061

Percentage variance accounted for 92.3

Standard error of observations is estimated to be 2.48

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	89.7	19.6	4.59	<.001
APP_N	0.1939	0.0318	6.09	<.001
Rad2	2.218	0.373	5.95	<.001
ETx4	-3.367	0.406	-8.28	<.001
RC1	-0.01498	0.00223	-6.73	<.001
rain2	-0.0358	0.0133	-2.70	0.017
RHn4	-0.277	0.136	-2.04	0.061

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, Rad2, ETx4, RC1, rain2, RHn4,

rad4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	1550.17	221.452	49.58	<.001
Residual	13	58.06	4.466		
Total	20	1608.23	80.411		
Change	-1	-28.34	28.339	6.34	0.026

Percentage variance accounted for 94.4

Standard error of observations is estimated to be 2.11

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	89.1	16.6	5.36	<.001
APP_N	0.2037	0.0274	7.45	<.001
Rad2	0.075	0.908	0.08	0.935
ETx4	-3.411	0.346	-9.85	<.001
RC1	-0.01543	0.00190	-8.11	<.001
rain2	-0.0440	0.0118	-3.75	0.002
RHn4	-0.328	0.118	-2.79	0.015
rad4	2.048	0.813	2.52	0.026

===== Cultivar 5 for FRUIT yield =====

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	558.7	558.71	28.85	<.001
Residual	19	368.0	19.37		
Total	20	926.7	46.33		
Change	-1	-558.7	558.71	28.85	<.001

Percentage variance accounted for 58.2

Standard error of observations is estimated to be 4.40

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-0.60	1.83	-0.33	0.747
P	0.4750	0.0884	5.37	<.001

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	662.7	331.36	22.60	<.001
Residual	18	264.0	14.66		
Total	20	926.7	46.33		
Change	-1	-104.0	104.02	7.09	0.016

Percentage variance accounted for 68.4

Standard error of observations is estimated to be 3.83

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-1.16	1.60	-0.72	0.480
P	0.4139	0.0803	5.15	<.001
ETn4	1.537	0.577	2.66	0.016

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	697.6	232.52	17.25	<.001
Residual	17	229.1	13.48		
Total	20	926.7	46.33		
Change	-1	-34.8	34.83	2.58	0.126

Percentage variance accounted for 70.9

Standard error of observations is estimated to be 3.67

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-3.99	2.34	-1.71	0.106
P	0.4251	0.0773	5.50	<.001
ETn4	1.373	0.562	2.44	0.026
K	0.0268	0.0167	1.61	0.126

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4, K, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	786.4	196.601	22.42	<.001
Residual	16	140.3	8.768		
Total	20	926.7	46.335		
Change	-1	-88.8	88.849	10.13	0.006

Percentage variance accounted for 81.1

Standard error of observations is estimated to be 2.96

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	22.56	8.55	2.64	0.018
P	0.5902	0.0811	7.28	<.001
ETn4	2.474	0.570	4.34	<.001
K	0.0499	0.0153	3.26	0.005
pH_H2O	-6.00	1.89	-3.18	0.006

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4, K, pH_H2O, DL4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	834.66	166.931	27.21	<.001
Residual	15	92.04	6.136		
Total	20	926.70	46.335		
Change	-1	-48.25	48.252	7.86	0.013

Percentage variance accounted for 86.8

Standard error of observations is estimated to be 2.48

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-4209.	1509.	-2.79	0.014
P	0.5903	0.0678	8.70	<.001
ETn4	3.042	0.518	5.87	<.001
K	0.0573	0.0131	4.39	<.001
pH_H2O	-5.82	1.58	-3.68	0.002
DL4	352.	126.	2.80	0.013

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4, K, pH_H2O, DL4, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	868.91	144.818	35.09	<.001
Residual	14	57.79	4.128		
Total	20	926.70	46.335		
Change	-1	-34.25	34.253	8.30	0.012

Percentage variance accounted for 91.1

Standard error of observations is estimated to be 2.03

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	-4703.	1250.	-3.76	0.002
P	0.6382	0.0581	10.99	<.001
ETn4	3.836	0.507	7.57	<.001
K	0.0656	0.0111	5.91	<.001
pH_H2O	-6.20	1.30	-4.77	<.001
DL4	394.	104.	3.78	0.002
frost4	3.58	1.24	2.88	0.012

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4, K, pH_H2O, DL4, frost4,

DL3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	878.83	125.547	34.10	<.001
Residual	13	47.87	3.682		
Total	20	926.70	46.335		
Change	-1	-9.92	9.918	2.69	0.125

Percentage variance accounted for 92.1

Standard error of observations is estimated to be 1.92

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-2883.	1620.	-1.78	0.099
P	0.5704	0.0687	8.31	<.001
ETn4	3.248	0.598	5.43	<.001
K	0.0555	0.0121	4.56	<.001
pH_H2O	-9.10	2.15	-4.23	<.001
DL4	383.1	98.5	3.89	0.002
frost4	3.28	1.19	2.76	0.016
DL3	-133.4	81.3	-1.64	0.125

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4, K, pH_H2O, DL4, frost4, DL3, WS4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	891.42	111.427	37.90	<.001
Residual	12	35.28	2.940		
Total	20	926.70	46.335		
Change	-1	-12.59	12.592	4.28	0.061

Percentage variance accounted for 93.7

Standard error of observations is estimated to be 1.71

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	-1895.	1524.	-1.24	0.237
P	0.5090	0.0682	7.47	<.001
ETn4	2.854	0.567	5.03	<.001
K	0.0546	0.0109	5.03	<.001
pH_H2O	-9.99	1.97	-5.07	<.001
DL4	450.1	93.8	4.80	<.001
frost4	2.43	1.14	2.14	0.054

DL3	-276.	100.	-2.76	0.017
WS4	5.94	2.87	2.07	0.061

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4, K, pH_H2O, DL4, frost4,

DL3, WS4, rain2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	896.43	99.604	36.20	<.001
Residual	11	30.26	2.751		
Total	20	926.70	46.335		
Change	-1	-5.01	5.013	1.82	0.204

Percentage variance accounted for 94.1

Standard error of observations is estimated to be 1.66

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	308.	2199.	0.14	0.891
P	0.4918	0.0671	7.33	<.001

ETn4	2.465	0.620	3.98	0.002
K	0.0506	0.0109	4.64	<.001
pH_H2O	-10.47	1.94	-5.40	<.001
DL4	353.	116.	3.04	0.011
frost4	2.62	1.11	2.36	0.037
DL3	-359.	115.	-3.13	0.010
WS4	7.78	3.09	2.52	0.029
rain2	0.0177	0.0131	1.35	0.204

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4, K, pH_H2O, DL4, frost4,
DL3, WS4, rain2, Ca

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	905.65	90.565	43.04	<.001
Residual	10	21.04	2.104		
Total	20	926.70	46.335		
Change	-1	-9.22	9.219	4.38	0.063

Percentage variance accounted for 95.5

Standard error of observations is estimated to be 1.45

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	82.	1927.	0.04	0.967
P	0.4908	0.0587	8.36	<.001
ETn4	2.447	0.542	4.52	0.001
K	0.05335	0.00963	5.54	<.001
pH_H2O	-10.91	1.71	-6.38	<.001
DL4	389.	103.	3.78	0.004
frost4	2.511	0.972	2.58	0.027
DL3	-377.	101.	-3.75	0.004
WS4	14.04	4.03	3.48	0.006
rain2	0.0254	0.0120	2.11	0.061
Ca	0.00874	0.00417	2.09	0.063

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4, K, pH_H2O, DL4, frost4,
DL3, WS4, rain2, Ca, Tx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	11	912.82	82.983	53.81	<.001
Residual	9	13.88	1.542		

Total	20	926.70	46.335		
Change	-1	-7.17	7.165	4.65	0.059

Percentage variance accounted for 96.7

Standard error of observations is estimated to be 1.24

*** Estimates of parameters ***

	estimate	s.e.	t(9)	t pr.
Constant	-2029.	1918.	-1.06	0.318
P	0.5643	0.0607	9.29	<.001
ETn4	2.527	0.465	5.43	<.001
K	0.05038	0.00836	6.02	<.001
pH_H2O	-9.61	1.58	-6.07	<.001
DL4	403.9	88.3	4.57	0.001
frost4	2.061	0.858	2.40	0.040
DL3	-227.	111.	-2.05	0.070
WS4	19.89	4.39	4.53	0.001
rain2	0.0307	0.0106	2.90	0.018
Ca	0.01268	0.00402	3.16	0.012
Tx4	0.954	0.443	2.16	0.059

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4, K, pH_H2O, DL4, frost4,

DL3, WS4, rain2, Ca, Tx4, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	12	916.30	76.358	58.75	<.001
Residual	8	10.40	1.300		
Total	20	926.70	46.335		
Change	-1	-3.48	3.481	2.68	0.140

Percentage variance accounted for 97.2

Standard error of observations is estimated to be 1.14

*** Estimates of parameters ***

	estimate	s.e.	t(8)	t pr.
Constant	-2540.	1788.	-1.42	0.193
P	0.5199	0.0620	8.38	<.001
ETn4	2.583	0.429	6.02	<.001
K	0.04891	0.00773	6.33	<.001
pH_H2O	-9.52	1.45	-6.55	<.001
DL4	417.8	81.5	5.13	<.001
frost4	2.037	0.788	2.59	0.032
DL3	-201.	103.	-1.96	0.086
WS4	21.87	4.21	5.20	<.001
rain2	0.02706	0.00997	2.72	0.026
Ca	0.01497	0.00394	3.80	0.005
Tx4	1.231	0.440	2.80	0.023
rad3	0.371	0.227	1.64	0.140

===== Cultivar 6 for FRUIT yield =====

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	166.5	166.50	9.53	0.006
Residual	19	331.9	17.47		
Total	20	498.4	24.92		
Change	-1	-166.5	166.50	9.53	0.006

Percentage variance accounted for 29.9

Standard error of observations is estimated to be 4.18

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-2.21	3.19	-0.69	0.497
APP_N	0.1012	0.0328	3.09	0.006

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, Long

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	289.4	144.72	12.47	<.001
Residual	18	208.9	11.61		
Total	20	498.4	24.92		
Change	-1	-122.9	122.94	10.59	0.004

Percentage variance accounted for 53.4

Standard error of observations is estimated to be 3.41

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	89.8	28.4	3.16	0.005
APP_N	0.0992	0.0267	3.71	0.002
Long	-3.073	0.944	-3.25	0.004

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, Long, RHx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	338.5	112.827	12.00	<.001
Residual	17	159.9	9.405		
Total	20	498.4	24.918		
Change	-1	-49.0	49.041	5.21	0.036

Percentage variance accounted for 62.3

Standard error of observations is estimated to be 3.07

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	125.9	30.1	4.19	<.001
APP_N	0.1258	0.0267	4.71	<.001
Long	-2.690	0.867	-3.10	0.006
RHx4	-0.569	0.249	-2.28	0.036

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, Long, RHx4, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	376.8	94.202	12.40	<.001
Residual	16	121.6	7.597		
Total	20	498.4	24.918		
Change	-1	-38.3	38.329	5.05	0.039

Percentage variance accounted for 69.5

Standard error of observations is estimated to be 2.76

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	139.5	27.7	5.04	<.001
APP_N	0.1070	0.0254	4.21	<.001
Long	-2.392	0.790	-3.03	0.008
RHx4	-0.650	0.227	-2.86	0.011
pH_H2O	-2.47	1.10	-2.25	0.039

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, Long, RHx4, pH_H2O, Resist

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	422.94	84.587	16.82	<.001
Residual	15	75.42	5.028		
Total	20	498.36	24.918		
Change	-1	-46.13	46.126	9.17	0.008

Percentage variance accounted for 79.8

Standard error of observations is estimated to be 2.24

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	172.2	25.0	6.89	<.001
APP_N	0.1093	0.0207	5.28	<.001
Long	-2.415	0.643	-3.76	0.002
RHx4	-0.872	0.199	-4.39	<.001
pH_H2O	-3.84	1.00	-3.83	0.002
Resist	-0.001963	0.000648	-3.03	0.008

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, Long, RHx4, pH_H2O, Resist, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	441.99	73.665	18.30	<.001
Residual	14	56.37	4.026		
Total	20	498.36	24.918		
Change	-1	-19.06	19.057	4.73	0.047

Percentage variance accounted for 83.8

Standard error of observations is estimated to be 2.01

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	172.1	22.4	7.70	<.001
APP_N	0.1342	0.0218	6.16	<.001
Long	-2.435	0.575	-4.23	<.001
RHx4	-0.962	0.183	-5.27	<.001
pH_H2O	-2.62	1.06	-2.47	0.027
Resist	-0.002312	0.000602	-3.84	0.002
frost4	2.65	1.22	2.18	0.047

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, Long, RHx4, pH_H2O, Resist,
frost4, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	452.57	64.653	18.36	<.001
Residual	13	45.79	3.522		
Total	20	498.36	24.918		
Change	-1	-10.58	10.581	3.00	0.107

Percentage variance accounted for 85.9

Standard error of observations is estimated to be 1.88

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	111.7	40.6	2.75	0.017
APP_N	0.1356	0.0204	6.65	<.001
Long	-0.84	1.07	-0.78	0.447
RHx4	-1.023	0.174	-5.87	<.001

pH_H2O	-2.32	1.01	-2.31	0.038
Resist	-0.001833	0.000627	-2.92	0.012
frost4	2.91	1.15	2.53	0.025
rad3	0.732	0.423	1.73	0.107

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, Long, RHx4, pH_H2O, Resist,
frost4, rad3, rain2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	460.45	57.556	18.22	<.001
Residual	12	37.91	3.159		
Total	20	498.36	24.918		
Change	-1	-7.88	7.875	2.49	0.140

Percentage variance accounted for 87.3

Standard error of observations is estimated to be 1.78

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.

Constant	109.2	38.5	2.84	0.015
APP_N	0.1396	0.0195	7.17	<.001
Long	-0.99	1.02	-0.98	0.348
RHx4	-0.907	0.181	-5.01	<.001
pH_H2O	-2.92	1.03	-2.85	0.015
Resist	-0.001768	0.000595	-2.97	0.012
frost4	2.61	1.11	2.36	0.036
rad3	0.769	0.401	1.92	0.079
rain2	-0.0164	0.0104	-1.58	0.140

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, Long, RHx4, pH_H2O, Resist,

frost4, rad3, rain2, DL4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	469.02	52.113	19.54	<.001
Residual	11	29.34	2.667		
Total	20	498.36	24.918		
Change	-1	-8.57	8.572	3.21	0.101

Percentage variance accounted for 89.3

Standard error of observations is estimated to be 1.63

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	-2693.	1563.	-1.72	0.113
APP_N	0.1322	0.0184	7.20	<.001
Long	0.26	1.17	0.22	0.829
RHx4	-0.858	0.168	-5.10	<.001
pH_H2O	-3.023	0.945	-3.20	0.008
Resist	-0.001262	0.000616	-2.05	0.065
frost4	1.73	1.13	1.53	0.154
rad3	1.115	0.416	2.68	0.021
rain2	-0.0308	0.0125	-2.47	0.031
DL4	230.	128.	1.79	0.101

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, Long, RHx4, pH_H2O, Resist,

frost4, rad3, rain2, DL4, Tn1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	476.60	47.660	21.91	<.001
Residual	10	21.76	2.176		

Total	20	498.36	24.918		
Change	-1	-7.58	7.582	3.48	0.091

Percentage variance accounted for 91.3

Standard error of observations is estimated to be 1.48

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	-3655.	1503.	-2.43	0.035
APP_N	0.0985	0.0245	4.02	0.002
Long	-0.29	1.09	-0.27	0.796
RHx4	-0.671	0.182	-3.68	0.004
pH_H2O	-5.62	1.63	-3.44	0.006
Resist	-0.001060	0.000566	-1.87	0.091
frost4	1.53	1.03	1.49	0.167
rad3	1.320	0.391	3.37	0.007
rain2	-0.0391	0.0121	-3.23	0.009
DL4	310.	123.	2.51	0.031
Tn1	1.473	0.789	1.87	0.091

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, Long, RHx4, pH_H2O, Resist,

frost4, rad3, rain2, DL4, Tn1, PC4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	11	482.34	43.849	24.63	<.001
Residual	9	16.02	1.781		
Total	20	498.36	24.918		
Change	-1	-5.73	5.733	3.22	0.106

Percentage variance accounted for 92.9

Standard error of observations is estimated to be 1.33

*** Estimates of parameters ***

	estimate	s.e.	t(9)	t pr.
Constant	-4974.	1546.	-3.22	0.011
APP_N	0.1042	0.0224	4.65	0.001
Long	0.71	1.14	0.63	0.547
RHx4	-0.786	0.177	-4.44	0.002
pH_H2O	-3.54	1.88	-1.89	0.092
Resist	-0.001173	0.000516	-2.27	0.049
frost4	1.470	0.929	1.58	0.148
rad3	1.709	0.415	4.12	0.003
rain2	-0.0417	0.0111	-3.77	0.004
DL4	416.	126.	3.29	0.009
Tn1	2.268	0.840	2.70	0.024
PC4	0.00464	0.00259	1.79	0.106

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, Long, RHx4, pH_H2O, Resist,

frost4, rad3, rain2, DL4, Tn1, PC4, Eto4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	12	492.510	41.0425	56.12	<.001
Residual	8	5.851	0.7313		
Total	20	498.360	24.9180		
Change	-1	-10.174	10.1740	13.91	0.006

Percentage variance accounted for 97.1

Standard error of observations is estimated to be 0.855

*** Estimates of parameters ***

	estimate	s.e.	t(8)	t pr.
Constant	-4656.	994.	-4.68	0.002
APP_N	0.1179	0.0148	7.96	<.001
Long	-0.441	0.790	-0.56	0.592
RHx4	-0.490	0.138	-3.54	0.008
pH_H2O	-3.64	1.20	-3.03	0.016
Resist	-0.000883	0.000340	-2.60	0.032

frost4	1.417	0.595	2.38	0.045
rad3	1.357	0.282	4.81	0.001
rain2	-0.04297	0.00709	-6.06	<.001
DL4	387.9	81.2	4.77	0.001
Tn1	3.704	0.662	5.60	<.001
PC4	0.00850	0.00195	4.35	0.002
Eto4	4.34	1.16	3.73	0.006

===== Cultivar 7 for FRUIT yield =====

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***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	8.80	8.8009	15.14	<.001
Residual	19	11.04	0.5813		
Total	20	19.85	0.9923		
Change	-1	-8.80	8.8009	15.14	<.001

Percentage variance accounted for 41.4

Standard error of observations is estimated to be 0.762

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-5.96	1.69	-3.51	0.002
rad3	0.3219	0.0827	3.89	<.001

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***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad3, DL2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	11.403	5.7017	12.16	<.001
Residual	18	8.442	0.4690		
Total	20	19.846	0.9923		
Change	-1	-2.602	2.6025	5.55	0.030

Percentage variance accounted for 52.7

Standard error of observations is estimated to be 0.685

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-120.1	48.5	-2.48	0.023
rad3	0.3324	0.0745	4.46	<.001
DL2	10.44	4.43	2.36	0.030

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***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad3, DL2, DL4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	13.639	4.5463	12.45	<.001
Residual	17	6.207	0.3651		
Total	20	19.846	0.9923		
Change	-1	-2.235	2.2354	6.12	0.024

Percentage variance accounted for 63.2

Standard error of observations is estimated to be 0.604

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	-954.	340.	-2.81	0.012

rad3	0.2807	0.0689	4.07	<.001
DL2	12.93	4.04	3.20	0.005
DL4	67.3	27.2	2.47	0.024

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***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad3, DL2, DL4, ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	15.928	3.9820	16.26	<.001
Residual	16	3.918	0.2449		
Total	20	19.846	0.9923		
Change	-1	-2.289	2.2893	9.35	0.008

Percentage variance accounted for 75.3

Standard error of observations is estimated to be 0.495

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	-1292.	299.	-4.32	<.001
rad3	0.3006	0.0568	5.29	<.001

DL2	5.27	4.15	1.27	0.222
DL4	102.4	25.1	4.09	<.001
ETn4	0.325	0.106	3.06	0.008

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad3, DL2, DL4, ETn4, Tave3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	16.565	3.3130	15.15	<.001
Residual	15	3.281	0.2187		
Total	20	19.846	0.9923		
Change	-1	-0.637	0.6366	2.91	0.109

Percentage variance accounted for 78.0

Standard error of observations is estimated to be 0.468

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	-1344.	285.	-4.72	<.001
rad3	0.2183	0.0722	3.02	0.009

DL2	21.9	10.5	2.09	0.055
DL4	92.1	24.4	3.77	0.002
ETn4	0.336	0.101	3.34	0.005
Tave3	-0.225	0.132	-1.71	0.109

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad3, DL2, DL4, ETn4, Tave3, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	17.140	2.8567	14.78	<.001
Residual	14	2.706	0.1933		
Total	20	19.846	0.9923		
Change	-1	-0.575	0.5752	2.98	0.107

Percentage variance accounted for 80.5

Standard error of observations is estimated to be 0.440

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.

Constant	-1357.	268.	-5.07	<.001
rad3	0.2391	0.0689	3.47	0.004
DL2	24.00	9.94	2.41	0.030
DL4	91.2	23.0	3.97	0.001
ETn4	0.422	0.107	3.95	0.001
Tave3	-0.235	0.124	-1.90	0.079
frost4	0.461	0.267	1.73	0.107

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad3, DL2, DL4, ETn4, Tave3, frost4,

pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	17.739	2.5342	15.64	<.001
Residual	13	2.106	0.1620		
Total	20	19.846	0.9923		
Change	-1	-0.600	0.5995	3.70	0.077

Percentage variance accounted for 83.7

Standard error of observations is estimated to be 0.403

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-1251.	251.	-4.98	<.001
rad3	0.2219	0.0638	3.48	0.004
DL2	42.2	13.1	3.21	0.007
DL4	66.3	24.7	2.68	0.019
ETn4	0.4224	0.0980	4.31	<.001
Tave3	-0.293	0.117	-2.50	0.027
frost4	0.511	0.246	2.07	0.058
pH_H2O	-0.857	0.445	-1.92	0.077

===== Cultivar 8 for FRUIT yield =====

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	380.3	380.27	30.20	<.001
Residual	19	239.2	12.59		
Total	20	619.5	30.97		
Change	-1	-380.3	380.27	30.20	<.001

Percentage variance accounted for 59.4

Standard error of observations is estimated to be 3.55

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-1.14	1.47	-0.77	0.449
P	0.3919	0.0713	5.50	<.001

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***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	442.2	221.083	22.44	<.001
Residual	18	177.3	9.851		
Total	20	619.5	30.974		
Change	-1	-61.9	61.897	6.28	0.022

Percentage variance accounted for 68.2

Standard error of observations is estimated to be 3.14

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-1.57	1.31	-1.19	0.248
P	0.3448	0.0658	5.24	<.001
ETn4	1.185	0.473	2.51	0.022

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	470.8	156.933	17.94	<.001
Residual	17	148.7	8.746		
Total	20	619.5	30.974		
Change	-1	-28.6	28.631	3.27	0.088

Percentage variance accounted for 71.8

Standard error of observations is estimated to be 2.96

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	12.93	8.11	1.59	0.129
P	0.4225	0.0754	5.60	<.001
ETn4	1.806	0.562	3.21	0.005
pH_H2O	-3.00	1.66	-1.81	0.088

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4, pH_H2O, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	527.80	131.951	23.03	<.001
Residual	16	91.68	5.730		
Total	20	619.48	30.974		
Change	-1	-57.00	57.005	9.95	0.006

Percentage variance accounted for 81.5

Standard error of observations is estimated to be 2.39

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	19.80	6.91	2.86	0.011
P	0.4977	0.0656	7.59	<.001
ETn4	2.040	0.461	4.42	<.001
pH_H2O	-5.28	1.52	-3.46	0.003
K	0.0390	0.0124	3.15	0.006

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4, pH_H2O, K, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	550.41	110.082	23.91	<.001
Residual	15	69.07	4.605		
Total	20	619.48	30.974		
Change	-1	-22.61	22.609	4.91	0.043

Percentage variance accounted for 85.1

Standard error of observations is estimated to be 2.15

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	19.15	6.21	3.09	0.008
P	0.5362	0.0613	8.75	<.001
ETn4	2.625	0.491	5.35	<.001
pH_H2O	-5.61	1.37	-4.08	<.001
K	0.0449	0.0114	3.94	0.001
frost4	2.88	1.30	2.22	0.043

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4, pH_H2O, K, frost4, DL4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	578.12	96.353	32.61	<.001
Residual	14	41.36	2.954		
Total	20	619.48	30.974		
Change	-1	-27.71	27.708	9.38	0.008

Percentage variance accounted for 90.5

Standard error of observations is estimated to be 1.72

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	-3218.	1057.	-3.04	0.009
P	0.5422	0.0491	11.04	<.001
ETn4	3.149	0.429	7.35	<.001
pH_H2O	-5.52	1.10	-5.01	<.001
K	0.05151	0.00938	5.49	<.001
frost4	3.32	1.05	3.16	0.007
DL4	269.6	88.0	3.06	0.008

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4, pH_H2O, K, frost4, DL4,
WS4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	582.60	83.229	29.34	<.001
Residual	13	36.88	2.837		
Total	20	619.48	30.974		

Change	-1	-4.48	4.482	1.58	0.231

Percentage variance accounted for 90.8

Standard error of observations is estimated to be 1.68

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	-3635.	1088.	-3.34	0.005
P	0.5471	0.0483	11.33	<.001
ETn4	3.251	0.428	7.60	<.001
pH_H2O	-4.55	1.32	-3.44	0.004
K	0.05584	0.00982	5.69	<.001
frost4	3.10	1.05	2.96	0.011
DL4	303.4	90.3	3.36	0.005
WS4	2.57	2.04	1.26	0.231

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4, pH_H2O, K, frost4, DL4,

WS4, DL1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.

Regression	8	593.84	74.230	34.74 <.001
Residual	12	25.64	2.137	
Total	20	619.48	30.974	
Change	-1	-11.24	11.238	5.26 0.041

Percentage variance accounted for 93.1

Standard error of observations is estimated to be 1.46

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	-3896.	951.	-4.10	0.001
P	0.4460	0.0608	7.33	<.001
ETn4	2.743	0.432	6.34	<.001
pH_H2O	-7.52	1.73	-4.35	<.001
K	0.04593	0.00955	4.81	<.001
frost4	2.518	0.942	2.67	0.020
DL4	207.3	88.9	2.33	0.038
WS4	6.20	2.38	2.61	0.023
DL1	128.0	55.8	2.29	0.041

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4, pH_H2O, K, frost4, DL4,

WS4, DL1, Ca

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	601.93	66.882	41.93	<.001
Residual	11	17.55	1.595		
Total	20	619.48	30.974		
Change	-1	-8.09	8.094	5.07	0.046

Percentage variance accounted for 94.9

Standard error of observations is estimated to be 1.26

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	-4909.	937.	-5.24	<.001
P	0.4149	0.0543	7.64	<.001
ETn4	2.678	0.375	7.15	<.001
pH_H2O	-8.82	1.60	-5.51	<.001
K	0.04651	0.00826	5.63	<.001
frost4	2.097	0.835	2.51	0.029
DL4	256.4	79.8	3.21	0.008
WS4	12.70	3.54	3.58	0.004
DL1	165.0	51.0	3.24	0.008
Ca	0.00820	0.00364	2.25	0.046

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4, pH_H2O, K, frost4, DL4,
WS4, DL1, Ca, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	610.383	61.0383	67.09	<.001
Residual	10	9.098	0.9098		
Total	20	619.480	30.9740		
Change	-1	-8.449	8.4490	9.29	0.012

Percentage variance accounted for 97.1

Standard error of observations is estimated to be 0.954

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	-4860.	708.	-6.87	<.001
P	0.2921	0.0575	5.08	<.001
ETn4	2.567	0.285	9.00	<.001
pH_H2O	-10.10	1.28	-7.89	<.001
K	0.04292	0.00635	6.76	<.001
frost4	2.237	0.632	3.54	0.005
DL4	195.8	63.5	3.08	0.012
WS4	16.02	2.89	5.54	<.001

DL1	225.0	43.2	5.21	<.001
Ca	0.01231	0.00306	4.02	0.002
rad3	0.545	0.179	3.05	0.012

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4, pH_H2O, K, frost4, DL4,
WS4, DL1, Ca, rad3, Tn1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	11	614.127	55.8297	93.86	<.001
Residual	9	5.353	0.5948		
Total	20	619.480	30.9740		
Change	-1	-3.744	3.7443	6.29	0.033

Percentage variance accounted for 98.1

Standard error of observations is estimated to be 0.771

*** Estimates of parameters ***

	estimate	s.e.	t(9)	t pr.

Constant	-4674.	577.	-8.10	<.001
P	0.2877	0.0465	6.18	<.001
ETn4	2.133	0.288	7.40	<.001
pH_H2O	-10.01	1.04	-9.66	<.001
K	0.03850	0.00543	7.09	<.001
frost4	2.291	0.512	4.48	0.002
DL4	194.4	51.3	3.79	0.004
WS4	16.28	2.34	6.96	<.001
DL1	208.6	35.5	5.87	<.001
Ca	0.01301	0.00249	5.22	<.001
rad3	0.738	0.164	4.51	0.001
Tn1	0.968	0.386	2.51	0.033

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, ETn4, pH_H2O, K, frost4, DL4,

WS4, DL1, Ca, rad3, Tn1, PC4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	12	616.126	51.3438	122.44	<.001
Residual	8	3.355	0.4193		
Total	20	619.480	30.9740		
Change	-1	-1.999	1.9986	4.77	0.061

Percentage variance accounted for 98.6

Standard error of observations is estimated to be 0.648

*** Estimates of parameters ***

	estimate	s.e.	t(8)	t pr.
Constant	-5137.	529.	-9.71	<.001
P	0.2647	0.0405	6.54	<.001
ETn4	1.948	0.257	7.59	<.001
pH_H2O	-10.559	0.906	-11.66	<.001
K	0.03580	0.00472	7.58	<.001
frost4	2.363	0.431	5.48	<.001
DL4	188.4	43.2	4.36	0.002
WS4	15.52	1.99	7.78	<.001
DL1	256.0	36.9	6.93	<.001
Ca	0.01430	0.00217	6.58	<.001
rad3	0.937	0.165	5.68	<.001
Tn1	1.835	0.513	3.58	0.007
PC4	0.00477	0.00218	2.18	0.061

===== Cultivar 10 for FRUIT yield =====

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***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	227.4	227.44	15.05	0.001
Residual	19	287.2	15.12		
Total	20	514.7	25.73		
Change	-1	-227.4	227.44	15.05	0.001

Percentage variance accounted for 41.3

Standard error of observations is estimated to be 3.89

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-2.62	2.97	-0.88	0.388
APP_N	0.1182	0.0305	3.88	0.001

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***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, rad3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	348.0	174.008	18.79	<.001
Residual	18	166.6	9.258		
Total	20	514.7	25.733		
Change	-1	-120.6	120.576	13.02	0.002

Percentage variance accounted for 64.0

Standard error of observations is estimated to be 3.04

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-26.27	6.95	-3.78	0.001
APP_N	0.1102	0.0240	4.60	<.001
rad3	1.197	0.332	3.61	0.002

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***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, rad3, RHx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.

Regression	3	408.7	136.229	21.85	<.001
Residual	17	106.0	6.234		
Total	20	514.7	25.733		
Change	-1	-60.7	60.672	9.73	0.006

Percentage variance accounted for 75.8

Standard error of observations is estimated to be 2.50

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	25.2	17.5	1.44	0.167
APP_N	0.1388	0.0217	6.40	<.001
rad3	1.223	0.272	4.49	<.001
RHx4	-0.622	0.199	-3.12	0.006

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***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, rad3, RHx4, rain3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.

Regression	4	423.01	105.752	18.46	<.001
Residual	16	91.66	5.728		
Total	20	514.66	25.733		

Change	-1	-14.32	14.320	2.50	0.133

Percentage variance accounted for 77.7

Standard error of observations is estimated to be 2.39

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	17.7	17.4	1.01	0.325
APP_N	0.1390	0.0208	6.69	<.001
rad3	1.190	0.262	4.55	<.001
RHx4	-0.494	0.207	-2.38	0.030
rain3	-0.00480	0.00304	-1.58	0.133

===== Cultivar 11 for FRUIT yield =====

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***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	533.5	533.51	33.30	<.001
Residual	19	304.4	16.02		
Total	20	837.9	41.90		
Change	-1	-533.5	533.51	33.30	<.001

Percentage variance accounted for 61.8

Standard error of observations is estimated to be 4.00

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-0.93	1.66	-0.56	0.580
P	0.4642	0.0804	5.77	<.001

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***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, Tn1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.

Regression	2	629.3	314.67	27.15	<.001
Residual	18	208.6	11.59		
Total	20	837.9	41.90		
Change	-1	-95.8	95.84	8.27	0.010

Percentage variance accounted for 72.3

Standard error of observations is estimated to be 3.40

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-14.28	4.85	-2.94	0.009
P	0.4100	0.0710	5.78	<.001
Tn1	1.683	0.585	2.88	0.010

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***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, Tn1, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	702.2	234.073	29.32	<.001

Residual	17	135.7	7.984		
Total	20	837.9	41.897		
Change	-1	-72.9	72.871	9.13	0.008

Percentage variance accounted for 80.9

Standard error of observations is estimated to be 2.83

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	0.62	6.37	0.10	0.923
P	0.5516	0.0753	7.33	<.001
Tn1	3.330	0.730	4.56	<.001
pH_H2O	-5.70	1.89	-3.02	0.008

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***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, Tn1, pH_H2O, DL3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	745.57	186.393	32.28	<.001
Residual	16	92.38	5.774		

Total	20	837.95	41.897		
Change	-1	-43.35	43.353	7.51	0.015

Percentage variance accounted for 86.2

Standard error of observations is estimated to be 2.40

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	3248.	1185.	2.74	0.015
P	0.4381	0.0762	5.75	<.001
Tn1	2.004	0.787	2.55	0.022
pH_H2O	-11.33	2.61	-4.35	<.001
DL3	-254.8	93.0	-2.74	0.015

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***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, Tn1, pH_H2O, DL3, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	758.86	151.772	28.78	<.001
Residual	15	79.09	5.273		

Total	20	837.95	41.897		
Change	-1	-13.29	13.286	2.52	0.133

Percentage variance accounted for 87.4

Standard error of observations is estimated to be 2.30

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	2808.	1166.	2.41	0.029
P	0.4815	0.0778	6.19	<.001
Tn1	1.969	0.753	2.62	0.019
pH_H2O	-11.08	2.49	-4.44	<.001
DL3	-220.1	91.5	-2.41	0.029
K	0.0196	0.0123	1.59	0.133

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***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, Tn1, pH_H2O, DL3, K, RHn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	772.57	128.761	27.57	<.001

Residual	14	65.38	4.670		
Total	20	837.95	41.897		
Change	-1	-13.71	13.707	2.93	0.109

Percentage variance accounted for 88.9

Standard error of observations is estimated to be 2.16

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	3298.	1134.	2.91	0.011
P	0.4829	0.0733	6.59	<.001
Tn1	1.582	0.743	2.13	0.052
pH_H2O	-11.05	2.35	-4.71	<.001
DL3	-259.4	89.1	-2.91	0.011
K	0.0236	0.0119	1.99	0.067
RHn4	0.1422	0.0830	1.71	0.109

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***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, Tn1, pH_H2O, DL3, K, RHn4, WS4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	782.79	111.828	26.36	<.001
Residual	13	55.16	4.243		
Total	20	837.95	41.897		
Change	-1	-10.23	10.228	2.41	0.145

Percentage variance accounted for 89.9

Standard error of observations is estimated to be 2.06

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	4318.	1265.	3.41	0.005
P	0.4578	0.0717	6.39	<.001
Tn1	1.527	0.709	2.15	0.051
pH_H2O	-11.49	2.26	-5.09	<.001
DL3	-341.1	99.9	-3.41	0.005
K	0.0255	0.0114	2.24	0.043
RHn4	0.1269	0.0797	1.59	0.135
WS4	4.50	2.90	1.55	0.145

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***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, Tn1, pH_H2O, DL3, K, RHn4, WS4,

DL4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	798.56	99.821	30.41	<.001
Residual	12	39.39	3.282		
Total	20	837.95	41.897		
Change	-1	-15.77	15.772	4.81	0.049

Percentage variance accounted for 92.2

Standard error of observations is estimated to be 1.81

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	2481.	1393.	1.78	0.100
P	0.4316	0.0642	6.73	<.001
Tn1	1.777	0.634	2.80	0.016
pH_H2O	-11.83	1.99	-5.95	<.001
DL3	-402.2	92.2	-4.36	<.001
K	0.0272	0.0100	2.72	0.019
RHn4	0.0953	0.0716	1.33	0.208
WS4	7.28	2.85	2.56	0.025
DL4	216.7	98.8	2.19	0.049

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***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, Tn1, pH_H2O, DL3, K, RHn4, WS4,
DL4, Ca

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	811.34	90.149	37.27	<.001
Residual	11	26.60	2.419		
Total	20	837.95	41.897		
Change	-1	-12.78	12.780	5.28	0.042

Percentage variance accounted for 94.2

Standard error of observations is estimated to be 1.56

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	1514.	1267.	1.20	0.257
P	0.4409	0.0552	7.98	<.001
Tn1	1.839	0.545	3.37	0.006
pH_H2O	-12.20	1.72	-7.11	<.001
DL3	-393.8	79.2	-4.97	<.001
K	0.03150	0.00880	3.58	0.004
RHn4	0.1394	0.0644	2.17	0.053
WS4	13.22	3.55	3.72	0.003
DL4	286.7	90.1	3.18	0.009

Ca	0.01004	0.00437	2.30	0.042

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***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, Tn1, pH_H2O, DL3, K, RHn4, WS4, DL4, Ca, DL1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	819.86	81.986	45.31	<.001
Residual	10	18.09	1.809		
Total	20	837.95	41.897		
Change	-1	-8.51	8.510	4.70	0.055

Percentage variance accounted for 95.7

Standard error of observations is estimated to be 1.35

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	-540.	1449.	-0.37	0.717
P	0.3697	0.0580	6.38	<.001
Tn1	1.395	0.514	2.71	0.022

pH_H2O	-14.15	1.73	-8.16	<.001
DL3	-255.7	93.5	-2.73	0.021
K	0.02831	0.00776	3.65	0.004
RHn4	0.1664	0.0570	2.92	0.015
WS4	17.49	3.65	4.79	<.001
DL4	155.7	98.6	1.58	0.145
Ca	0.01460	0.00432	3.38	0.007
DL1	170.0	78.4	2.17	0.055

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, Tn1, pH_H2O, DL3, K, RHn4, WS4,
DL4, Ca, DL1, rain2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	11	826.15	75.104	57.26	<.001
Residual	9	11.80	1.312		
Total	20	837.95	41.897		
Change	-1	-6.29	6.290	4.80	0.056

Percentage variance accounted for 96.9

Standard error of observations is estimated to be 1.15

*** Estimates of parameters ***

	estimate	s.e.	t(9)	t pr.
Constant	943.	1407.	0.67	0.520
P	0.3628	0.0494	7.34	<.001
Tn1	1.235	0.444	2.78	0.021
pH_H2O	-14.34	1.48	-9.70	<.001
DL3	-315.3	84.2	-3.75	0.005
K	0.02812	0.00660	4.26	0.002
RHn4	0.1265	0.0519	2.44	0.037
WS4	20.69	3.44	6.02	<.001
DL4	98.5	87.9	1.12	0.292
Ca	0.01647	0.00378	4.36	0.002
DL1	165.4	66.8	2.48	0.035
rain2	0.01916	0.00875	2.19	0.056

===== Cultivar 12 for FRUIT yield =====

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.

Regression	1	749.1	749.14	38.39	<.001
Residual	19	370.8	19.52		
Total	20	1120.0	56.00		
Change	-1	-749.1	749.14	38.39	<.001

Percentage variance accounted for 65.1

Standard error of observations is estimated to be 4.42

*** Estimates of parameters ***

	estimate	s.e.	t(19)	t pr.
Constant	-1.37	1.83	-0.75	0.465
P	0.5500	0.0888	6.20	<.001

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, Tn1

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	854.0	427.00	28.90	<.001
Residual	18	266.0	14.78		
Total	20	1120.0	56.00		

Change	-1	-104.9	104.85	7.10	0.016

Percentage variance accounted for 73.6

Standard error of observations is estimated to be 3.84

*** Estimates of parameters ***

	estimate	s.e.	t(18)	t pr.
Constant	-15.33	5.48	-2.80	0.012
P	0.4933	0.0801	6.16	<.001
Tn1	1.760	0.661	2.66	0.016

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, Tn1, pH_H2O

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	937.4	312.48	29.11	<.001
Residual	17	182.5	10.74		
Total	20	1120.0	56.00		

Change	-1	-83.4	83.45	7.77	0.013

Percentage variance accounted for 80.8

Standard error of observations is estimated to be 3.28

*** Estimates of parameters ***

	estimate	s.e.	t(17)	t pr.
Constant	0.62	7.39	0.08	0.934
P	0.6449	0.0873	7.39	<.001
Tn1	3.523	0.847	4.16	<.001
pH_H2O	-6.10	2.19	-2.79	0.013

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, Tn1, pH_H2O, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	974.5	243.632	26.80	<.001
Residual	16	145.4	9.089		
Total	20	1120.0	55.998		
Change	-1	-37.1	37.084	4.08	0.060

Percentage variance accounted for 83.8

Standard error of observations is estimated to be 3.01

*** Estimates of parameters ***

	estimate	s.e.	t(16)	t pr.
Constant	4.08	7.01	0.58	0.569
P	0.6903	0.0834	8.28	<.001
Tn1	3.173	0.798	3.98	0.001
pH_H2O	-6.94	2.06	-3.38	0.004
K	0.0318	0.0157	2.02	0.060

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, Tn1, pH_H2O, K, DL3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	5	992.5	198.503	23.36	<.001
Residual	15	127.4	8.496		
Total	20	1120.0	55.998		
Change	-1	-18.0	17.986	2.12	0.166

Percentage variance accounted for 84.8

Standard error of observations is estimated to be 2.91

*** Estimates of parameters ***

	estimate	s.e.	t(15)	t pr.
Constant	2157.	1480.	1.46	0.166
P	0.6073	0.0988	6.15	<.001
Tn1	2.353	0.955	2.46	0.026
pH_H2O	-10.53	3.17	-3.32	0.005
K	0.0264	0.0157	1.68	0.113
DL3	-169.	116.	-1.45	0.166

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, Tn1, pH_H2O, K, DL3, Long

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	6	1030.68	171.780	26.94	<.001
Residual	14	89.28	6.377		
Total	20	1119.96	55.998		

Change	-1	-38.17	38.168	5.99	0.028

Percentage variance accounted for 88.6

Standard error of observations is estimated to be 2.53

*** Estimates of parameters ***

	estimate	s.e.	t(14)	t pr.
Constant	4221.	1535.	2.75	0.016
P	0.373	0.128	2.91	0.012
Tn1	2.826	0.850	3.32	0.005
pH_H2O	-13.76	3.05	-4.52	<.001
K	0.0335	0.0139	2.41	0.030
DL3	-323.	119.	-2.72	0.017
Long	-3.57	1.46	-2.45	0.028

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, Tn1, pH_H2O, K, DL3, Long, frost4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	7	1050.67	150.095	28.16	<.001

Residual	13	69.29	5.330		
Total	20	1119.96	55.998		
Change	-1	-19.99	19.987	3.75	0.075

Percentage variance accounted for 90.5

Standard error of observations is estimated to be 2.31

*** Estimates of parameters ***

	estimate	s.e.	t(13)	t pr.
Constant	4747.	1429.	3.32	0.006
P	0.353	0.118	2.99	0.010
Tn1	3.339	0.821	4.07	0.001
pH_H2O	-14.67	2.82	-5.20	<.001
K	0.0356	0.0127	2.79	0.015
DL3	-363.	111.	-3.29	0.006
Long	-4.28	1.38	-3.09	0.009
frost4	2.53	1.31	1.94	0.075

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, Tn1, pH_H2O, K, DL3, Long, frost4,

ETx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	8	1068.03	133.504	30.85	<.001
Residual	12	51.93	4.327		
Total	20	1119.96	55.998		
Change	-1	-17.36	17.360	4.01	0.068

Percentage variance accounted for 92.3

Standard error of observations is estimated to be 2.08

*** Estimates of parameters ***

	estimate	s.e.	t(12)	t pr.
Constant	6150.	1466.	4.20	0.001
P	0.310	0.108	2.86	0.014
Tn1	3.481	0.743	4.68	<.001
pH_H2O	-14.36	2.55	-5.63	<.001
K	0.0335	0.0115	2.91	0.013
DL3	-475.	114.	-4.16	0.001
Long	-3.50	1.31	-2.68	0.020
frost4	2.76	1.18	2.33	0.038
ETx4	-0.624	0.312	-2.00	0.068

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, Tn1, pH_H2O, K, DL3, Long, frost4,
ETx4, Tn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	9	1082.34	120.260	35.17	<.001
Residual	11	37.61	3.419		
Total	20	1119.96	55.998		
Change	-1	-14.32	14.316	4.19	0.065

Percentage variance accounted for 93.9

Standard error of observations is estimated to be 1.85

*** Estimates of parameters ***

	estimate	s.e.	t(11)	t pr.
Constant	5671.	1324.	4.28	0.001
P	0.2892	0.0968	2.99	0.012
Tn1	1.967	0.992	1.98	0.073
pH_H2O	-14.47	2.27	-6.39	<.001
K	0.0287	0.0105	2.73	0.020
DL3	-435.	103.	-4.21	0.001
Long	-4.32	1.23	-3.51	0.005
frost4	2.57	1.06	2.44	0.033
ETx4	-1.294	0.429	-3.02	0.012
Tn4	3.04	1.48	2.05	0.065

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P, Tn1, pH_H2O, K, DL3, Long, frost4,

ETx4, Tn4, rain4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	10	1088.37	108.837	34.45	<.001
Residual	10	31.59	3.159		
Total	20	1119.96	55.998		
Change	-1	-6.02	6.022	1.91	0.197

Percentage variance accounted for 94.4

Standard error of observations is estimated to be 1.78

*** Estimates of parameters ***

	estimate	s.e.	t(10)	t pr.
Constant	6046.	1301.	4.65	<.001
P	0.2640	0.0948	2.78	0.019
Tn1	1.28	1.08	1.19	0.261
pH_H2O	-15.81	2.38	-6.63	<.001

K	0.0303	0.0102	2.97	0.014
DL3	-463.	101.	-4.57	0.001
Long	-5.41	1.42	-3.81	0.003
frost4	2.99	1.06	2.82	0.018
ETx4	-1.233	0.414	-2.98	0.014
Tn4	3.91	1.56	2.51	0.031
rain4	0.00480	0.00348	1.38	0.197

===== Area 1 for FRUIT yield =====

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	158.	157.86	9.21	0.003
Residual	75	1285.	17.14		
Total	76	1443.	18.99		
Change	-1	-158.	157.86	9.21	0.003

Percentage variance accounted for 9.8

Standard error of observations is estimated to be 4.14

*** Estimates of parameters ***

	estimate	s.e.	t(75)	t pr.
Constant	-0.53	1.68	-0.32	0.753
APP_N	0.0553	0.0182	3.04	0.003

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, Tx2

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	218.	108.79	6.57	0.002
Residual	74	1225.	16.56		
Total	76	1443.	18.99		
Change	-1	-60.	59.73	3.61	0.061

Percentage variance accounted for 12.8

Standard error of observations is estimated to be 4.07

*** Estimates of parameters ***

	estimate	s.e.	t(74)	t pr.
Constant	-29.7	15.4	-1.92	0.058
APP_N	0.0581	0.0180	3.23	0.002
Tx2	1.078	0.568	1.90	0.061

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, APP_N, Tx2, K

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	252.	83.98	5.15	0.003
Residual	73	1191.	16.32		
Total	76	1443.	18.99		
Change	-1	-34.	34.34	2.10	0.151

Percentage variance accounted for 14.1

Standard error of observations is estimated to be 4.04

*** Estimates of parameters ***

	estimate	s.e.	t(73)	t pr.
Constant	-41.9	17.5	-2.40	0.019
APP_N	0.0653	0.0185	3.53	<.001
Tx2	1.444	0.617	2.34	0.022
K	0.01244	0.00857	1.45	0.151

===== Area 2 for FRUIT yield =====

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	731.	731.35	16.27	<.001
Residual	75	3372.	44.96		
Total	76	4104.	53.99		
Change	-1	-731.	731.35	16.27	<.001

Percentage variance accounted for 16.7

Standard error of observations is estimated to be 6.71

*** Estimates of parameters ***

	estimate	s.e.	t(75)	t pr.
Constant	-49.9	14.4	-3.45	<.001
rad4	2.836	0.703	4.03	<.001

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad4, WS3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	2	1198.	598.77	15.25	<.001
Residual	74	2906.	39.27		
Total	76	4104.	53.99		
Change	-1	-466.	466.19	11.87	<.001

Percentage variance accounted for 27.3

Standard error of observations is estimated to be 6.27

*** Estimates of parameters ***

	estimate	s.e.	t(74)	t pr.

Constant	-152.7	32.7	-4.66	<.001
rad4	3.971	0.735	5.40	<.001
WS3	31.89	9.26	3.45	<.001

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad4, WS3, ETn4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	1391.	463.53	12.47	<.001
Residual	73	2713.	37.16		
Total	76	4104.	53.99		
Change	-1	-193.	193.07	5.20	0.026

Percentage variance accounted for 31.2

Standard error of observations is estimated to be 6.10

*** Estimates of parameters ***

	estimate	s.e.	t(73)	t pr.
Constant	-154.6	31.9	-4.85	<.001
rad4	3.517	0.742	4.74	<.001

WS3	35.73	9.16	3.90	<.001
ETn4	1.423	0.624	2.28	0.026

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, rad4, WS3, ETn4, rain3

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	1443.	360.67	9.76	<.001
Residual	72	2661.	36.96		
Total	76	4104.	53.99		
Change	-1	-52.	52.08	1.41	0.239

Percentage variance accounted for 31.6

Standard error of observations is estimated to be 6.08

*** Estimates of parameters ***

	estimate	s.e.	t(72)	t pr.
Constant	-156.2	31.8	-4.91	<.001
rad4	3.276	0.767	4.27	<.001
WS3	40.52	9.99	4.06	<.001

ETn4 2.49 1.10 2.28 0.026

rain3 -0.0130 0.0110 -1.19 0.239

===== Area 3 for FRUIT yield =====

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, WS4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	159.	159.27	5.77	0.019
Residual	75	2070.	27.60		
Total	76	2229.	29.33		
Change	-1	-159.	159.27	5.77	0.019

Percentage variance accounted for 5.9

Standard error of observations is estimated to be 5.25

*** Estimates of parameters ***

	estimate	s.e.	t(75)	t pr.
Constant	38.3	14.6	2.62	0.011

WS4 -12.28 5.11 -2.40 0.019

===== Year 1 for FRUIT yield =====

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	205.0	204.99	16.92	<.001
Residual	31	375.6	12.12		
Total	32	580.6	18.14		
Change	-1	-205.0	204.99	16.92	<.001

Percentage variance accounted for 33.2

Standard error of observations is estimated to be 3.48

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	-1.18	1.22	-0.96	0.343
P	0.1983	0.0482	4.11	<.001

===== Year 2 for FRUIT yield =====

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, IC4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	5.81	5.812	2.15	0.153
Residual	31	83.76	2.702		
Total	32	89.58	2.799		
Change	-1	-5.81	5.812	2.15	0.153

Percentage variance accounted for 3.5

Standard error of observations is estimated to be 1.64

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	2.377	0.570	4.17	<.001
IC4	-0.000755	0.000515	-1.47	0.153

===== Year 3 for FRUIT yield =====

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	112.5	112.53	6.18	0.019
Residual	31	564.5	18.21		
Total	32	677.0	21.16		
Change	-1	-112.5	112.53	6.18	0.019

Percentage variance accounted for 13.9

Standard error of observations is estimated to be 4.27

===== Year 4 for FRUIT yield =====

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, Eto4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	131.	131.07	3.41	0.074
Residual	31	1192.	38.46		
Total	32	1323.	41.35		
Change	-1	-131.	131.07	3.41	0.074

Percentage variance accounted for 7.0

Standard error of observations is estimated to be 6.20

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	-24.1	17.0	-1.41	0.167
Eto4	9.23	5.00	1.85	0.074

===== Year 5 for FRUIT yield =====

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, P

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	229.	228.86	5.80	0.022
Residual	31	1223.	39.44		
Total	32	1451.	45.36		
Change	-1	-229.	228.86	5.80	0.022

Percentage variance accounted for 13.0

Standard error of observations is estimated to be 6.28

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	1.73	2.39	0.72	0.476
P	0.263	0.109	2.41	0.022

===== Year 6 for FRUIT yield =====

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, RHx4

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	1032.	1031.78	16.69	<.001
Residual	31	1916.	61.81		
Total	32	2948.	92.12		
Change	-1	-1032.	1031.78	16.69	<.001

Percentage variance accounted for 32.9

Standard error of observations is estimated to be 7.86

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	394.6	94.4	4.18	<.001
RHx4	-4.29	1.05	-4.09	<.001

===== Year 7 for FRUIT yield =====

126.....

***** Regression Analysis *****

Response variate: fyield

Fitted terms: Constant, Long

*** Summary of analysis ***

	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	1	34.9	34.94	2.11	0.156
Residual	31	512.6	16.54		
Total	32	547.5	17.11		
Change	-1	-34.9	34.94	2.11	0.156

Percentage variance accounted for 3.4

Standard error of observations is estimated to be 4.07

*** Estimates of parameters ***

	estimate	s.e.	t(31)	t pr.
Constant	43.0	26.9	1.60	0.119
Long	-1.307	0.899	-1.45	0.156

59

1

Appendix 3.10 AMMI analysis of fruit yield per cultivar and area

JPfyieldAMMI.out

file is JPfyieldAMMI.gen

========== CACTUS PEAR ENVIRONMENTAL ADAPTIBILITY: FRUIT YIELD

AMMI analysis: Environments are AREAxYEAR e.g. 27 means area 2 for year 7

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CACTUS PEAR FRUIT YIELD 1994 to 2000

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***** Environment means and variances *****

ENV	Nobservd	Mean	Variance
11	55	2.389	7.95
21	55	6.559	32.78
31	55	0.612	1.21
12	55	2.066	8.98
22	55	1.819	3.42
32	55	1.078	1.34
13	55	5.067	21.78
23	55	7.626	21.30
33	55	3.000	18.11
14	55	6.783	30.53
24	55	9.981	42.47
34	55	5.123	48.56
15	55	6.301	35.80

25	55	10.345	50.02
35	55	3.905	39.08
16	55	5.411	21.64
26	55	16.680	121.27
36	55	4.302	50.18
17	55	2.579	4.75
27	55	5.054	12.42
37	55	4.327	43.60
Margin	1155	5.286	41.97

********** AMMI Analysis **********

***** The genotype means and scores *****

Genotype	NG	Gen	Mean	IPCAG[1]	IPCAG[2]
1	1	1	1.439	-0.572	1.385
2	2	2	0.931	-0.913	2.175
3	3	3	1.143	-0.831	1.417
4	4	4	9.398	-2.208	-4.407
5	5	5	7.740	2.561	-0.539
6	6	6	7.235	-2.348	-0.577
7	7	7	0.605	-1.031	2.034
8	8	8	5.741	1.750	-0.226
10	9	10	8.413	-1.881	-0.074
11	10	11	7.214	2.509	-0.273
12	11	12	8.288	2.964	-0.915

***** The environment means and scores *****

Environment	NE	Env	Mean	IPCAE[1]	IPCAE[2]
11	1	11	2.389	0.658	1.153
21	2	21	6.559	1.495	0.244
31	3	31	0.612	-0.653	1.482
12	4	12	2.066	0.491	1.285
22	5	22	1.819	0.138	1.346
32	6	32	1.078	-0.554	1.246
13	7	13	5.067	1.310	0.894
23	8	23	7.626	0.054	-0.277
33	9	33	3.000	-1.701	0.204
14	10	14	6.783	1.170	0.211
24	11	24	9.981	0.248	-1.039
34	12	34	5.123	-2.501	-0.776
15	13	15	6.301	1.818	-0.204
25	14	25	10.345	1.334	-1.466
35	15	35	3.905	-2.109	-1.200
16	16	16	5.411	1.224	0.299
26	17	26	16.680	2.030	-3.698
36	18	36	4.302	-2.125	-1.721
17	19	17	2.579	0.295	1.018
27	20	27	5.054	-0.218	1.078
37	21	37	4.327	-2.405	-0.079

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CACTUS PEAR FRUIT YIELD 1994 to 2000

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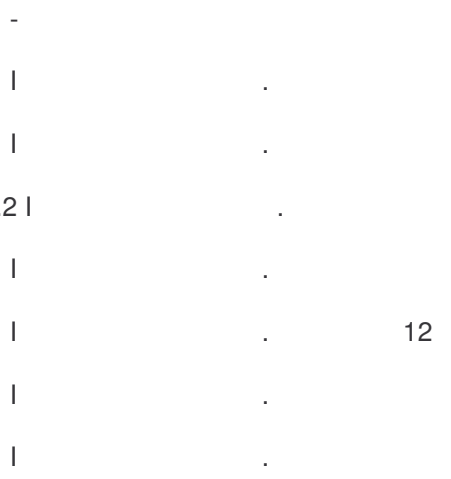
********** The ANOVA table for AMMI model **********

Source	df	SS	MS	F	F_prob
Total	1154	48434	42.0	*	*
Treatment	230	44373	192.9	47.08	<.001
Environment	20	15106	755.3	102.50	<.001
Block	84	619	7.4	1.80	<.001
Genotype	10	12839	1283.9	313.30	<.001
Interaction	200	16429	82.1	20.04	<.001
IPCA	29	8629	297.5	72.61	<.001
IPCA	27	5715	211.7	51.65	<.001
Residual	144	2085	14.5	3.53	<.001
Error	840	3442	4.1	*	*

Noise is 4.7 % of the TRT SS

NB: the block source of variation refers to blocks within environments

Plot of Genotype interaction PCA1 scores versus means



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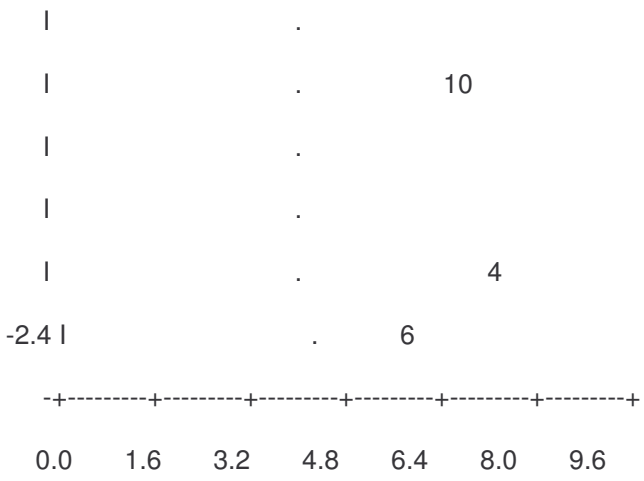
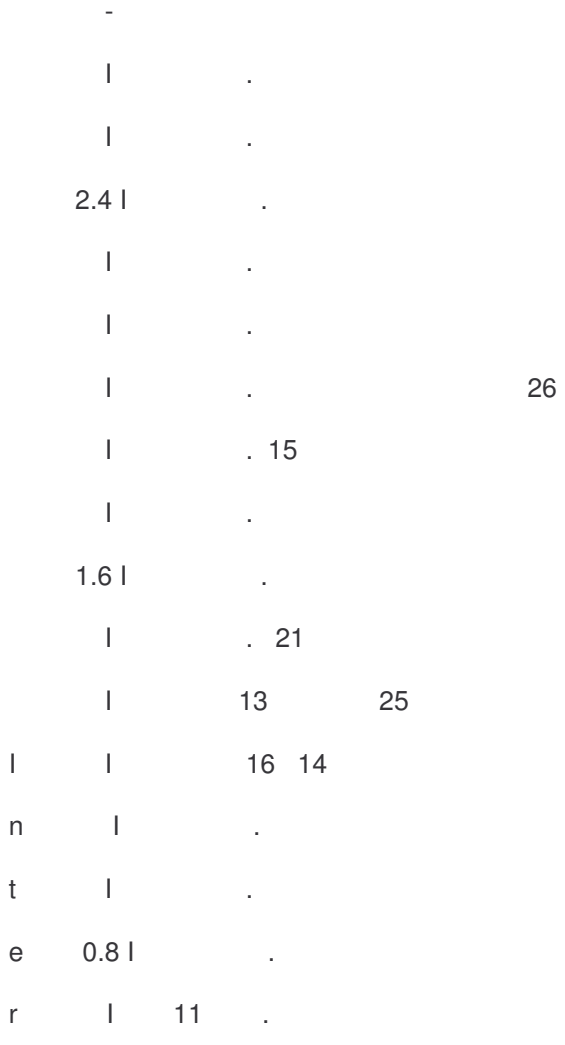


Genotype means

Plot of Environment interaction PCA1 scores vs means



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0.0 3.0 6.0 9.0 12.0 15.0 18.0

Environment means

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CACTUS PEAR FRUIT YIELD 1994 to 2000

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***** AMMI-estimates per environment *****

Environment 11 AMMI-estimates		Ranked	
1	-0.236	12	6.286
2	-0.057	5	5.908
3	-0.667	11	5.652
4	-0.034	10	4.194
5	5.908	8	3.735
6	2.128	6	2.128
7	-0.625	4	-0.034
8	3.735	2	-0.057
10	4.194	1	-0.236
11	5.652	7	-0.625
12	6.286	3	-0.667

Environment 21 AMMI-estimates		Ranked	
1	2.196	12	13.769
2	1.371	5	12.711
3	1.519	11	12.170

4	6.292	8	9.575
5	12.711	10	6.855
6	4.856	4	6.292
7	0.833	6	4.856
8	9.575	1	2.196
10	6.855	3	1.519
11	12.170	2	1.371
12	13.769	7	0.833

Environment 31 AMMI-estimates Ranked

1	-0.810	10	4.857
2	0.077	6	3.237
3	-0.889	5	0.597
4	-0.367	11	0.498
5	0.597	12	0.324
6	3.237	2	0.077
7	-0.382	4	-0.367
8	-0.410	7	-0.382
10	4.857	8	-0.410
11	0.498	1	-0.810
12	0.324	3	-0.889

Environment 12 AMMI-estimates Ranked

1	-0.282	12	5.349
2	0.059	5	5.087
3	-0.664	11	4.875
4	-0.570	10	4.174
5	5.087	8	3.091
6	2.120	6	2.120
7	-0.508	2	0.059

8	3.091	1	-0.282
10	4.174	7	-0.508
11	4.875	4	-0.570
12	5.349	3	-0.664

Environment 22 AMMI-estimates Ranked

1	-0.243	10	4.587
2	0.266	12	3.998
3	-0.532	5	3.902
4	-0.305	11	3.725
5	3.902	6	2.667
6	2.667	8	2.211
7	-0.267	2	0.266
8	2.211	1	-0.243
10	4.587	7	-0.267
11	3.725	4	-0.305
12	3.998	3	-0.532

Environment 32 AMMI-estimates Ranked

1	-0.727	10	5.156
2	-0.060	6	3.609
3	-0.839	5	1.442
4	0.924	12	1.298
5	1.442	11	1.275
6	3.609	4	0.924
7	-0.497	8	0.282
8	0.282	2	-0.060
10	5.156	7	-0.497
11	1.275	1	-0.727
12	1.298	3	-0.839

Environment 13 AMMI-estimates		Ranked	
1	1.709	12	11.135
2	1.461	5	10.396
3	1.101	11	10.037
4	2.346	8	7.613
5	10.396	10	5.663
6	3.424	6	3.424
7	0.853	4	2.346
8	7.613	1	1.709
10	5.663	2	1.461
11	10.037	3	1.101
12	11.135	7	0.853

Environment 23 AMMI-estimates		Ranked	
1	3.364	4	12.839
2	2.618	12	11.043
3	3.045	10	10.671
4	12.839	5	10.369
5	10.369	11	9.766
6	9.607	6	9.607
7	2.325	8	8.239
8	8.239	1	3.364
10	10.671	3	3.045
11	9.766	2	2.618
12	11.043	7	2.325

Environment 33 AMMI-estimates		Ranked	
1	0.407	4	9.969

2	0.641	10	9.312
3	0.559	6	8.824
4	9.969	5	0.988
5	0.988	12	0.774
6	8.824	2	0.641
7	0.488	11	0.605
8	0.432	3	0.559
10	9.312	7	0.488
11	0.605	8	0.432
12	0.774	1	0.407

Environment 14 AMMI-estimates Ranked

1	2.560	12	13.059
2	1.820	5	12.120
3	1.967	11	11.588
4	7.380	8	9.238
5	12.120	10	7.694
6	5.864	4	7.380
7	1.326	6	5.864
8	9.238	1	2.560
10	7.694	3	1.967
11	11.588	2	1.820
12	13.059	7	1.326

Environment 24 AMMI-estimates Ranked

1	4.553	4	18.125
2	3.140	12	14.670
3	4.159	5	13.631
4	18.125	11	12.815
5	13.631	10	12.718

6	11.947	6	11.947
7	2.932	8	11.106
8	11.106	1	4.553
10	12.718	3	4.159
11	12.815	2	3.140
12	14.670	7	2.932

Environment 34 AMMI-estimates Ranked

1	1.631	4	18.175
2	1.363	6	13.390
3	1.958	10	13.012
4	18.175	3	1.958
5	1.590	1	1.631
6	13.390	5	1.590
7	1.444	7	1.444
8	1.377	12	1.422
10	13.012	8	1.377
11	0.989	2	1.363
12	1.422	11	0.989

Environment 15 AMMI-estimates Ranked

1	1.133	12	14.877
2	-0.156	5	13.521
3	0.358	11	12.844
4	7.295	8	9.983
5	13.521	4	7.295
6	4.099	10	6.023
7	-0.669	6	4.099
8	9.983	1	1.133
10	6.023	3	0.358

11	12.844	2	-0.156
12	14.877	7	-0.669

Environment 25 AMMI-estimates Ranked

1	3.70	12	18.64
2	1.58	4	17.97
3	3.01	5	17.01
4	17.97	11	16.02
5	17.01	8	13.47
6	10.01	10	11.07
7	1.31	6	10.01
8	13.47	1	3.70
10	11.07	3	3.01
11	16.02	2	1.58
12	18.64	7	1.31

Environment 35 AMMI-estimates Ranked

1	-0.399	4	17.963
2	-1.135	6	11.498
3	-0.186	10	11.088
4	17.963	12	1.753
5	1.603	5	1.603
6	11.498	8	0.940
7	-1.041	11	0.869
8	0.940	3	-0.186
10	11.088	1	-0.399
11	0.869	7	-1.041
12	1.753	2	-1.135

Environment 16 AMMI-estimates Ranked

1	1.278	12	11.768
2	0.588	5	10.840
3	0.673	11	10.328
4	5.502	8	7.941
5	10.840	10	6.212
6	4.312	4	5.502
7	0.075	6	4.312
8	7.941	1	1.278
10	6.212	3	0.673
11	10.328	2	0.588
12	11.768	7	0.075

Environment 26 AMMI-estimates Ranked

1	6.55	4	32.61
2	2.43	12	29.08
3	5.61	5	26.33
4	32.61	11	24.71
5	26.33	8	21.52
6	16.00	10	16.26
7	2.39	6	16.00
8	21.52	1	6.55
10	16.26	3	5.61
11	24.71	2	2.43
12	29.08	7	2.39

Environment 36 AMMI-estimates Ranked

1	-0.714	4	20.691
2	-1.857	6	12.233
3	-0.514	10	11.554

4	20.691	12	2.580
5	2.241	5	2.241
6	12.233	8	1.427
7	-1.687	11	1.369
8	1.427	3	-0.514
10	11.554	1	-0.714
11	1.369	7	-1.687
12	2.580	2	-1.857

Environment 17 AMMI-estimates Ranked

1	-0.026	12	5.523
2	0.171	5	5.240
3	-0.366	10	5.076
4	1.552	11	4.968
5	5.240	8	3.320
6	3.248	6	3.248
7	-0.335	4	1.552
8	3.320	2	0.171
10	5.076	1	-0.026
11	4.968	7	-0.335
12	5.523	3	-0.366

Environment 27 AMMI-estimates Ranked

1	2.825	10	8.512
2	3.244	6	6.892
3	2.620	12	6.424
4	4.895	5	6.370
5	6.370	11	6.141
6	6.892	4	4.895
7	2.791	8	4.885

8	4.885	2	3.244
10	8.512	1	2.825
11	6.141	7	2.791
12	6.424	3	2.620

Environment 37 AMMI-estimates Ranked

1	1.745	4	14.096
2	1.996	10	11.984
3	2.070	6	11.967
4	14.096	3	2.070
5	0.663	2	1.996
6	11.967	7	1.966
7	1.966	1	1.745
8	0.591	5	0.663
10	11.984	8	0.591
11	0.243	12	0.272
12	0.272	11	0.243

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******* Table of AMMI selections per environment *******

Eno	Env	Mean	Score	AMMI selections			
17	26	16.680	2.030	4	12	5	11	8

13	15	6.301	1.818	12	5	11	8	4
2	21	6.559	1.495	12	5	11	8	10
14	25	10.345	1.334	12	4	5	11	8
7	13	5.067	1.310	12	5	11	8	10
16	16	5.411	1.224	12	5	11	8	10
10	14	6.783	1.170	12	5	11	8	10
1	11	2.389	0.658	12	5	11	10	8
4	12	2.066	0.491	12	5	11	10	8
19	17	2.579	0.295	12	5	10	11	8
11	24	9.981	0.248	4	12	5	11	10
5	22	1.819	0.138	10	12	5	11	6
8	23	7.626	0.054	4	12	10	5	11
20	27	5.054	-0.218	10	6	12	5	11
6	32	1.078	-0.554	10	6	5	12	11
3	31	0.612	-0.653	10	6	5	11	12
9	33	3.000	-1.701	4	10	6	5	12
15	35	3.905	-2.109	4	6	10	12	5
18	36	4.302	-2.125	4	6	10	12	5
21	37	4.327	-2.405	4	10	6	3	2
12	34	5.123	-2.501	4	6	10	3	1

******* AMMI Stability values for each Genotype *******

Genotype	NG	Gen	GM	IPCAG[1]	IPCAG[2]	ASV
1	1	1	1.439	-0.572	1.385	1.632
3	3	3	1.143	-0.831	1.417	1.893
7	7	7	0.605	-1.031	2.034	2.561
2	2	2	0.931	-0.913	2.175	2.575
8	8	8	5.741	1.750	-0.226	2.652
10	9	10	8.413	-1.881	-0.074	2.841
6	6	6	7.235	-2.348	-0.577	3.591

11	10	11	7.214	2.509	-0.273	3.797
5	5	5	7.740	2.561	-0.539	3.904
12	11	12	8.288	2.964	-0.915	4.567
4	4	4	9.398	-2.208	-4.407	5.526

NOTE

ASVs are useful when the first two IPCAs are significant can be accounted for biologically, otherwise use the IPCA 1 scores

ASVs computed from stability values as derived by JL Purchase in:

Purchase,JL, Hatting,H & Van Deventer,CS. 2000. S.Afr.J.Plant Soil 17(3)

***** Clustering of Genotypes over Environments *****

**** Average linkage cluster analysis ****

**** Hierarchical clusters ****

** Level 95.0

1 3

2 7

5 10

** Ungrouped

4 6 9 11 8

** Level 90.0

1 3 2 7

5 10 11

** Ungrouped

4 6 9 8

** Level 85.0

1 3 2 7

5 10 11

** Ungrouped

4 6 9 8

** Level 80.0

1 3 2 7

6 9

5 10 11

** Ungrouped

4 8

** Level 75.0

1 3 2 7

6 9

5 10 11 8

** Ungrouped

4

** Level 70.0

1 3 2 7

6 9

5 10 11 8

** Ungrouped

4

** Level 65.0

1 3 2 7

6 9

5 10 11 8

** Ungrouped

4

** Level 60.0

1 3 2 7

4 6 9

5 10 11 8

** Level 55.0

1 3 2 7

4 6 9

5 10 11 8

** Level 50.0

1 3 2 7

4 6 9 5 10 11 8

** Level 45.0

1 3 2 7 4 6 9 5 10 11
8

**** Dendrogram ****

** Levels 100.0 90.0 80.0 70.0 60.0 50.0

1 1 ..

7 3 ..)..

3 2 ..)

6 7 ..)..).....

2 4 .....)

10 6 .....))

5 9 .....).....).....)

8 5 ..))

12 10 ..)..))

4 11 .....).....))

11 8 .....).....)..).....

***** Clustering of Environments over Genotypes *****

**** Average linkage cluster analysis ****

**** Hierarchical clusters ****

** Level 95.0

1 4 5 19

3 6

** Ungrouped

2 10 7 16 13 9 12 21 15 18

8 11 14 20 17

** Level 90.0

1 4 5 19 3 6

2 10 7 16

12 21

15 18

** Ungrouped

13 9 8 11 14 20 17

** Level 85.0

1 4 5 19 3 6

2 10 7 16 13

12 21

15 18

8 11

** Ungrouped

9 14 20 17

** Level 80.0

1 4 5 19 3 6

2 10 7 16 13

9 12 21 15 18

8 11 14

** Ungrouped

20 17

** Level 75.0

1 4 5 19 3 6 2 10 7 16

13

9 12 21 15 18

8 11 14 20

** Ungrouped

17

** Level 70.0

1 4 5 19 3 6 2 10 7 16

13 9 12 21 15 18

8 11 14 20

** Ungrouped

17

** Level 65.0

1 4 5 19 3 6 2 10 7 16

13 9 12 21 15 18 8 11 14 20

** Ungrouped

17

** Level 60.0

1 4 5 19 3 6 2 10 7 16

13 9 12 21 15 18 8 11 14 20

** Ungrouped

17

** Level 55.0

1 4 5 19 3 6 2 10 7 16

13 9 12 21 15 18 8 11 14 20

** Ungrouped

17

** Level 50.0

1 4 5 19 3 6 2 10 7 16

13 9 12 21 15 18 8 11 14 20

** Ungrouped

17

** Level 45.0

1 4 5 19 3 6 2 10 7 16

13 9 12 21 15 18 8 11 14 20

** Ungrouped

17

** Level 40.0

1 4 5 19 3 6 2 10 7 16

13 9 12 21 15 18 8 11 14 20

** Ungrouped

17

** Level 35.0

1 4 5 19 3 6 2 10 7 16

13 9 12 21 15 18 8 11 14 20

17

**** Dendrogram ****

** Levels 100.0 90.0 80.0 70.0 60.0 50.0 40.0

26 1 ..

25 4 ..)

13 5 ..)

36 19 ..)..

21 3 ..)

16 6 ..)..).....

15 2 .....)

17 10 .....))

14 7 .....))

31 16 .....)..)

23 13 .....).....)..

12 9 .....)

22 12 .....))

34 21 .....).....))

32 15 .....))

35 18 .....).....).....)..

11 8 .....)

24 11 .....)..)

27 14 .....)..)

37 20 .....).....).....

33 17 .....).....

1