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**EQUITY IN NATURAL RESOURCE USE: FARM LAND  
RESOURCE UTILIZATION AND LAND VALUE TRENDS  
IN THE FREE STATE UNDER LRAD**

by

**LEON KOTZE**

Submitted in partial fulfillment of the requirements for the degree of

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**Co-supervisor: Prof. J.M. Laubscher**

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Leon Kotze  
30 May 2008

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**Supervisor: Prof. A. Jooste**  
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## **ABSTRACT**

The demand for land as an economic asset represents a source of identity and a symbol of citizenship in South Africa. This symbol has become an important factor, guiding policy development. South Africa's current ownership and use of agricultural land is the inevitable outcome of decades of policies favouring white commercial farmers. The need for land reform was clearly identified in the new South African Constitution (Act 108 of 1996, Section 25).

In the process of redistribution of land to previously disadvantaged communities in primary agriculture in South Africa, it is vitally important that issues such as the productivity of the land and infrastructure on farms are considered since not only do it affect the income potential of the land, but also the value of the land, which is in turn important to, for example, gain access to credit.

The primary objective of this study was to provide a clear picture of equity in agricultural resource use in the Free State Province (FSP).



This study shows that there are currently no proper systems in place to monitor the ongoing process of land reform in the FSP. There are no apparent correlation between land prices and the potential of the resources in the FSP when investigated on an aggregate level. There is also a poor correlation between different sources that provide information on land prices. This situation renders it very difficult to make specific conclusions on the equity in natural resource use. It was furthermore shown that records being kept by Land Affairs Offices are in general incomplete to the extent that such records could potentially provide a skew picture of the current progress being made by the land reform programme.

These problems and shortcomings of the data available to measure the progress made in redistribution of land and resources led to the development of a hedonic pricing model that attempts to isolate the transaction characteristics that have the most significant impact on the price paid for land under LRAD in the FSP. The hedonic model shows that Rent, Size, Location of the land and the Type of enterprise significantly affected the price paid for land. The analysis also reveals that the current aggregate information on Land Capability is not optimally suited to link farm prices to the potential income the farm can generate. Rental values of land will serve this purpose much better.

Finally, the results obtained from this study provided no evidence that land transferred were only in areas of low quality resources nor that such land was overpriced.

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# REGVERDIGE GEBRUIK VAN NATUURLIKE HULPBRONNE: DIE BENUTTING VAN HULPBRONNE VIR BOERDERYGROND EN TENDENSE IN GRONDWAARDES IN DIE VRYSTAAT ONDER HGLO

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## UITTREKSEL

Die vraag na grond as 'n ekonomiese bate verteenwoordig 'n bron van identiteit en 'n simbool van burgerskap in Suid-Afrika. Hierdie simbool het 'n belangrike faktor en 'n riglyn tot beleidsontwikkeling geword. Huidige eienaarskap en die gebruik van landbougrond in Suid-Afrika is die onvermydelike resultaat van dekades van beleidsrigtings wat wit kommersiële boere bevoordeel het. Die noodsaak tot grondhervorming is duidelik geïdentifiseer in die nuwe Suid-Afrikaanse Grondwet (Wet 108 van 1996, artikel 25).

In die proses van die herverdeling van grond aan voorheen benadeelde gemeenskappe in primêre landbou in Suid-Afrika, is dit van die allergrootste belang dat aspekte soos produktiwiteit van die grond en infrastruktuur op plase oorweeg moet word, aangesien dit nie slegs die inkomste-potensiaal van die grond beïnvloed nie, maar ook die waarde van die grond, wat op sy beurt belangrik is om byvoorbeeld toegang tot krediet te verkry.

Die primêre doelwit van hierdie studie was om 'n duidelike prentjie van die regverdigheid in die gebruik van landbouhulpbronne in die Vrystaat Provinsie (VSP) daar te stel.

Die studie wys dat daar tans geen behoorlike stelsels in plek is om die voortgaande proses van grondhervorming in die VSP te monitor nie. Daar is geen sigbare korrelasie tussen grondpryse en die potensiaal van die hulpbronne in die VSP as dit in die breë ondersoek word nie. Daar is ook 'n swak korrelasie tussen verskillende bronne wat inligting oor grondpryse verskaf. Dié situasie maak dit baie moeilik om bepaalde gevolgtrekkings oor die regverdige gebruik van natuurlike hulpbronne te maak. Daar is voorts aangedui dat rekords wat deur Grondsake-kantore bygehou word, onvolledig is in dié sin dat dit 'n verdraaide prentjie kan gee van die huidige vordering met die grondhervormingsprogram.

Hierdie probleme en tekortkomings van die beskikbare data waaraan die vordering met die herverdeling van grond en hulpbronne gemeet word, het gelei tot die ontwikkeling van 'n hedoniese prysmodel, wat poog om die transaksie-eienskappe te isoleer, wat die bepalendste impak het op die pryse wat betaal word vir grond onder HGLO in die VSP. Die hedoniese model wys dat Huur, Grootte, Ligging van die grond en die Tipe onderneming, 'n beduidende uitwerking het op die prys wat vir die grond betaal word. Die analise het ook aan die lig gebring dat die breë definisie oor Grondvermoë wat nou beskikbaar is, nie heeltemal geskik is om plaaspryse te koppel aan die potensiële inkomste wat die plaas kan voortbring nie. Huurwaardes van grond sal baie beter aan hierdie doel beantwoord.

Ten slotte, het die resultate wat in hierdie studie behaal is, geensins bewys dat grond wat oorgedra is, slegs geleë was in gebiede met lae gehalte hulpbronne nie en ook nie dat te hoë pryse vir sodanige grond gevra is nie.

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## ABBREVIATIONS

ANC	African National Congress
ARC	Agricultural Research Council
ARS	Agricultural Risk Specialists
DoA	Department of Agriculture
DLA	Department of Land Affairs
DSC	District Screening Committee
F	Forestry
FSP	Free State Province
GEAR	Growth Employment and Redistribution
GIS	Geographic Information System
HGLO	Herverdeling van Grond vir Landelike-ontwikkeling
IC	Intensive, well-adapted cultivation
IG	Intensive grazing
LC	Poorly adapted cultivation
LCC	Land Capability Classification
LG	Light grazing
LRAD	Land Redistribution for Agricultural Development
MC	Moderately well-adapted cultivation
MG	Moderate grazing
MLAR	Market-Led Agrarian Reform
NAFU	National African Farmers' Union
NCEUS	National Commission for Enterprises in the Unorganized Sector
OLS	Ordinary Least Squares
PDA	Provincial Department of Agriculture

PGAC	Provincial Grant Approval Committee
PLRO	Provincial Land Reform Offices
RDP	Reconstruction and Development Programme
SLAG	Settlement/Land Acquisition Grant
TARLV	Transacted average land value categories
US	United States
VIC	Very intensive, well-adapted cultivation
VSP	Vrystaat Provinsie
W	Wildlife

# CHAPTER 1

## INTRODUCTION

---

### 1.1 Introduction

South Africa has experienced far-reaching changes in the political sphere resulting in the new democracy that ended the apartheid era and opened the way for resuming a full role within the international community. It is generally accepted that equality should be the guiding principle in the political and social spheres of South African society. The consensus also favours equality of opportunity in the economic sphere (Binswanger, Kirsten & Van Zyl, 1996). Current structural problems such as racially skewed access to land and land ownership in South Africa are mainly due to dispossession by forced removals and the relocation of people to the former homelands and development trust areas. Attempts to rectify the situation are supported by the Provision of Land and Assistance Act (No. 126 of 1993) as amended, which addresses land restitution, land tenure reform and land redistribution. In the Provision of Land and Assistance Act, the Land Redistribution for Agricultural Development Sub-program (LRAD), which aims to address the land redistribution issue, forms part of concise efforts to restore and redress past imbalances in land ownership and to create access to land and economic opportunities for previously disadvantaged people in agriculture (Laubscher, Jooste & Kotze, 2007).

The need for land reform was clearly identified in the new South African Constitution (Act 108 of 1996, Section 25). The Reconstruction and Development Programme (RDP) identified land reform as a key component of its programme of "meeting basic needs" and "building the economy" (ANC, 1994). The White Paper on South African Land Policy included in its strategic goals the promotion of economic growth and poverty reduction through land reform (DLA, 1997). The approach to land reform would be through willing buyer-willing seller in the market at market rates.

The World Bank proposed to the African National Congress (ANC) that 30% of white owned medium to high quality commercial farmland should be transferred to 600 000 smallholders through a market-led programme of land redistribution. It was estimated at a cost of R 22.1 billion, but it was also predicted that substantial expansion of institutional capacity in the public sector should form part of the process to successfully implement a programme of this scale (World Bank, 1994 as reported by Ntsebeza & Hall, 2007; Binswanger *et al.*, 1996). It was believed that if 6% of medium to high potential agricultural land in the commercial farming sector could be transferred every year of the programme, it would lead to the accomplishment of the target of 30% being transferred over 5 years, resulting in net livelihoods of 1.5 million being created (Binswanger *et al.*, 1996).

## **1.2 Problem statement**

In 1996, less than 1% of the population owned and controlled over 80% of farmland (Wildschut & Hulbert, 1998). The 60 000 white farmers who then made up only 5% of the white population, owned 87% of land which white settlers appropriated under the 1913 Native Land Act. This Act restricted the area of land for lawful African occupation, and stripped African cash tenants and sharecroppers of their land and consequently replaced sharecropping and rent-tenant contracts with labour tenancy (Wellington, 2003).

In the subsequent years Acts and policies that enhanced the segregation of the population following the enactment of Acts such as the Development Trust and Land Act (1936), which allocated already promised land to the reserves and made squatting illegal; the Natives Laws Amendment Act (1937) which prohibited Africans from buying land; the Group Areas Act (1950) which further racially segregated areas with respect to residence and business, and controlled interracial property actions; the Bantu Authorities Act (1951), which allowed the establishment of tribal, regional and territorial authorities; the Prevention of Illegal Squatting Act (1951) that allowed the government to

establish resettlement camps for surplus people evicted from white farms; and the Black Resettlement Act (1954), which gave the state the authority to remove Africans from any area in the magisterial district of Johannesburg and adjacent areas. The Promotion of Bantu Self-Government Act was also enacted in 1959, to establish the Bantustans and make the reserves the political homeland of black South Africans. In the early 1960's, the first relocation camps were established. This was an attempt to remove displaced labour tenants, unwanted farm workers and unemployed urban people. In 1964, the Black Laws Amendment Act was enacted. This, alongside the Native Trust Act, was used to finally abolish labour tenancy and squatting on farms. Collectively these Acts contributed significantly to the segregation of the population in terms of business and residential rights (Wellington, 2003).

Moyo (2000) mentioned that in 1998 only 20 000 white commercial farmers produced 80% of the gross value of agricultural production. A further 40 000, including some 2 000 African farmers, produced 15% of the gross value of agricultural production, while 500 000 families living in the former homeland produce an estimated 5%. At least 12 million Africans inhabit 17.1 million hectares of land and no more than 15% (2.6 million hectares) of this land is potentially arable. Consequently, whites own six times more land in terms of quantity and quality (Moyo, 2000). The skewness in land ownership however still remains due to the slow pace of land reform in South Africa.

Meaningful progress to empower previously disadvantaged communities in primary agriculture will have to take into account productivity differences in resources as well as the value of such resources since the transformation target specifies not only 30% of agricultural land, but 30% of medium to high potential agricultural land. Productivity determines the potential income the resource can generate and the value of such resources are mostly used to gain access to, for example, credit from banks – an input highlighted by numerous studies as being one of the main factors inhibiting the potential of small-scale emerging farmers. The lack of complete and reliable data on land use and potential makes it difficult to assess the availability of land in South Africa's white commercial agricultural sector (Van Zyl, McKenzie & Kirsten,

1996). Furthermore, very little information currently exists on the relative distribution of resources used in agriculture (as will be shown in this study). This situation makes it very difficult to properly measure the overall success of land reform in South Africa, i.e. not only the quantity of land transferred but also the quality of land transferred. Thus, there is a need to also identify different data sources that are available that record transactions relating to land reform and an in-depth look at the usability of such information. The lack of this type of information is not conducive to efficient policy development and implementation of land reform at national and provincial level. If this shortcoming is not adequately addressed the outcome of land reform could potentially bring about even more challenging problems than those of the current situation, at great cost to society.

### **1.3 Objectives**

The primary objective of this study is to provide a clear picture of equity in agricultural resource use in the Free State Province (FSP). It was assumed that farmland values as a quantitative measure will be pivotal in assessing the developments with regard to the equity involved, when such transfers occur. This approach involves analysing whether there is a clear link between land prices and resources in a given area as recorded by different data sources. However, as it will become clear, this is no easy task mainly due to (i) poor record keeping of empowerment transactions, (ii) serious discrepancies in and between the different databases that record land values and (iii) lack of information in general.

The secondary objective of this study is to identify the available sources that record land reform transactions and investigate the usability of such sources in an attempt to measure the progress that has been made with land reform in an effort to provide a clearer picture of the overall success of land reform in the FSP. The requirements of the secondary objective will be met by means of the following steps:



- Investigate and identify different data sources that record land transfers;
- Exposition of the record system used by these sources;
- Isolate resource factors identified by these sources;
- Test the link between prices and isolated resource factors;
- Correlate and compare the sources and factors with land prices; and
- Use the above-mentioned results as measure of equity in resource distribution.

## **1.4 Methodology**

In the course of understanding the aims of land reform, the primary program, LRAD, which has been implemented to steer the process, selected international case studies involving land reform programmes in other countries will be reviewed

In order to determine the state of equity in farm land use in the FSP data collected by the Deeds Office will be used as departure point to provide different land price categories. These land price categories will then be compared with established land quality criteria to determine whether there is any significant correlation between land prices and land quality. As will become clear later in this study other sources that records land prices and provide indicative land quality measures had to be consulted as well.

In order to achieve the primary objective of this study it is necessary to (i) obtain accurate records of land transfers and (ii) compare such records with the criteria established with the analysis conducted as described in the previous paragraph. Finally this study uses a hedonic pricing model to investigate the significance of different land and land transfer characteristics as derived from land transfer documentation on the prices paid for farms that were transferred. During the data gathering phase of the research, more specifically regarding resource potential, land prices and land sales, it became evident that, (i) there is not a single data set that provides all the relevant

information, (ii) there are serious questions regarding the accuracy and interpretability of existing information (e.g. deeds office data) and (iii) some information (e.g. land transfers under LRAD) that should by assumption be available, are either not available or are scattered and incomplete to the extent that it is not usable in its current state. In several other cases, magisterial and administrative boundaries do not overlap exactly.

## **1.5 Outline of this study**

In Chapter 2 theoretical and practical issues pertaining to land reform approaches is discussed. Experience from land reform in selected countries is also reviewed, including South Africa. Chapter 3 identifies data sources available on land prices to develop a price criterion to compare to the land uses in the FSP. Chapter 4 explores an alternative route to determine whether equity has realized by focusing on resources at farm level. In Chapter 5 a hedonic regression model is developed to determine the significance of land and other characteristics on prices of selected LRAD transactions. Chapter 6 draws conclusions from all the chapters and recommendations are made toward policy development and further research.

## CHAPTER 2

### DEVELOPMENT OF LAND REFORM

---

#### 2.1 Introduction

Resettlement with agricultural production as one of its core objectives has been undertaken on every continent, creating a large body of literature (Kinsey & Binswanger, 1996). Hulme (1988) noted that much of the literature is fragmented and idiosyncratic, with no generally accepted methodological approach or theoretical basis for the analysis of resettlement schemes. Hulme (1988) characterised three broad categories of analysis: (a) conventional evaluation, the majority, which is based on empirical approaches to scheme or policy performance; (b) the social consequences approach, which is concerned with the impact of schemes on individuals, families and communities; and (c) radical and political approaches, which are derived from theories of the role of the state in development. The literature review for this study incorporates a combination of the analysis categories identified by Hulme (1988).

The literature review examines land reform in Brazil, India, Colombia and Zimbabwe in an attempt to put land reform in South Africa in a global context. The first part of the literature review focuses on the economic and theoretical implications of land reform. This section argues the theoretical differences between different approaches, namely, market-led and state-led resettlement. It also touches on the theoretical implications of each approach, which will lead into the next section that evaluates the actual land reform experiences in Brazil, India, Colombia, Zimbabwe and South Africa, exposing the results and lessons of each of these countries. The final part of the literature review introduces the South African policy, giving an overview of the primary resettlement programme,

including implementation procedures and problems with the programme and their implications.

## **2.2 Pro-market based critique of state-led against market-led agrarian reform**

### **2.2.1 State-led**

According to Borras (2003), state-led reform is supply driven. The processes are initiated by both expropriating land and then looking for beneficiaries or, looking for beneficiaries first and then expropriating land which leads to heightened economic inefficiencies. These inefficiencies consist of:

- Productive farms being expropriated and sub-divided into smaller less productive farming units; and
- Peasant households “unfit” to become beneficiaries (i.e. which have no potential to become efficient producers due to a lack of farming experience or who have little incentive to farm) are given lands to farm, which contributes to inefficiencies.

State-led reform that acquires land proactively (which is financed from a national budget and not personal funds and which often excludes negotiation for the lowest price), leads to land being overpriced. Often the productive value of the land is not taken into account in the process of price discovery. Once the land has been purchased, exit options are limited, since land effectively is owned by the state, not the individual. This situation renders little transparency coupled with individuals having little incentive for accountability (Borras, 2003). Borras (2003) argues that this contributes to an economic condition known as “moral hazard”, which is defined by the prospect that a party insulated from risk may behave differently than it would if it were fully exposed to the risk. Moral hazard arises because an individual or institution does not bear the full consequences of its actions, and therefore has a tendency to act less carefully than it otherwise

would, leaving another party to bear some responsibility for the consequences of those actions.

This critique also argues that the state-led approach to land reform drives credit sources away, because expropriation pushes landlords away from farming, while credit institutions do not honour land award certificates from beneficiaries due to land sales and rental prohibitions. High risk of default or failure, due to limited collateral or capital as insurance, contributes to driving credit sources away from such initiatives. For the same reason, potential external investors are discouraged from entering the agricultural sector. These negative affects of state-led land reforms seems to be the price of successful reform since the participation of government plays a crucial role in the pace of reform as explained by Norton & Alwang (1985). The more interference by government with markets the more distortion is caused. The role of government should be to establish a comprehensive legal, institutional and policy framework that will ensure a level playing field for all players. This framework will include increased reliance on markets, privatisation, de-concentration and decentralization (Van Zyl, Binswanger, & Kirsten, 1996). Deininger & Binswanger (1999) concluded in their report on "*The Evolution of the World Bank's land policy*" that centralized government bureaucracies – charged with providing technical assistance and other support services to beneficiaries – proved to be corrupt, expensive and ineffective in responding to beneficiaries' demands.

From the above discussion one can postulate the probability is high that the role and results of government's presence, which is crucial for successful reform, could have depressing affects that can distort the land market resulting in economic inefficiencies.

### **2.2.2 Market-led**

Market-Led Agrarian Reform (MLAR) is a demand driven approach which ensures that only beneficiaries with the human capital, previous savings and adequate knowledge of how to make use of the opportunity would make the decision to take part in MLAR (Buainain, Antonio, da Silveira, Souza & Magalhães, 1999). Deinsinger & Binswanger (1999) explain that the MLAR has a self-selection process that excludes less promising beneficiaries by means of prospective buyers not allowing the less capable beneficiaries to join the organization that would negotiate the purchase of land through the programme. As highlighted by the World Bank (1994), the need for expansion in institutional capacity to support such programmes is critical and in this case the need to form organizations that can provide the buyers with bargaining power which will place the beneficiaries one step closer to economies of scale in the input and output markets. Private ownership creates a high degree of transparency and accountability increasing the incentive to succeed in the endeavour. The presence of such a programme in the land market stimulates the market rather than distorting it.

### **2.2.3 Summary**

According to Borras (2003), state-led and market-led approaches to land reform can be summarized as shown in Table 2.1. From this theoretical analysis it becomes evident that state-led land reform causes increased costs and economic inefficiencies that theoretically, can be prevented by a market-led approach to resettlement. However, market-led reform has some problems of its own and should be monitored carefully to ensure successful progress of the programme.

**Table 2.1: Key features of state-and market-led approaches based on pro-market explanations**

<b>Issues</b>	<b>State-led</b>	<b>Market-led</b>
<i>Getting access to land</i>		
<b>Acquisition method</b>	Coercive: Cash-bond payments at below market price	Voluntary: 100% cash payment based on 100% market value of land
<b>Beneficiaries</b>	Supply driven: beneficiaries state-selected	Demand driven: self-selected
<b>Implementation method</b>	Statist-centralized: low degree of transparency and accountability	Privatised-decentralized: high degree of transparency and accountability
<b>Pace and nature</b>	Protracted: politically and legally contentious	Quick: politically and legally non-contentious
<b>Land prices</b>	Higher	Lower
<b>Land markets</b>	Land reform: cause aggravated land market distortions; progressive land tax and land titling programme not required	Land reform: cause and effect of land market stimulation; progressive land tax and titling programme required
<i>Post-land transfer farm and beneficiary development</i>		
<b>Programme sequence development and extension services</b>	Farm development plans after land redistribution. Protracted, uncertain and anaemic post land transfer development; extension service statist-centralized = inefficient	Farm development plans before pace of redistribution. Quick, certain, and dynamic post-land transfer development; extension service privatised-decentralized = efficient
<b>Credit and Investments</b>	Low credit supply and low investments	Increased credit and investments
<b>Exit options</b>	None	Ample
<i>Financing</i>		
<b>Mechanism</b>	State 'universal' subsidies; sovereign guarantee; beneficiaries pay subsidized land price; 'dole-out' mentality among beneficiaries	Flexible loan-grant mechanism; co-sharing of risks; beneficiaries shoulder full cost of land; farm development cost given via grant
<b>Cost of reform</b>	High	Low

Source: Borras, 2003

Some international experiences have shown that market-led and state-led approaches can be used in combination to reach the goals of reform.

### **2.3 Criticism and debates surrounding land reform programmes**

In a context of liberalized markets and increasing privatised agricultural services, redistributive policies were seen as politically undesirable given their economically destabilizing effect not only on property markets, but also on investment strategies of landowners (Tilley, 2002). According to Deininger & Binswanger (1999) one of the factors that contribute to the resistance of land owners against land reform is the below market value payment that is caused by staggered, partly government, bonds, allowing the real value of land owners money to erode. Borras (2003) claimed that landlords could slow or prevent the process by the launch of legal battles and even subvert the policy by evading coverage and subdividing their farms and retaining the best parts. The dramatic liberalization of the agricultural sector, which is in line with the market-based prescription of smaller state involvement, has less regulation, encouragement of free trade and the removal of distortions that have been a central part of the South African agriculture economy for decades (Binswanger & Deininger, 1996).

During the 1980s the government provided more than R4 billion in direct financial assistance and subsidies to about 27 000 white farmers (Wegerif, 2004). In 1988 alone, the government subsidized wheat and maize farmers with R 500 million and in addition supported and protected agriculture with high tariffs. By the end of the 1990s all direct financial support and protection has been removed leaving the South African agriculture sector as one of the least protected in the world (Tilley, 2002). Critics argue that this is far from creating a level playing field and that the liberalization of the agriculture sector will enhance the dominance of those already holding economic power and further alienate potential new entrants to the sector (Wegerif, 2004).

One of the strongest arguments against market-based land reform is that it will not lead to substantial change in land redistribution. The World Bank also noted



that without massive political upheaval, land reform has rarely succeeded in transferring much of a country's land (Wegerif, 2004). In East Asia, Griffin (2002) found that land reform based on free market prices is impossible. Land activists argue that a more interventionist and robust approach from the government would ensure a fundamental transformation of landholdings which can shift the extreme inequity in landholdings that is prevailing in South Africa (Wegerif, 2004). According to Aliber (2002), Riedinger *et al* (2000) provides six main arguments against the willing-buyer / willing-seller approach:

- "A market-based approach to agrarian reform will redistribute little land and benefit few landless families.
- A market-based approach to land reform is likely to be unaffordable to the would-be beneficiaries because the 'market' value of land exceeds the agronomic value of the land.
- If implemented, large-scale market-based agrarian reform will drive up land prices, effectively excluding poor farmers from the benefits of reform.
- Would-be beneficiaries of market-based agrarian reform lack access to affordable private credit markets to finance their share of the land cost.
- The empirical record of market-based reforms offers little evidence that this approach will result in rapid or significant redistribution of land.
- Uncertainty in the agricultural sector can best be addressed by a clear commitment to rapid completion of conventional – compulsory acquisition-based – agrarian reform." (Riedinger *et al.*, 2000.)

## **2.4 Measure and fundamentals of successful land reform**

Norton & Alwang (1985) explained that even if there is a change in ownership of land due to land reform, it does not necessarily mean that successful land reform has transpired. There are various indications that can be used as measures of successful reform (Norton & Alwang, 1985):

- Increased political stability;
- Incentives so that farmers want to work hard and increase their capital investment;
- Reduced poverty and increased social status for the rural population;
- Increased and continuous capital accumulation by small farmers in the form of livestock, farm buildings, equipment and other improvements; and
- Agricultural productivity should increase in the long run.

Evaluation of the success of land reform is a dynamic process that should be undertaken over many years following its inception. Nelson (1973) identified at least three stages of development of resettlement; firstly the pioneer stages (0-5 years), secondly the consolidation stage (5-10 years) and finally the growth stage that ranges over no specific timeframe.

If the reform has any prospect for success, incentives should be in place to make reform in the agricultural sector profitable. If not, then farm failures will occur, and, under capitalist reforms, consolidation into larger units will follow. Thus quickly growing farm sizes can be an indication of failure of land reform (Norton & Alwang, 1985).

Government has an important role to play in the approach to successful land reform. Governments resolve is strengthened by reduction in transaction costs and more effective information flows, which inform the people making it easier for them to express their point of view. However, in the case of corrupt leaders, bureaucrats and minimal sincere desire of those opposing effective land reform, change is highly unlikely unless peasants take land reform into their own hands.

According to Borras (2003), the most important key factor for the successful implementation of market-led agrarian reform is to have the cooperation of the landowners. This is also highlighted by Deininger & Binswanger (1999) that if market-led agrarian reform model approach is followed the landowners will

voluntarily comply to sell which in effect removes the confrontational atmosphere that can characterize land reforms.

An example of land owners opposing land reform can be seen in Colombia with the passing of Law 200 in 1936, which aimed to expropriate less productive, abandoned large land holdings. This caused a short-term increase in productivity that resulted in very little land being confiscated. Civil violence followed that weakened the political powers. Shortly after, in the 1950's, an ambitious reform package was set forth which compensated the landowners in full for the value of their land. Political pressure caused by coalition of allied land groups and interested urban consumers diverted inputs and caused subsidies to large-scale farmers that resulted in increasingly higher land prices for favoured farms, making compensation financially impossible. Landless and marginal farmers were politically and economically excluded. The conditions for successful land reform never really existed in Colombia. Shifting alliances between urban and rural power groups diminished the political will. A lack of clear conviction for redistribution, combined with slow pace of reform, inhibited the efforts (Bell, 1990).

Policies such as tax exemption policies, credit policies and input subsidies, favour large farms and have the effect of increasing land prices making compensation more expensive and giving economic advantage to the privileged class. Policies favouring large farms create incentives to oppose land reform and reduce the probability of successful land reform. This was the case in India with the "zamindari" system where landowners collect tax from the peasants (Joshi, 1975). The incentive of the peasants to produce was retarded since any profits generated by production would be collected by the landlords.

An administrative organization that focuses on coordinating the process on local and national decision-making and implementation of the reform programme is essential. Speed is crucial in the implementation process because if reform is

announced but not implemented quickly, capital will be removed from farms and productivity will suffer. Central authorities must act quickly to assemble land records that clearly identify targeted land and its productivity (Norton & Alwang, 1985).

Criteria for acquiring land must be clear and simple, and rules of compensating former landowners must be established. Former landowners must not be allowed to reacquire the land after the reform. Payments of new landowners must be modest and should be integrated into a land tax system. The government is given the opportunity to restructure the tax system. New land owners of small plots have increased capability to pay taxes and may do so willingly if they see that the tax system is honest and the proceeds will be used for schools, roads, and other local infrastructure (Norton & Alwang, 1985).

These theoretical fundamentals and structures to approach land reform can now be compared to some of the world experiences to investigate whether these theoretical frameworks applied to actual implementation.

## **2.5 Selected experiences with land reform**

This section examines the international experience with land reform and the agrarian structures that were developed and implemented. Examples will be taken from Zimbabwe, India, Brazil, Colombia and South Africa. Borras (2003) identifies the key features that need to be taken into consideration when examining the structures developed by each of these countries. The key features are: (i) Getting access to land, (ii) Post transfer development and (iii) Financing. These features will be discussed in each case.

### 2.5.1 Zimbabwe

To a large extent, the South African and Zimbabwean pre land reform situations are similar. Zimbabwean whites, although making up less than 1% of the population, owned more than 70% of the arable land, including most of the best land. There were 4 500 white commercial large-scale farmers that dominated the Zimbabwean agrarian economy with 6 million black people living in marginal areas with little to no access to natural resources (Moyo, 1998). Over a period of time, holdings were consolidated to create the various sub-sectors that are characterized not only by the quality of land but also by their access to, or exclusion from (to varying degrees), the necessary inputs for successful farming practices (Weiner *et al*, 1985). Together with trans-national capital, white agrarian interests controlled key sectors such as tourism, forestry, commodity exports and the narrow agro-industrial sector underlying the urban political economy.

These imbalances dramatically skewed income distribution in Zimbabwe, reflecting an unchanged legacy of colonial rule. The growth of poverty, unemployment and income disparities in the face of the under-use<sup>1</sup> of substantial parts of Zimbabwe's land and natural resources was the main driving force behind land reform in Zimbabwe (Moyo, 2000).

The 1985 Land Acquisition Act, though drawn in the spirit of the 1979 Lancaster House "willing seller, willing buyer" clause (which could not be changed for ten years), gave the government the first right to purchase excess land for redistribution to the landless (World Bank, 1991. Weiner *et al*, 1985). However, the Act had a limited impact, largely because the government did not have the money to compensate landowners. In addition, white farmers mounted a vigorous opposition to the Act. The 1992 Land Acquisition Act was enacted to

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<sup>1</sup> Under-used pieces of land in Zimbabwe refer to land owned by multinationals and foreigners.

speed up the land reform process by removing the "willing seller, willing buyer" clause. The Act empowered the government to buy land compulsorily for redistribution, and a fair compensation was to be paid for land acquired. Landowners were given the right to go to court if they did not agree to the price set by the acquiring authority. Opposition by landowners increased throughout the period from 1992 to 1997. In 1997 government identified 1471 farms covering approximately 3.5 million hectares that were to be acquired and redistributed, to 70 000 families. Among the farms gazetted for acquisition, a mere nine farms accounted for a full 23 per cent of the total land area to be acquired. They ranged in size from 30,000 to 350,000 hectares. The 29 largest farms together accounted for 1.3 million hectares (33 %) of the total. Conversely, as many as 990 of the smallest farms, ranging in size from one to 1,499 hectares, accounted for only 20 per cent of the total area identified for acquisition (Moyo, 2000. Weiner *et al*, 1985). Economic analysts predicted a 50 percent reduction in tobacco production since 700 tobacco farmers were identified to be among the 1471 farms. Tobacco which accounted for 40 percent of Zimbabwe's total exports was expected to decrease 23 percent of foreign currency by 1999 given a 50 percent production decrease.

The results of the land reform process have been disastrous for the economy of Zimbabwe. Prior to land redistribution, land owning (mostly white) farmers had large tracts of land and utilized economies of scale to raise capital, borrow money when necessary and purchase modern mechanized farm equipment to increase productivity on their land. The reforms broke this land into smaller tracts (thereby destroying the economies of scale) and gave it to former (mostly black) farm workers and peasants, who had little knowledge of how to run the farms efficiently or raise productivity. Further, the refusal of banks to lend them money has limited their ability to purchase equipment or otherwise raise capital. As a result, the drop in total farm output has been tremendous and produced widespread claims by aid agencies of starvation and famine. Currently, Zimbabwe suffers from widespread food shortages, the world's highest inflation

rate at over 100 000%, and a bitter political struggle which often turns violent between the ruling ZANU-PF party and the opposition Movement for Democratic Change, whose members have faced imprisonment and torture. Domestic and international critics lay much of the blame for the current chaos at the feet of the land reform program. Many Zimbabwean refugees have fled to South Africa or Mozambique.

The Zimbabwean experience has resulted in some of the worst outcomes of land reform and should be considered in future to avoid similar consequences.

### **2.5.2 India**

The “caste” system is not unique to India, though it is usually associated with Indian culture. It has existed for more than 3000 years and basically means the structure of social organisation through birth. People are born into one of four “castes”, or classes. This organisation of society meant everybody knew their place, but it also meant that people were confined to live and marry within their own caste, and there was no possibility of social mobility.

There are four “castes” (otherwise known as “varnas”) (Sethi, 2006). They are:

- Brahmins (priests)
- Kshatriya (warriors and rulers)
- Vaisya (traders and agriculturalists), and
- Sudra (manual workers)

The people who fell outside the four main ‘varna’ (castes) included people of the lowest social class, who were called the “Untouchables”. The “Untouchables” – sometimes known as “Dalits” – are considered by the upper castes as less than human, and are forced to perform the most menial and degrading jobs. When India gained independence in 1947, it declared itself a secular state, with no official state religion. The first Prime Minister, Jawaharlal Nehru, was committed

to the secular, socialist and democratic principles on which the nation was founded and which makes it the world's largest democracy. Caste-based discrimination has been outlawed and although caste barriers have mostly broken down in large cities, they still exist in rural areas. The caste system does continue to play a major role in Indian society and politics. Dalits are socially, religiously, economically and politically oppressed, deprived and exploited. They are poor, have no political power or representation, and became known as "Untouchables" because they are not allowed to touch "caste" Hindus. This social system and injustice has meant that millions of Indians today live in poverty (Sethi, 2006). There is terrible overcrowding in India's big cities and people are forced to live in large, sprawling slums because they cannot afford to own property. The majority of the poor people in India (as many as 75%) live in rural areas. A 2007 report by the state-run "*National Commission for Enterprises in the Unorganised Sector*" (NCEUS) found that 77% of Indians, or 836 million people, lived on less than 20 rupees per day (approximately 50 cents) with most working in "informal labour sector with no job or social security, living in abject poverty." India has the highest rate of malnutrition for children under the age of three of any country in the world (Sethi, 2006).

Ownership and control of land was highly concentrated in the hands of a few landlords whose main intention was to get maximum rent from their tenants. Under this arrangement, the tenant farmer had little economic motivation to develop farmland for increased production (because they would not make any money out of it). At the same time, the landlord was not particularly concerned about improving the economic condition of the farmers (because the landowner would lose money). As a result, agricultural productivity suffered and the tenants' situation deteriorated. In the years immediately following India's independence, land ownership was recognised as crucially important. India was extremely poor, and in order to try to abolish poverty, progress was needed on two fronts: high productivity and sharing equally. Land reforms were to be an important pillar for a strong and prosperous country (Sethi, 2006).



Large sums of money were dedicated to this, with a degree of success in certain regions and states: the abolition of intermediaries, protection of tenants and a restriction on how much land could be owned by any individual. This improved the situation for many middle class people, but has not benefited the poor who actually work on the land. (Joshi, 1975; Sethi, 2006).

Most studies indicate that inequalities have increased, rather than decreased. The number of people who do not own any land has gone up and the top ten percent of the population monopolizes more land now than in 1951. Meanwhile, the issue of land reforms has over the years, either unconsciously faded from public mind or deliberately been glossed over. Rich landowners often have powerful political friends, whereas the powerless poor often cannot get their voices heard. As a result, land is mostly for the urban, educated elite, which has become more a matter for housing, investment and building infrastructure. The idea of land as a basis of livelihood – for subsistence, survival, social justice and human dignity has largely been lost, so the poor become even poorer (Sethi, 2006).

### ***2.5.3 Brazil, Colombia and South Africa***

Table 2.2 summarizes the comparison of the key issues used to evaluate land reform in Brazil, Colombia and South Africa. From Table 2.2 it can be concluded that South Africa has a combination of state-led and market-led consequences influencing the success of land reform.

**Table 2.2: Land reform comparison between Brazil, Colombia and South Africa**

<b>Issues</b>	<b>Brazil</b>	<b>Colombia</b>	<b>South Africa</b>
<i>Getting access to land</i>			
<b>Willing sellers</b>	Popular support from landlords	Popular support from landlords	Popular support from white commercial farmers
<b>Willing buyers</b>	Beneficiaries pre-enter average income above poverty line; elite peasant leaders took control of the organizations	Beneficiaries: agrarian bourgeoisie who took control of the programme	25% of beneficiaries above poverty line
<b>Decentralized</b>	Substantially decentralized, but manipulated by local governments and other elite; generally not transparent, not accountable	Highly centralized; process manipulated by local elites like land overpricing; generally not transparent, not accountable	Highly centralized, and process not transparent, not accountable
<b>Land prices</b>	Land prices not low as expected - higher than that in state-led programme	Massive land overpricing; prices higher than that in state-led approach	No parallel land reform to compare with, but possible overpricing
<b>Land market</b>	Depressed land prices (60% decrease from 1994 to 1998), but high land prices in Projeto Cedula da Terra (PCT). No progressive land tax; no land titling programme	Depressed land prices prior to MLAR, but MLAR triggered increases in land prices; no progressive land tax; no land titling programme	Depressed land prices, but land prices under LRP-RDP high; no progressive land tax, no land titling programme
<i>Post-land purchase farm and beneficiary development</i>			

<b>Sequence and pace of development</b>	"Farm plans before land purchase" approach not satisfactory implemented; pace of development slow and uncertain; extension service privatised but poor quality	"Farm plans before land purchase" approach not satisfactorily implemented; pace of development slow and uncertain; extension service within general government programme	"Farm plans before land purchase" approach not satisfactorily implemented; pace of development slow and uncertain; extension service within general government programme
<b>Credit and investment</b>	No evidence available on the credit and investment performance of projects	No evidence available on the credit and investment performance of projects	Low isolated cases
<b>Exit options</b>	Exit options denied (no exit from farm collectives)	No evidence of systematic exit options	No evidence of systematic exit options
<i>Financing</i>			
<b>Flexible loan</b>	Implemented but failed to achieve objectives	Not implemented; used 70% of land price in 100% grant (30% of land cost from beneficiary)	Not implemented; used method 100% grant for land purchase but no development grants
<b>Programme cost</b>	US\$11200/beneficiary not sufficient	US\$21000/beneficiary; land purchase subsidy not sufficient (not for development projects)	R16000/beneficiary not sufficient (and nothing for development projects)

Source: Borras, 2003.

## **2.6 Land reform programmes in South Africa**

This section focuses on the programmes that have been implemented in South Africa, evaluating the structures, targets and procedures

### ***2.6.1 Settlement/Land Acquisition Grant (SLAG)***

Delivery of land reform started as a pilot programme in 1995. The first version of the redistribution programme, in 1995, involved the Department of Land Affairs (DLA) providing a Settlement/Land Acquisition Grant (SLAG) to assist the poor with the purchase of land (DLA, 1997). SLAG focused on poor families with income lower than R1500 a month. The international experience with the income ceiling approach to selecting beneficiaries and benefiting the poor, was also used in Brazil with an income ceiling of less than US\$2880/year and in Colombia with income not more than the equivalent of income derived from a 15-hectare farm (Borras, 2003). In 2000 the Minister for Agriculture released a policy statement that confirmed weaknesses of the SLAG approach including the failure to realize land reform objectives, the reliance on market based forces for the redistribution failing to produce the desired results, and the SLAG grants being unsuitable for the creation of group black commercial farmers (Wegerif, 2004).

SLAG was largely replaced in 2001 by the LRAD programme that removed poverty as a criterion for beneficiary selection and focused more on creating black commercial farmers.

### ***2.6.2 Land Redistribution for Agricultural Development (LRAD)***

LRAD's objectives were to improve nutrition and incomes of the rural poor by farming on any scale, to reduce pressure on scarce resources in the former homelands and to create opportunities in agriculture for women and youth in rural areas (Coetzee & Jooste, 2004). The demand-driven program embraces the willing buyer-willing seller principle, which places a huge responsibility on

applicants for subsidies to identify suitable land, negotiate realistic prices for land and to take transfer of land (Coetzee & Jooste, 2004). With the replacement of SLAG, government placed much vocal blame on the landowners ability to prohibit or hinder land redistribution and thus on the pace of the whole willing-buyer / willing-seller approach (Aliber, 2002). Interesting to note is that Vink reported in 2004 that most white commercial farmers do not feel intimidated by the land reform policy, but that they feel that other factors, such as uncertainty caused by deregulation, minimum wages, loss of water rights and property taxes threaten their survival (Vink, 2004).

The primary mechanism of LRAD is grants to beneficiaries. The size of the grant depends on the applicant's own contribution, skills and management ability, although in practice there is no assessment of management ability (DLA, 2001, NDA, 2001). To receive a R 20 000 grant a person must contribute R 5 000. There is a provision of labour as contribution that is classified as "*sweet equity*" and is worth R 5 000. The maximum amount of grant that can be accessed is R 100 000 with a corresponding own contribution of R 400 000. LRAD grant money is never given to the beneficiary; it is paid directly to the seller of the land or other assets being purchased. While there should be consultation with the beneficiary, the final decision on the release of the grant money and the payment is made by DLA. A "*planning grant*" is available in addition to the main LRAD grant to pay for "*design agents*" to work on the project design, business plans and proposals (Wegerif, 2004). The planning grant is also used to pay for services such as land valuations and land sub-division. The planning grant should not exceed 15% of the projected total capital costs of the project (DLA 2001). Details on the procedure of the business plans will be highlighted later.

A study done by Coetzee & Jooste (2004) in the Eastern Cape, outlined the constraints of the current land redistribution program on the basis of practical experiences with LRAD in South Africa,

The program currently follows a widely applied sequence of events (DLA, 2000). These entail:

- Upon implementation of the process, individuals are required to determine the amount of the grant that can be acquired, as calculated by the amount of their own contribution.
- Sourcing the services of a “*design agent*”.
- Identifying available land.
- The beneficiary will then enter into an informal contract with a willing seller.
- Apply for loans from the Land Bank or commercial banks.
- Seeking the services of a “*design agent*” and preparing a farm business plan.
- Approaching the local agricultural extension officer of the Provincial Department of Agriculture (PDA) for an opinion on the viability of the farm.
- Submitting a complete proposal package to the District Screening Committee (DSC) and the Provincial Grant Approval Committee (PGAC) for final approval or rejection.
- After approval of the project, funds are released and transfer of the property is implemented.

Support and supervision of the process falls within the responsibilities of the DLA and the Department of Agriculture (DoA). DLA designs and monitors the impact of the LRAD and other land reform policies. The DLA co-ordinates policy issues and interdepartmental activities at a national level. The budget, and control over it, is allocated per province and executed by Provincial Land Reform Offices (PLROs) in each province. PLROs provide the budget, support and training for beneficiaries, agents and local agricultural officers up to the point where land is transferred (DLA, 2000). On a provincial level, the Provincial Executive Council through the Provincial Department of Agriculture (PDA), in cooperation with the PLRO, takes responsibility for the program. Its main objective is to establish and monitor the work of the PLRO in the province. It is at this level that considerable uncertainty exists regarding the role of the PDA as opposed to that of the PLRO. The doubt is mostly related to a lack of communication between the two institutions, as well a lack of capacity on the side of the PDA to provide consistent support to beneficiaries during and after land acquisition (Coetzee & Jooste, 2004). The Provincial

Land Reform Co-ordination Committee comprises key stakeholders (representatives of the National African Farmers' Union (NAFU), Agri-SA, labour unions and relevant government officials). This Committee meets quarterly to review the performance of the Provincial Grant Approval Committee (PGAC).

The PGAC consists of provincial officers of DLA and PDA. The Committee decides on land reform project proposals that have been approved at district level by the District Screening Committee (DSC). Upon approval of a project to acquire land, the PGAC makes the funding available for proceeding with the planning of the land transfer, which includes fees to social facilitators and legal counsel, as well as the money to buy the land itself (DLA, 2000). Once the land has been transferred to the beneficiaries, extension officers of the PDA in the district where the land is situated are required to provide technical support regarding the execution of the original farm plan, land use and environmental aspects of farming. They assist in identifying potential land, and identifying the seller's title and land price and negotiating (Botha *et al*, 2006, Coetzee & Jooste, 2004).

### **2.6.3 Problems with LRAD**

Most of the programme objectives are vague and has no quantitative or qualitative component that could be effectively monitored. This according to Wegerif (2004) includes the definition of the targeted 30% agricultural land. He also argues that the nature of the objectives makes it difficult to hold government accountable for delivery (Wegerif, 2004).

Low levels of literacy and experience restrain potential beneficiaries of the program, they find it difficult to direct the institutional, technical and legal requirements of the process described above. The process is extensive and requires a high degree of beneficiary consultation, as well as a great deal of time and energy. Both the sellers of the land and the beneficiaries of the program feel uncomfortable with the process and they have indicated that this

is one of the reasons they refrain from accessing the program (Vink, 2004). At the point of entry, beneficiaries rely largely on extension officers' knowledge and experience regarding the process. A complicating issue is the decentralized nature of institutional governance, i.e. rules and guidelines are determined at the national level, but local planners from DLA and extension officers themselves do not understand the complicated institutional structures that govern them and their tasks leading to mutual frustration as regards the LRAD process (Coetzee & Jooste, 2004).

Given the beneficiary background of poor exposure to commercial agriculture and lack of information, they find it difficult to identify farmland that is for sale leading to the frustration of the LRAD beneficiaries. Aliber & Moekoena (2003) echoes that landowners will attempt to take advantage of the program by inflating land prices. This claim has also been made in Government's own review of the Redistribution Program, which concludes that marginal land is being sold at exorbitant prices, turning white landowners into "instant millionaires" (DLA, 1997). Potential buyers furthermore lack access to information on current land values and land price trends. Under these circumstances, farm sellers use the opportunity to obtain maximum prices.

In their endeavours to identify land, LRAD applicants are often influenced by residential improvements on farms rather than the agricultural production potential of the properties. This leads to a wrong impression with regard to the value and potential of the farm to sustain and increase the applicant's income. Options to purchase agriculturally unsuitable properties, such as smallholdings around towns, are often signed at excessive prices, a reflection of the residential value rather than the agricultural value of the property (Coetzee & Jooste, 2004).

The DLA strongly emphasizes the need for proper business planning for anticipated farming businesses. The prerequisite of a business plan is therefore a critical requirement for the allocation of a subsidy (DLA, 2000). The policy also states that there should be maximum beneficiary involvement in the process, giving the beneficiaries the majority say in what they want to



farm with and how they want to execute the plans (DLA, 2000). Poor literacy levels and farming experience amongst the applicants make the in-house planning of the business very difficult. The applicants are thus at the fate of anyone who is prepared to conduct the planning, knowing that they risk forfeiting the consultancy fee if the application is rejected. Consequently, business plans from these sources are very optimistic so that applications appear feasible. Lynne & Darroch (2003) found that business plans ignore the realities of low returns on investment and risk in agriculture, as well as the level of farming experience of the applicants.

The slow pace of land reform in South Africa causes pressure to involve maximum amounts of the black participants where in fact there is a need to have optimum participation. Misallocation of resources or under spending on budgetary provisions, segmented information flows and none existing post transfer support all contribute to the inefficiencies of reform. Over the past two years the government has begun to admit what informed outsiders have been saying for a decade or more; that the greatest impediment to successful implementation of land reform is the lack of capacity in the DLA. In November 2006 the Minister of Agriculture and Land Affairs said that there were 1000 vacancies in the department. According to Walker (2007), a former lands claims commissioner in KwaZulu Natal, government could not meet its own deadlines without compromising significantly on the quality of the outcomes and suggested that "limited state capacity" is not a temporary aberration, but an institutional reality knitted into the fabric of state operations, which will persist into the foreseeable future.

Cognisance should be taken that the market driven land reform programme to date was in line with changes in South African economic policy that took on a more market- and investor-friendly direction with the adoption of the Growth Employment and Redistribution (GEAR) policy in 1996 (Wegerif, 2004). Currently, however, the policy trend is toward a more state-driven land reform strategy and the question arises whether a more state-driven approach which will surely demand more capacity, will succeed with the already problematic staff shortage and capacity problems (CDE, 2008).

## 2.7 Conclusions

The demand for land as an economic asset represents a source of identity and a symbol of citizenship. Land reform is therefore also a politically imperative and continued inequality in land ownership is a highly emotive and controversial issue. While commercial farmers fear a Zimbabwe "land-grab", landless people and their supporters are becoming increasingly frustrated with the slow pace of land reform (Ntsebeza & Hall, 2007). Historically, land reforms have most often been made possible only after significant social upheaval caused by revolution, the overthrow of colonial powers, or war. In countries with capitalist forms of social and economic relationships, land reforms are difficult to achieve because those holding the land rights also have strong political power, where in socialist economic systems and group farming, land reforms also may involve increased privatisation of land or the rights to plan and to market output from land. These reforms are difficult to achieve because they imply movement toward a more market-driven economy and a more free political system (Norton & Alwang, 1985).

Sociologists have argued that once expectations have been aroused for improved welfare, smashed dreams become dangerous (Groenewald, 2003). More than 100 years ago (1856) the French social thinker Alexis de Tocqueville wrote: "Evils which have been patiently endured when they seem inevitable become intolerable once the idea of escape from them is suggested" (in: Bassis, Gelles & Levine, 1991:192 quoted Groenewald, 2003).

The modern term for this phenomenon is "*raising expectations*." People in a daily struggle just to exist and survive, are very unlikely to rise in protest, but if their economic condition improves, or if they are given what appears to be realistic promises, their expectations rise. "They soon begin to believe that a better life is just around the corner. When these hopes fail to materialize, they become angry and frustrated. The gap between what they expected and what they have now seems intolerable" (Groenewald, 2003). It is possible that this phenomenon materially contributed to hurried action, causing the present Zimbabwe chaos.

South Africa's current ownership and use of agricultural land is the inevitable outcome of decades of policies favouring white commercial farmers (Van Zyl, *et al*, 1996). Thus, the need for reform is critically important, but with some unavoidable costs. The MLAR in theory causes the least distortions in the market and is theoretically the most efficient approach to reform. It also has become clear that not all of the reform approaches are in fact as efficient as it was hoped they would be. In some cases, the complete opposite was realized as was predicted by the MLAR theory. In the case of South Africa, there is a combination of implications between the market-led and state-led approach. These implications have opposing and contradicting affects.

There is a payoff between equity and efficiency, socialism and capitalism. On the one side, the government is aiming for a highly efficient, market driven, competitive economy with 6% growth rate, but on the other side, is dealing with high cost social responsibilities that are critical and unavoidable. In the period prior to reform the large-scale white farming sector was being actively promoted through the use of a variety of mechanisms such as subsidies on capital equipment, subsidized credit for production and land purchases, pricing controls with prices above parity, and restrictions on where producers could sell. These measures seriously distorted the economic incentives in agriculture (Van Zyl *et al*, 1996). Currently, the international agricultural playing field is highly unequal, with little to no protection from world competition and yet the introduction of land reform, which plays a crucial role in development of the rural population, continues. The contradicting aims have no single route to accomplish the ultimate goal of economic and social prosperity except via a complex combination of both principles. Identifying the inefficiencies within the process of achieving equity and solving these problems could provide a midway solution closer to reaching the ultimate goal of successful reform.

## CHAPTER 3

### DATA SOURCES AND LAND USES IN THE FREE STATE PROVINCE

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#### 3.1 Introduction

This chapter focuses on the establishment of a price criterion into categories to evaluate value trends when linked to agro-ecological characteristics of land. These characteristics can be subdivided into physical and biological factors, which will be tested against this price criterion. It is also hypothesised that the profitability of land influences the value of land; thus the uses of land are also tested against the price criterion. Given the results and conclusion on the Deeds Office price criterion, a further investigation into the factors contributing to price discovery under the LRAD programme will be examined.

The first part of this chapter explains the price criterion that was developed for the analysis, which is then compared with the various characteristics identified by the Department of Agriculture as having an effect on the price of land. The different data sources are compared towards the middle of the chapter, while the final part draws a correlation between the different sources.

#### 3.2 Establishing value categories

The analysis of the Deeds Office data covers the period 1994 to 2003, but it must be noted that the data for the first and last years are incomplete. This stems from the fact that the land market trends have been organised here according to the year in which the purchase agreement was struck between the seller and the buyer, which is not necessarily the same year in which the transaction was registered with the Deeds Office. Many of the transactions that were agreed

upon in 2003 were not registered as of January 2004, which is the last month for which data on registered transactions is available (ALPRO, 2006).

It must also be noted that 'farmland' is here taken to mean land historically designated as such in the cadastre and in the deeds registry. This is not to say that all such land is in fact farmland: Some of it is rural but not actively farmed, and a small amount is in fact urban. However, the terms 'farmland' and 'rural property' are used interchangeably, and it is assumed that anomalies such as urban "farms" are minimal. Also, smallholdings have not been included. Smallholdings account for a large number of what might be called rural transactions, but collectively they make up a very small area and in general are not actual farms (ALPRO, 2006).

A brief provincial comparison of prices and other land market trends, noting significant differences between provinces in terms of land price inflation as well as market activity and movement, are shown in Table 3.1 and Table 3.2, respectively (ALPRO, 2006). Table 3.1 show that the annual average increase in land prices between 1999 and 2003 was 14 percent. In the Eastern Cape and North West Province this increase was higher than the South African average. Notably, Gauteng and KwaZulu-Natal experienced a much lower increase in land values compared to the other provinces.

**Table 3.1: Average price per hectare by province and by year**

Size category	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Avg. annual increase, 1999 - 2003
RSA	766	989	793	914	901	898	1,103	965	1,262	1,517	14.0%
Eastern Cape	520	641	637	736	591	590	636	719	936	1,100	16.9%
Free State	615	688	759	737	790	856	883	864	1,083	1,388	12.8%
Gauteng	2,668	2,581	4,711	3,555	3,963	3,492	1,833	3,795	5,342	4,532	6.7%
KwaZulu-Natal	1,624	3,031	1,687	2,034	2,274	2,107	2,200	2,399	2,660	2,473	4.1%
Limpopo	916	962	1,111	1,240	1,368	1,524	3,425	1,658	2,038	2,329	13.0%
Mpumalanga	1,256	2,270	1,179	2,004	1,932	1,705	1,689	1,848	2,039	2,784	12.7%
Northern Cape	151	159	163	198	210	208	215	227	298	335	11.2%
North West	779	879	915	953	1,068	1,076	1,227	1,264	1,403	1,925	15.7%
Western Cape	912	1,134	1,045	1,262	953	1,339	1,164	1,215	1,348	1,964	10.0%

Source: ALPRO, 2006.

Table 3.2 shows that, on average, about 5.5 percent of commercial farmland are transacted annually. In Gauteng this average is exceeded by far. More specifically with regard to the FSP, land transfers are recorded in 43 administrative districts and encompass the total transacted value and the size of the land transferred (Deeds Office refers to registration district) (See Figure B2 in Appendix B for overarching district municipalities).

**Table 3.2: Average share of commercial farmland transacted annually**

	1995-2002	1995-1998	1999-2002
RSA	5.5%	5.1%	5.9%
Eastern Cape	4.3%	3.5%	5.0%
Free State	5.8%	5.4%	6.1%
Gauteng	13.6%	10.8%	16.4%
KwaZulu-Natal	5.1%	5.8%	4.5%
Limpopo	8.6%	8.5%	8.7%
Mpumalanga	6.7%	6.9%	6.4%
Northern Cape	4.5%	4.1%	4.9%
North West	7.4%	6.5%	8.2%
Western Cape	5.7%	5.2%	6.3%

Source: ALPRO, 2006.

Cognisance should be taken that no reference is made to the underlying value drivers. Table 3.3 shows the value of land transacted per hectare for different size categories (ALPRO, 2006). It is clear that smaller plots of land attract higher prices than larger plots of land, but as mentioned no other conclusions can be drawn in terms of value drivers from the information provided by the Deeds Office. Hence the size of the property, amongst other things, needs to be accounted for when comparing and evaluating the drivers behind price per hectare.

**Table 3.3: Land sales by total area, with value shares, by size category – Free State**

Size category (ha)	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	R/ha	R/ha	R/ha	R/ha	R/ha	R/ha	R/ha	R/ha	R/ha	R/ha
1-5	13 652	23 984	28 498	29 570	26 764	26 023	21 938	31 121	40 976	47 321
6-20	8 834	11 888	12 795	17 070	15 099	14 985	13 660	14 567	16 637	29 962
21-100	2 184	2 524	2 509	3 037	2 699	3 097	2 700	3 304	3 473	3 555
101-500	807	890	927	1 023	1 086	1 076	1 096	1 066	1 224	1 573
501-1000	542	615	681	644	612	760	718	807	1 000	1 238
1001-5000	360	399	453	448	426	456	524	551	725	964
5001+	183	0	0	73	350	0	0	200	503	47
All	615	688	759	737	790	856	883	864	1 083	1 388

Source: ALPRO, 2006.

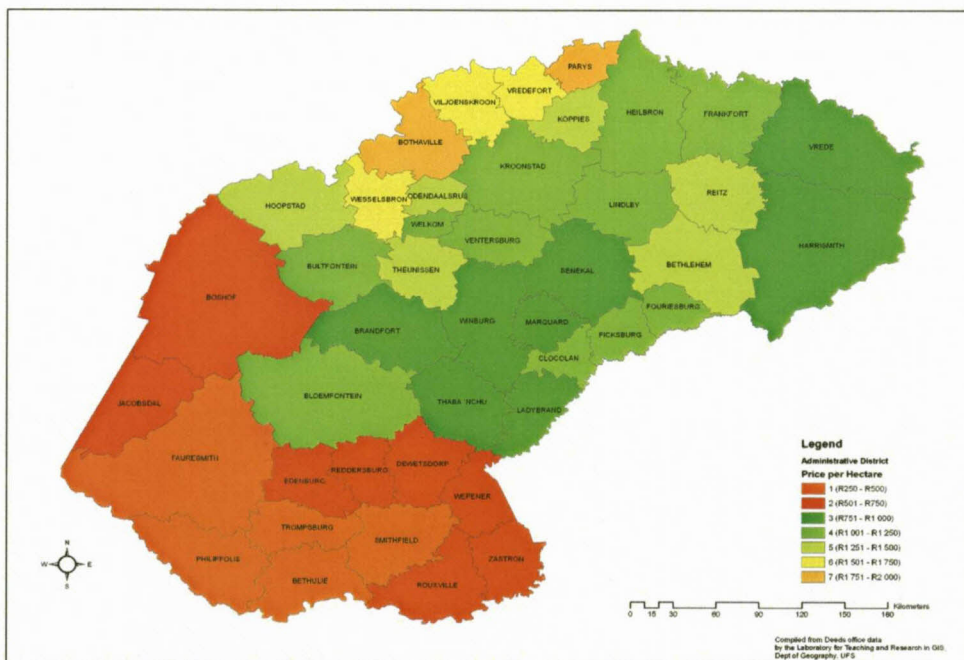
In order to establish a basis for comparing different land values in the FSP with variables such as agro-ecological potential, it was necessary to categorise land values. The aim of this approach was to evaluate whether there was a link between higher price ranges and certain agro-ecological zones as depicted by the spatial maps obtained from various sources. Table 3.4 shows the different transacted land value categories, where category 1 represents the lowest land value range and category 7 the highest.

**Table 3.4: Transacted average land value categories**

CATEGORY	VALUE RANGES
1	R250 - R500
2	R501 - R750
3	R751 - R1 000
4	R1 001 - R1 250
5	R1 251 - R1 500
6	R1 501 - R1 750
7	≥ R1 750

In order to account for the effect of inflation, all values were deflated with 2000 as base year. The transacted average real values per administrative district were

then paired with the value categories in Table 3.4. The end result is depicted in Figure 3.1, which shows the transacted average real land value (TARLV) categories per administrative district. This delineation was used as the base or master overlay for subsequent comparisons with the main agro-ecological characteristics that were tested separately to determine whether there was a stronger influence from certain factors. Moreover, the main objective with this matching technique was to evaluate the correlation between TARLV dispersion and some of the most important agro-ecological characteristics of the FSP. If a strong correlation between TARLV and the agro-ecological characteristics exists, it indicates that Deeds Office data captures the underlying agro-ecological potential of land and hence can be used to explain differences between land prices in different administrative districts. This is over and above the obvious correlation between the size of the plot of land and the price per hectare, as discussed earlier. In the case of poor correlation, Deeds Office data should be used with caution when comparing land values, other than the size variable.



**Figure 3.1: District categories for transacted average real values per hectare (2000=100)**

Source: Deeds Office (2003)



### 3.3 Agro-ecological delineation with TARLV

#### 3.3.1 Role of resources

The farming systems in each region of the country show considerable variety. Farming systems are differentiated by how production is organised, the nature of the technologies employed, and the types of crops and livestock produced. The primary determinants of the prevailing system must be evaluated and understood before they can be improved. Technical, institutional and human factors determine the type of agricultural system. These sets of factors interact at each location and point in time to provide a unique environment for agricultural production. When these factors remain constant in a particular geographical area for several years, the farming system that evolves represents a long-term adaptation to that environment. Economic development can introduce rapid changes in several of the underlying factors, which causes pressure on the existing system (Norton & Alwang, 1985).

Technical elements, including both physical and biological factors, determine the potential crop type and livestock system. Previous research has shown that *"in order to determine relatively homogeneous agro-economical zones, it is necessary to know which factors cause major differences between regions and make them suitable for the production of different commodities"* (Tekle, 2004). The production potential is indicative of the profitability of same and consequently provides a base for value determination. According to the Department of Agriculture the most suitable form of farming in a particular area is mainly determined by:

- Physical factors (topography, rainfall, vegetation, soil);
- Biological factors (diseases, pests); and
- Economic factors (market and transport facilities, production costs).

None of these factors will be found in exactly the same ratio on any farm. Evidence exist that certain areas of the FSP are, however, to a lesser or to a greater extent suitable for certain crop or livestock types. Such areas can usually be distinguished from neighbouring areas due to certain characteristics or the specific nature of farming enterprises in that area.

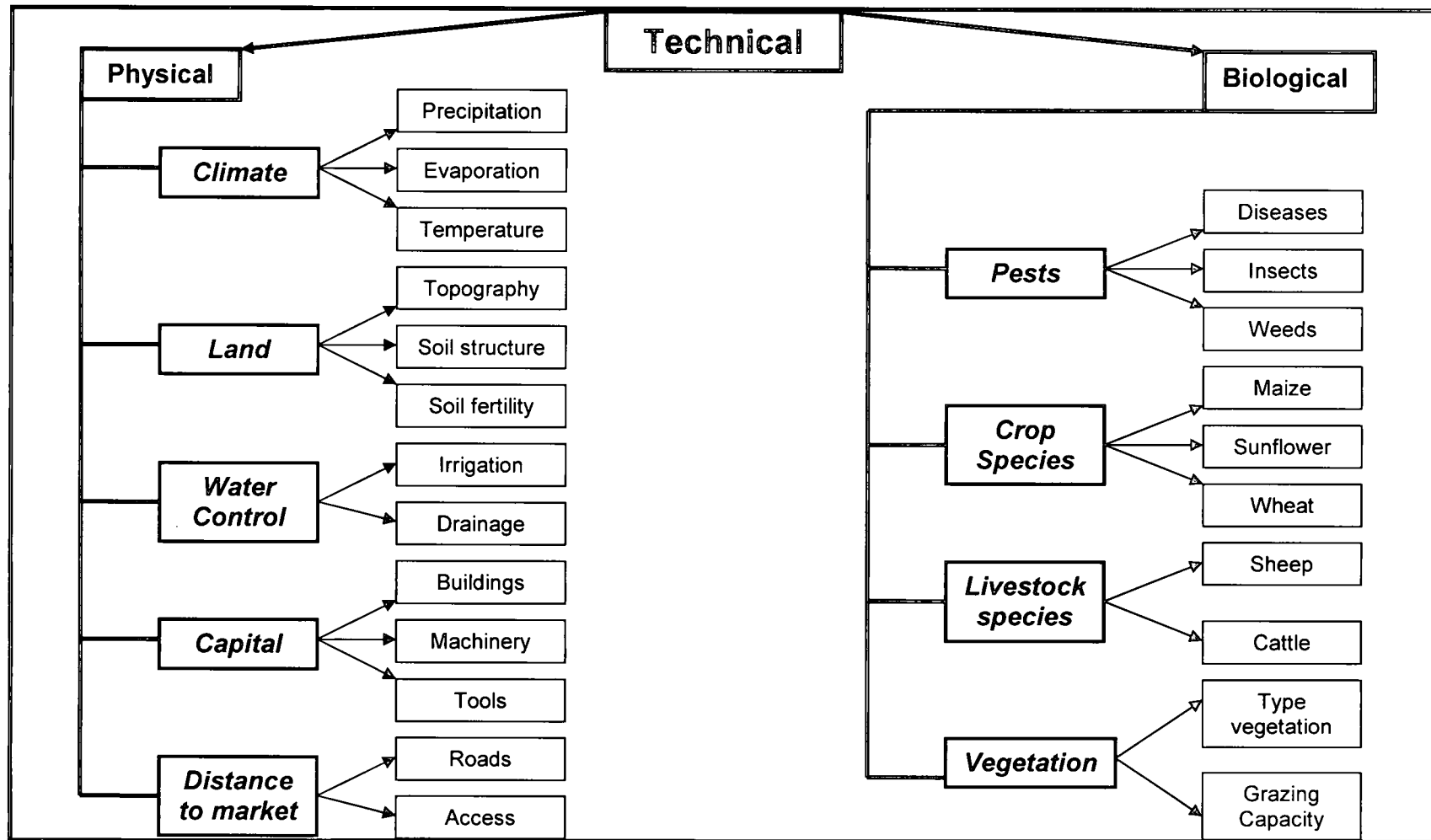
Physical factors include climate, land, water control, capital items, and distance to market. These factors and the associated subdivisions have important implications for production decisions. The structure of each of these factors is shown in Figure 3.2.

Topography refers to altitude and soil gradient. Altitude is a critical factor determining the nature of South Africa's climate, due to the country's specific location on earth. For example, high-lying places in the eastern part of the FSP are cooler in the summer months and normally colder in the winter months than lower-lying areas. Moreover, the proximity and direction of mountains may also influence rainfall in a region. The relatively flat topography in other parts of the FSP gives rise to the evaporation of scarce water resources. In some instances, a specific topography coupled with low rainfall and insufficient vegetation causes severe erosion. There is a relatively close relationship between temperature and topography. Temperature influences not only natural plant growth, but also the type of crop cultivated, and to a lesser extent the type of livestock that can be kept in a region. Temperature also influences the rate of evaporation. Higher temperatures are associated with higher evaporation, thus having a negative effect on the availability of water (Figure C1 of Appendix C displays the average temperatures in the FSP).

Precipitation is indisputably the strongest limiting natural factor in South African agriculture, especially with regard to crop production. The FSP is no exception. Rainfall is distributed unevenly over the FSP, with only a small percentage

receiving a median annual rainfall of more than 1000 mm. This area is mainly restricted to the eastern parts of the province. Even more important is the distribution, nature and certainty thereof. Rainfall has a major influence on both cropping practices and livestock farming. Rainfall is a major determinant of natural vegetation in a region and hence also the type of livestock held. The natural vegetation within a region is the cheapest form of feed available for livestock production, hence the importance of this natural resource. The grazing capacity of a region directly influences the intensity of livestock production. Settled farmers have an intimate knowledge of soil variations and water availability field by field, in far more detail than an itinerant soil surveyor is likely to acquire. If there is a lack of farming experience, a survey of the natural resources is needed in order to prevent mistakes being made or to improve efficiency (Young, 1998). Soil not only dictates whether a region is suitable for cropping, but together with rainfall and temperature it determines the nature of a region's natural plant growth. This in turn influences the extent and nature of livestock farming. After rainfall, soil is the most important factor determining farming systems in a particular region. While air and sunlight are generally available in most geographic locations, crops also depend on soil nutrients and the availability of water. When farmers grow and harvest crops, they remove some of these nutrients from the soil. Without replenishment the land would suffer from nutrient depletion and be unusable for further farming. Sustainable agriculture depends on replenishing the soil while minimising the use of non-renewable resources, such as natural gas (used in converting atmospheric nitrogen into synthetic fertiliser) or mineral ores (e.g. phosphate).

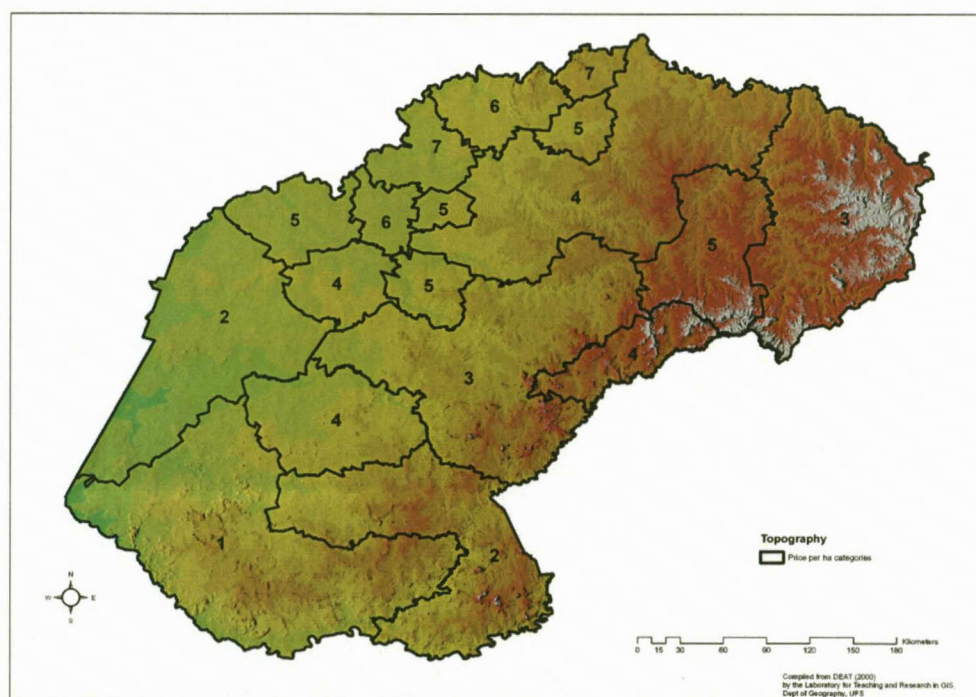
Figure 3.2 structurally represents the agro-ecological variable considered in the research. The structure developed by Norton & Alwang (1985) has been modified to also incorporate the effects of certain farming practices and products produced in a region. This can be seen with the inclusion of crop and livestock species and vegetation types within a region.



**Figure 3.2: Resource structure**

Source: Norton & Alwang, 1985.

In studying the literature it became apparent that some physical and biological factors have an immense influence on the decision on what can be produced in a sustainable manner. Figure 3.3 gives the topography of the FSP compared to TARLV. Topography specifically involves the recording of relief or terrain, the three-dimensional quality of the surface, and the identification of specific landforms. In general there appears to be no distinctive correlation between topography and TARLV recorded by the Deeds Office. Moreover, topography also influences other variables like vegetation, soil and rainfall, and at a later stage the reader will come to realise that these factors affect one another interchangeably, making it difficult to draw any conclusions on any of the agro-ecological factors separately. This complication is discussed later on in this section. Although these factors interact, it is still important to determine whether individual patterns exist between the agro-ecological factors and TARLV.



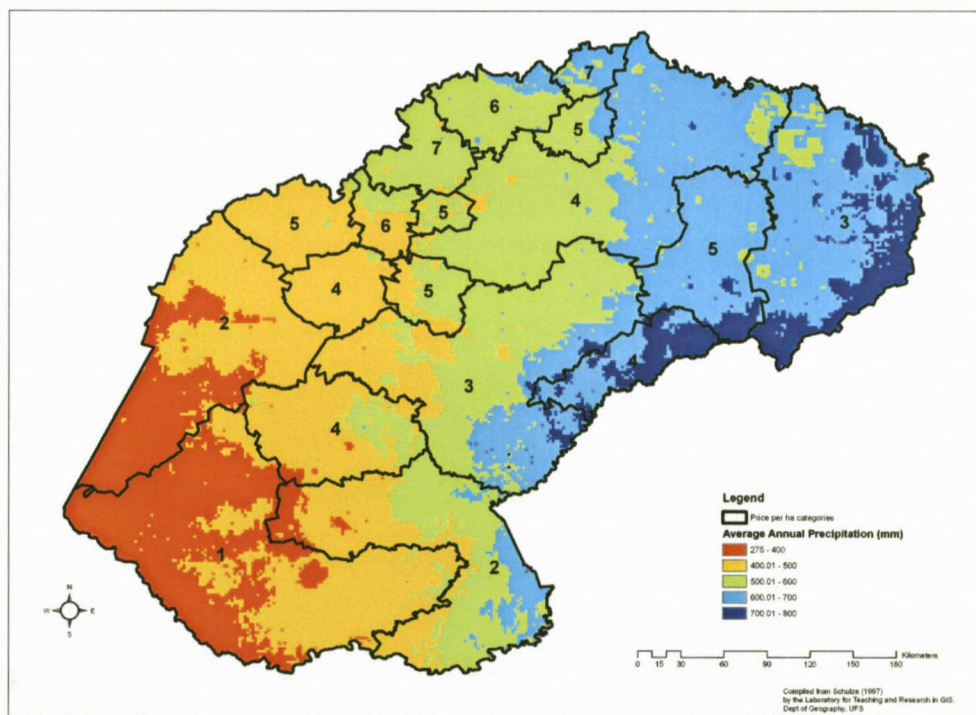
**Figure 3.3: Topography of the Free State with TARLV categories**

Source: Centre for Research and Geography, UFS (2006)

Note: Numbers refer to TARLV



Figure 3.4 compares the average precipitation with TARLV. One could argue that the higher the rainfall the higher the production potential and consequently the income-generating capacity, resulting in higher land values. Figure 3.4 does not, however, support such a hypothesis. Areas with the highest rainfall attracted relatively moderate prices in comparison with the price ranges. A high correlation is seen between low rainfall and low prices in the south-western region of the FSP. Combining topography with precipitation can provide a possible explanation for the moderate prices in the north-eastern region of the FSP, since the highest slope regions are found there, and combined with high rainfall this could result in serious erosion and areas that are less suitable for crop production.

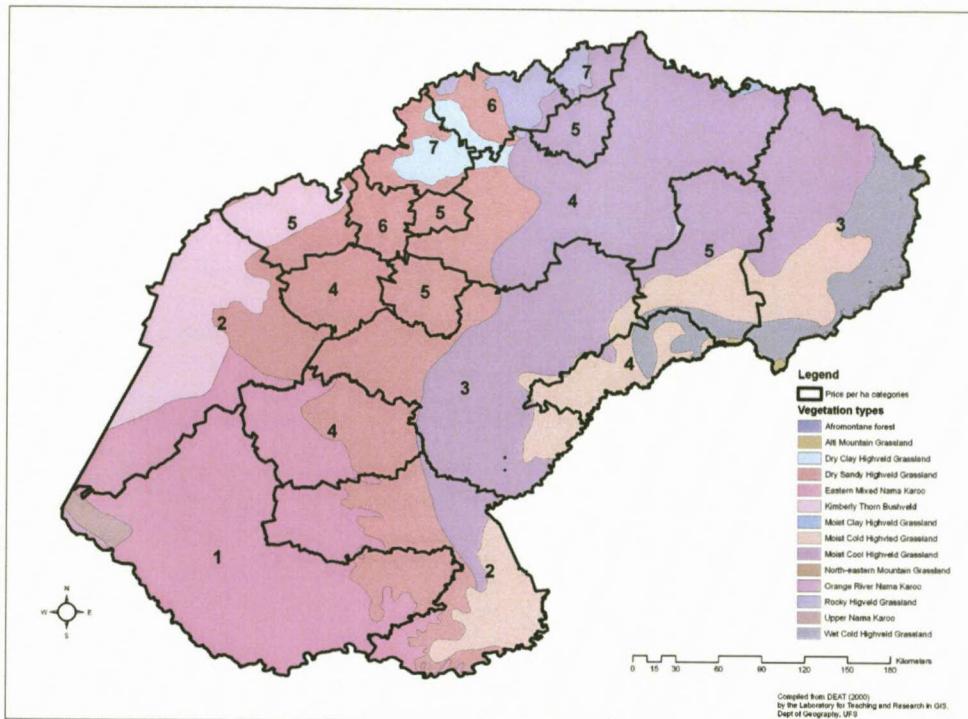


**Figure 3.4: Average precipitation with TARLV categories (mm)**

Source: Centre for Research and Geography, UFS (2006)

Note: Numbers refer to TARLV

Figure 3.5 provides the vegetation dispensation for the FSP and how it corresponds with TARLV. No clear correlation is apparent between TARLV and vegetation spread. Note that the same vegetation is present in parts of the FSP, with TARLV varying between categories 3 and 7.



**Figure 3.5: Vegetation spread in the Free State with TARLV categories**

Source: Centre for Research and Geography, UFS (2006)

Note: Numbers refer to TARLV

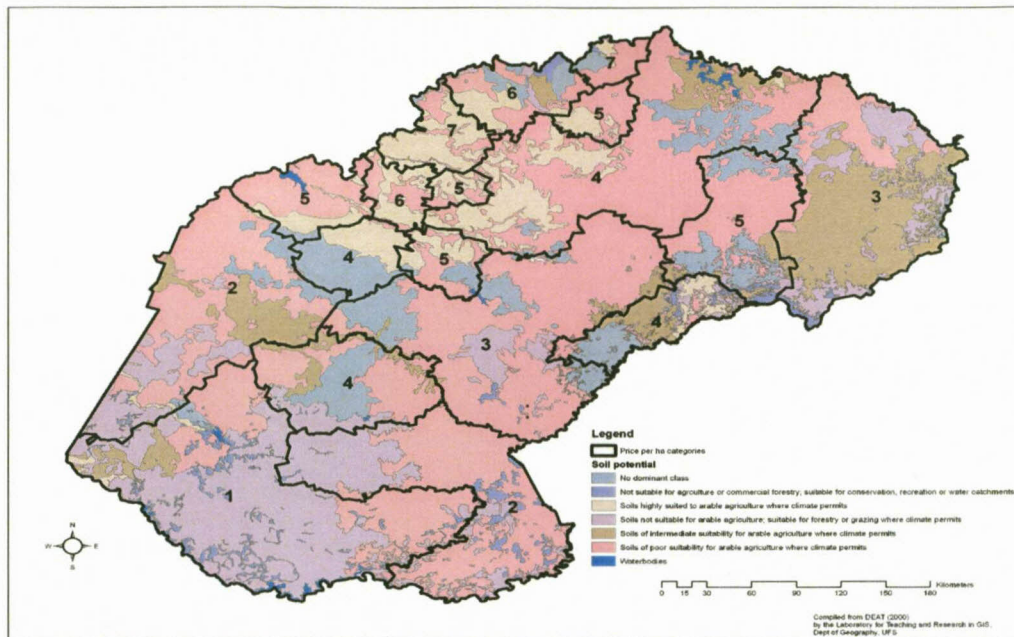
Figure 3.6 displays the soil potential of the FSP. Studies done in the United States by the US Department of Agriculture found that, if managed appropriately, certain types of soil render different financial returns than other types. Other factors found to have an impact on returns were topography and slope (Davis, 1929). Davis also quotes several other authors who have highlighted the importance of these factors in considering enterprise selection within a region:

*"We find that soil type has a pronounced influence on the type of farming even within a small geographical area, but it is a most difficult influence to measure statistically. Such studies, together with studies of prices, are a fundamental basis for developing farm organization. It appears that topography first, and soil-type second, is the most important factor in determining type of farming."* (Davis, 1929)

Each classification in soil is a complex of soil characteristics, such as colour, texture, surface soil, subsoil, and substrata, as well as other physical and chemical characteristics. The land is not laid out in any regular pattern, but variations occur in a most random way (Miranowski & Hammes, 1984). In the FSP it is clear that not only does soil type vary significantly, but there is hardly any off-hand correlation visible between TARLV and the type of soil. In the north-western region of the FSP there seems to be some relation between higher prices and areas highly suitable for arable agriculture where the climate permits. The low correlation can to a certain extent be explained by a weakness in the price range approach, since soil type does not follow district boundaries.

This renders the land price approach rather useless, since no strong or conclusive correlation is visible between the prices paid for land in a region and the underlying physical and biological factors in that area. As mentioned earlier in the text, these factors would never be found in a single ratio, but rather as a complex hybrid of variations. The hybrid of variations as possible rationalisation needed to be investigated as a potential explanation of price. This was done with the inclusion of the Land Capability Classification index.





**Figure 3.6: Soil potential of the Free State with TARLV categories**

Source: Centre for Research and Geography, UFS (2006)

Note: Numbers refer to TARLV

### 3.3.2 Land capability<sup>2</sup>

Since no conclusive pattern of correlation was visible on the main individual agro-ecological factor delineation with TARLV, this led to the introduction of the land capability concept into the evaluation. The Land Capability Classification (LCC) system refers to the classification of land according to the land's potential for general kinds of land uses and is depicted in Figure 3.7 (details of each class are provided in Appendix D, Table D.1). LCC considers the long-term proper use of soils for crop production without degradation and starts with a soil survey, including topography, soil type and climate. It should be noted that land capability decreases from Class 1 to Class 8, i.e. Class 1 is highly capable while Class 8 has extreme restrictions on the types of enterprises that can be sustained. The FSP mainly comprises Classes 4 and 5, followed by Class 3 mainly in the eastern parts. Table 3.5 gives a summary of the LCC system.

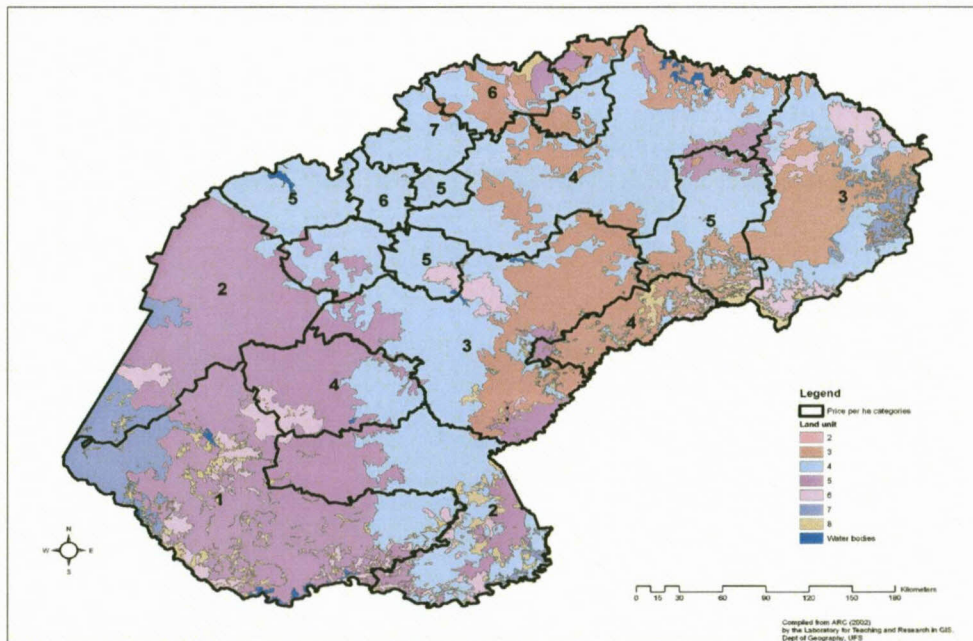
<sup>2</sup> Land capability is the total suitability for use, in an ecologically sustainable way, for crops, for grazing, for woodland and for wildlife. A land capability class is an interpretive grouping of land units with similar potential and ongoing limitations or hazards.

**Table 3.5: Land Capability Classification system**

LAND CAPABILITY CLASS	LAND USE OPTIONS	LAND CAPABILITY GROUPS
I (1)	W F LG MG IG LC MC IC VIC	Arable land
II (2)	W F LG MG IG LC MC IC	
III (3)	W F LG MG IG LC MC	
IV (4)	W F LG MG IG LC	
V (5)	W F LG MG	Grazing
VI (6)	W F LG MG	
VII (7)	W F LG	
VIII (8)	W	Wildlife

W - Wildlife  
 F - Forestry  
 LG - Light grazing  
 MG - Moderate grazing  
 IG - Intensive grazing  
 LC - Poorly adapted cultivation  
 MC - Moderately well-adapted cultivation  
 IC - Intensive, well-adapted cultivation  
 VIC - Very intensive, well-adapted cultivation

The lack of a distinct correlation between TARLV and the capability class is evident. One would expect that higher capabilities of farmland would correspond to higher TARLV, but such an inference cannot be made. This again underlines the questionability of only using Deeds Office data to synchronise agro-ecological potential and the value of land.



**Figure 3.7: Land capability in the Free State with TARLV categories (2000=100)**

Sources: ARS (2006) and own calculations

Note: Numbers refer to TARLV

### **3.3.3 Conclusion**

Transacted values from the Deeds Office provide no indication of the imbedded values of farmland upon change of ownership, nor do they shed any light on differentiators. An independent analysis of land value trends per various size categories was conducted for each district. Size was the only differentiation that was made, and no further breakdown of factors or elements influencing price was obtained from the Deeds Office (Deeds Office, 2005). Subsequently, the apparent correlation between agro-ecological variables, land capability and TARLV was tested, but no clear correlation was found. This calls into question the usability of Deeds Office data to explain the differences in land values between different administrative districts, other than explaining that smaller plots of land are more expensive than larger plots of land. In addition, it says nothing about price differences in an administrative district. Given the aforementioned a decision was made to compare TARLV with actual and predicted land use. This is done in the next section.

### **3.4 Land use possibilities and TARLV categories**

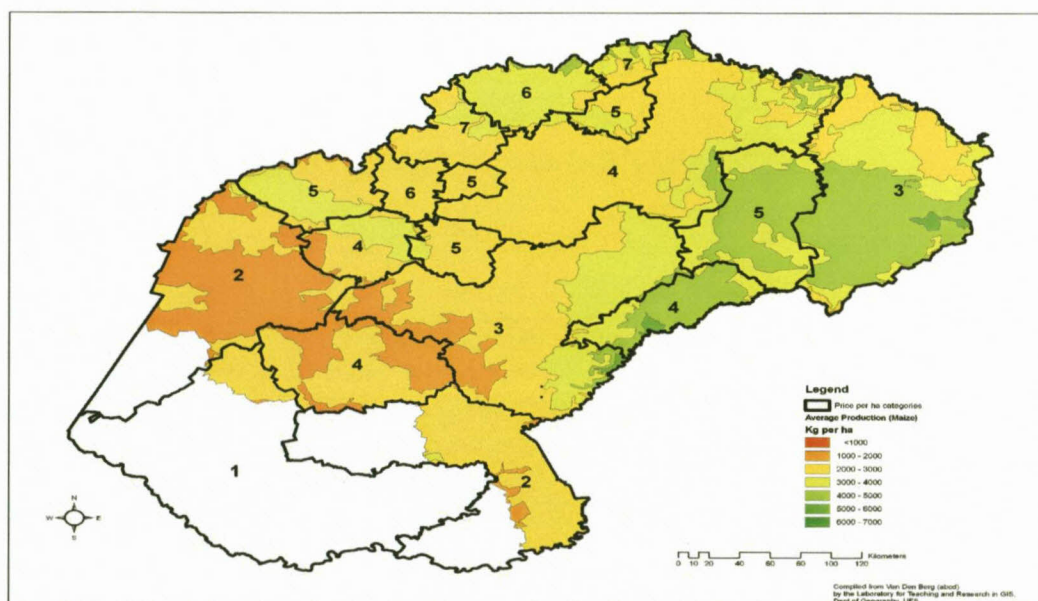
In the previous section it was indicated that there is no significant correlation between TARLV (derived from Deeds Office data) and agro-ecological indicators at an administrative level. In this section actual and predicted land use patterns are compared with TARLV categories. It should be noted that actual and predicted land use patterns are linked with the agro-ecological potential of the area. In other words, this section attempts to provide a more in-depth analysis of the reasons for the differences in land values and the link thereof to land use as determined by agro-ecological characteristics. The FSP is endowed with quite a variety of land use possibilities. The field crop potential of the FSP has been assessed in terms of output potential per hectare for a number of crops by ARS (Agricultural Risk Specialists). The CERES growth simulation model with spatial inputs was used to simulate 25 years of historic yields for maize. Historic yields for grain sorghum, sunflower seed and soybeans were derived from the simulated maize yields (ARS, 2006). Wheat yields were simulated over the same period using the PUTU



growth simulation model. Results are contained in two types of information maps, namely (i) simulated average yields for maize, sunflower seed, grain sorghum, soybeans and winter wheat, and (ii) standard deviation (%) of yields, which is an indication of the risk involved in production (ARS, 2006).

### 3.4.1 Maize

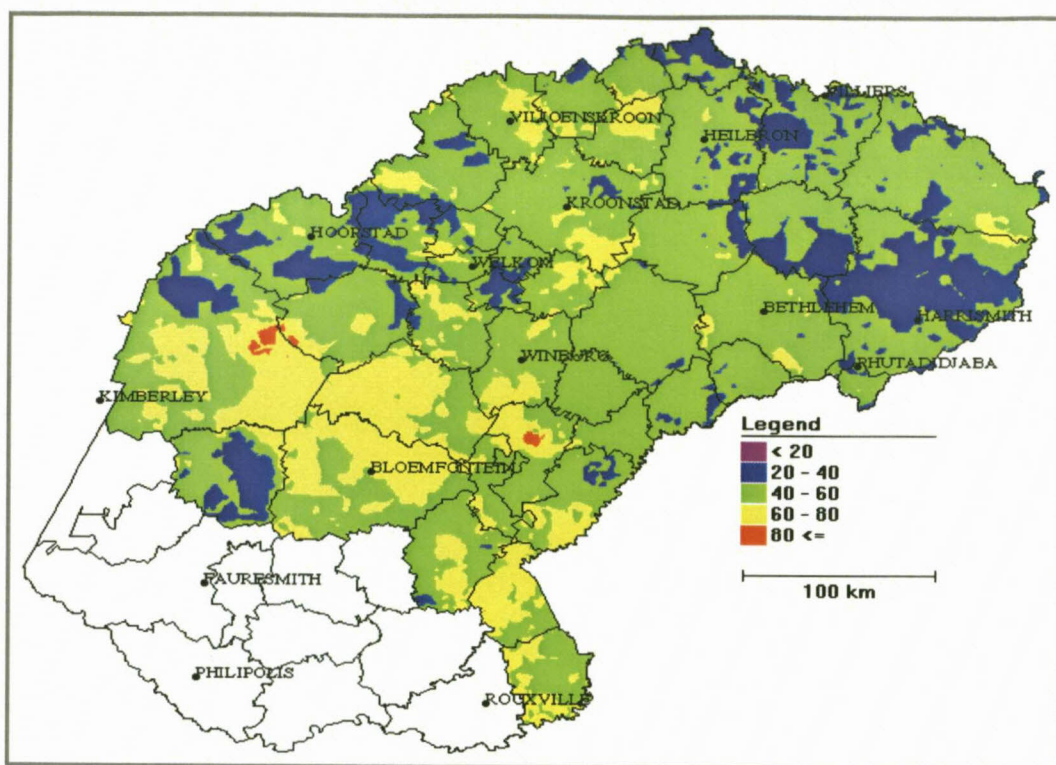
The simulated average maize yield across the FSP is shown in Figure 3.8. From Figure 3.8 there is no clear correlation between TARLV and potential maize yield. The standard deviation of simulated yields is depicted in Figure 3.9. Areas with the most stable maize yields are demarcated in blue in Figure 9. It is also in reality the maize production area of the FSP. The low standard deviations of these areas are in most cases a function of the soil's physical properties (good water-holding capacity, high suitability for maize production). Although the lower standard deviations of maize production correspond better with TARLV, it still encompasses a wide range of TARLV categories from 2 to 7. This is indicative that more in-depth analysis will be necessary at micro level.



**Figure 3.8: Simulated average maize yields (1980-2005) in kg/ha for the Free State (preliminary estimates)**

Sources: ARS (2006) and own calculations

Note: Numbers refer to TARLV

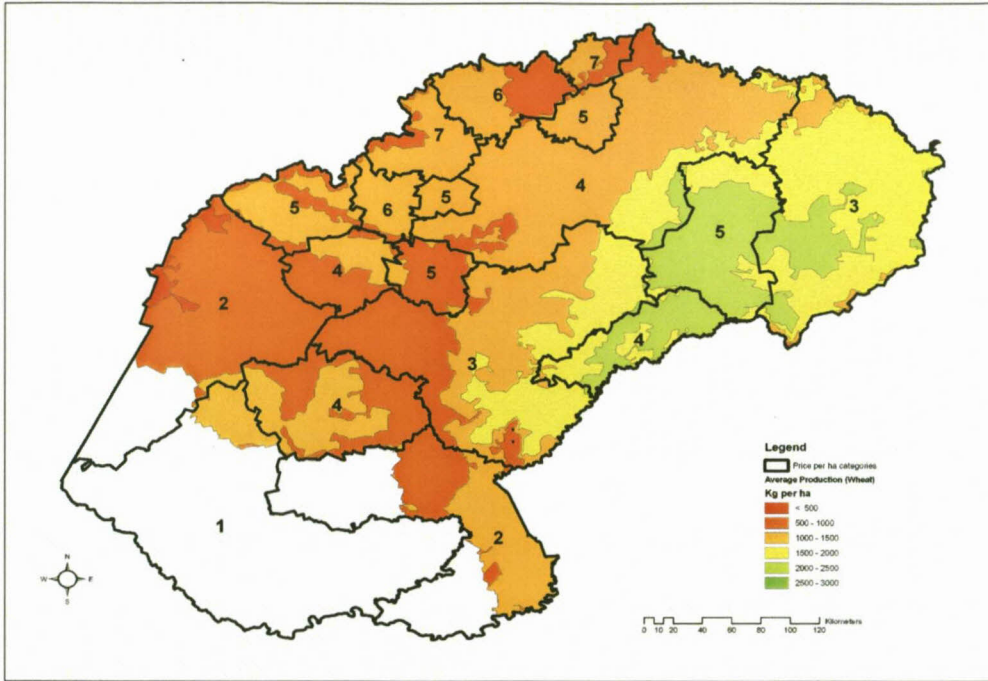


**Figure 3.9: Standard deviation (%) of simulated maize yields for the Free State (preliminary estimates)**

### **3.4.2 Winter wheat**

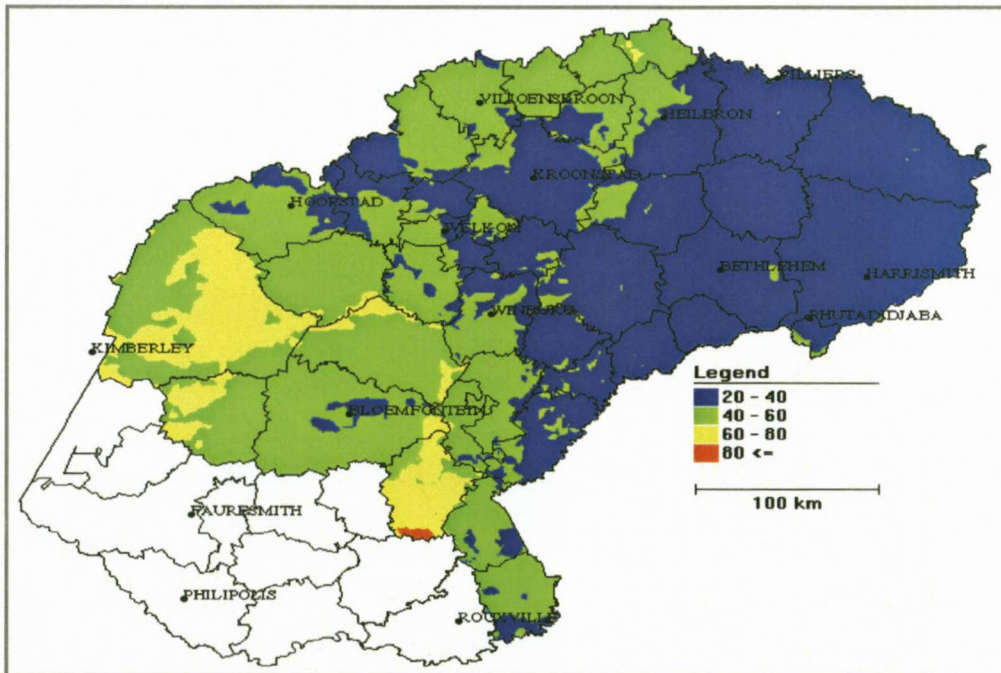
The important production factors for wheat production are the soil's water-holding capacity and rainfall during the September to November period. The eastern FSP is the main production area and it is also the area where there is a high probability for rain in the important months of September to November (Figure 3.10). Stability of production (Figure 3.11) depends mainly on spring rainfall and secondly on the soil's water-holding capacity. No distinctive correlation is visible between TARLV and wheat yields. The standard deviation of wheat yields also shows no correlation with TARLV.





**Figure 3.10: Simulated average wheat yields (1980-2005) in kg/ha for the Free State (preliminary estimates)**

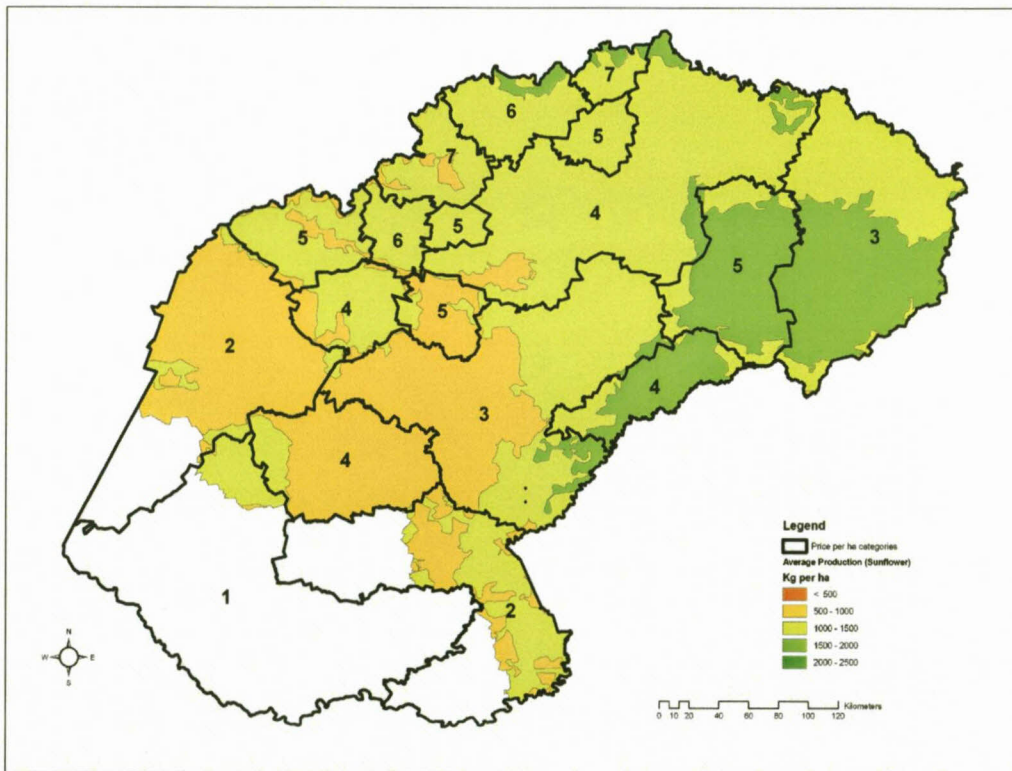
Note: Numbers refer to TARLV



**Figure 3.11: Standard deviation (%) of simulated wheat yields for the Free State (preliminary estimates)**

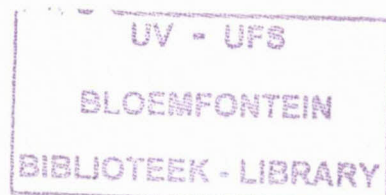
### 3.4.3 Sunflower seed

Areas with a high potential for sunflower seed production (Figure 3.12) are more or less the same as for maize. There is, however, a lower risk involved in sunflower production compared to maize production, as can be seen from the relatively low standard deviation (Figure 3.13) compared to the standard deviation for maize (Figure 3.9). A variety of TARLV categories are present in the same yield areas of sunflower seed, which makes it clear that there is also no strong correlation between TARLV and yields of sunflower seed. The percentage deviation from simulated yields is widely scattered across the FSP and has little relation to TARLV.

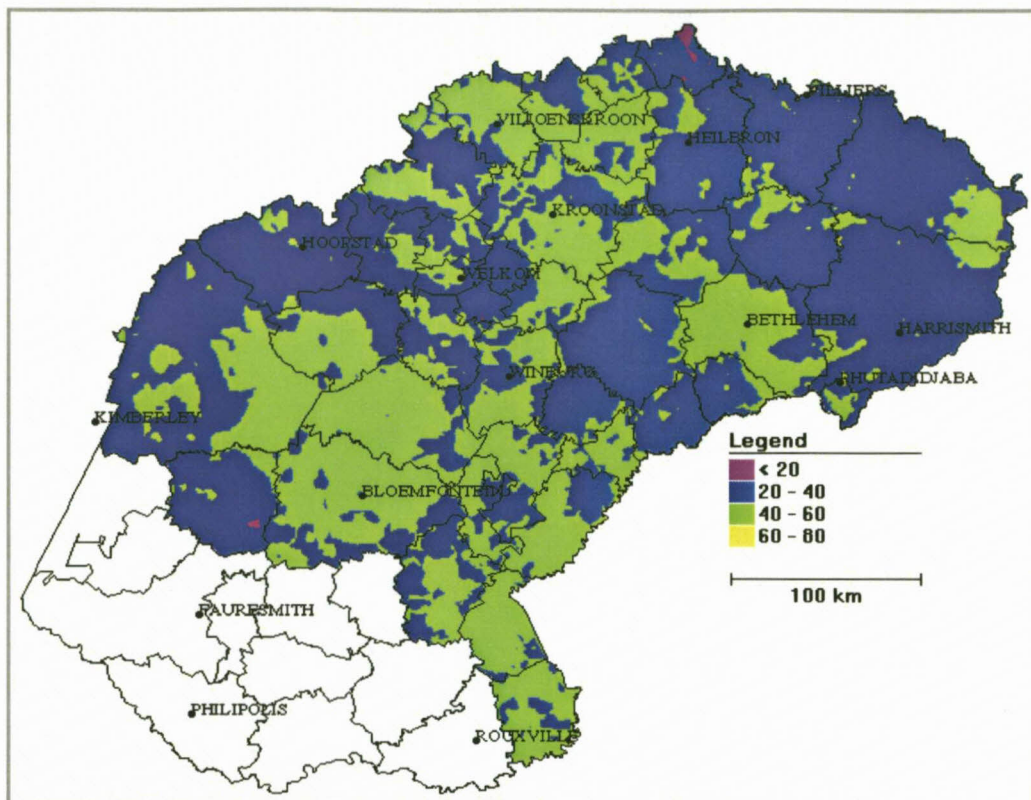


**Figure 3.12: Simulated average sunflower seed yields (1980-2005) in kg/ha for the Free State (preliminary estimates)**

Note: Numbers refer to TARLV





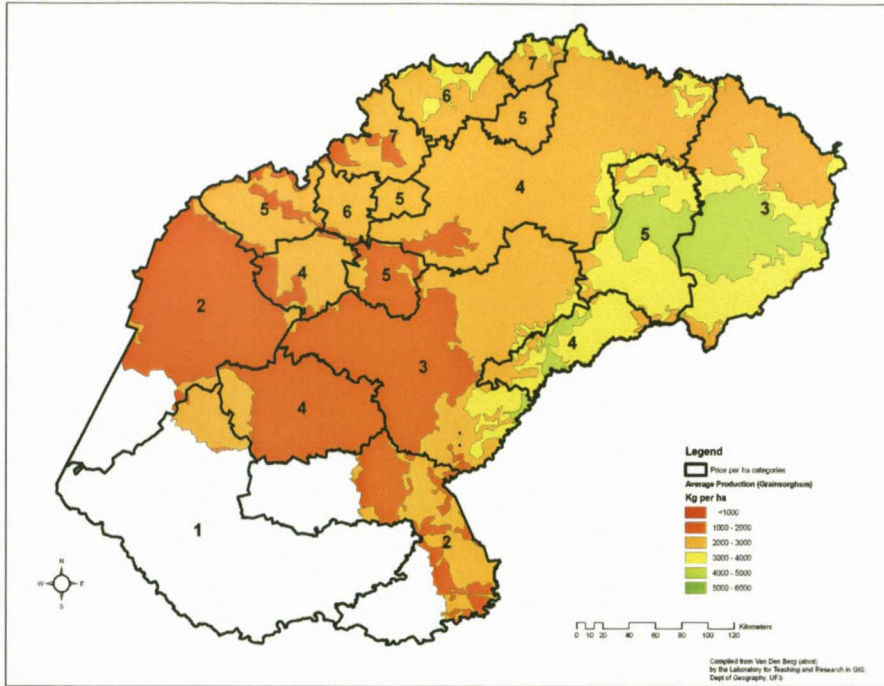


**Figure 3.13: Standard deviation (%) of simulated sunflower seed yields for the Free State (preliminary estimates)**

#### **3.4.4 Grain sorghum**

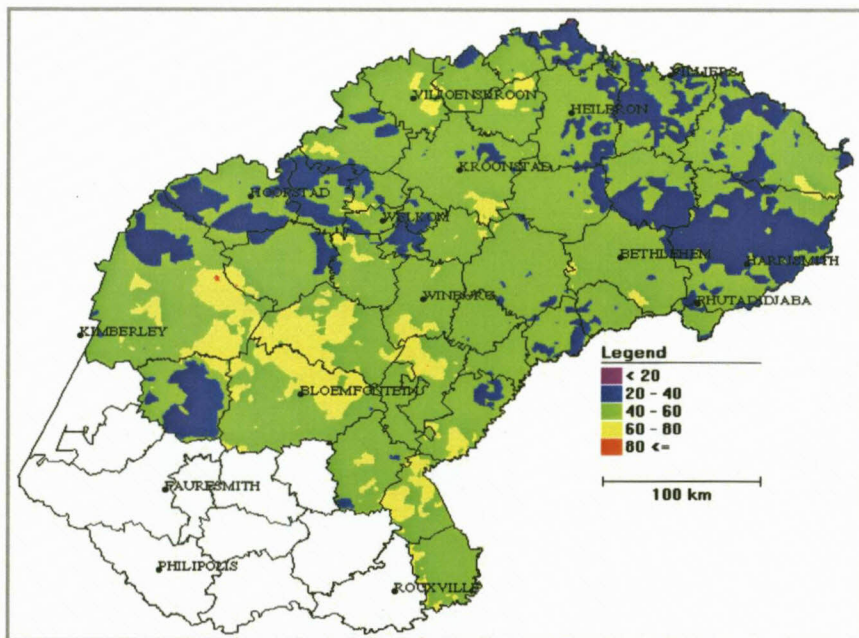
Yields, production areas (Figure 3.14) and standard deviation (Figure 3.15) for grain sorghum are about the same (somewhat lower) as those for maize. However, the production of grain sorghum is not considered to be a significant contributor to the gross value of farm production. Production sites are scattered across the FSP, with some concentrated areas in the northern FSP. The correlation between TARLV and grain sorghum is similar to that for sunflower seed, but with a larger percentage deviation of simulated average yields. Thus no strong correlation is present between TARLV and grain sorghum production.





**Figure 3.14: Simulated average grain sorghum yields (1980-2005) in kg/ha for the Free State (preliminary estimates)**

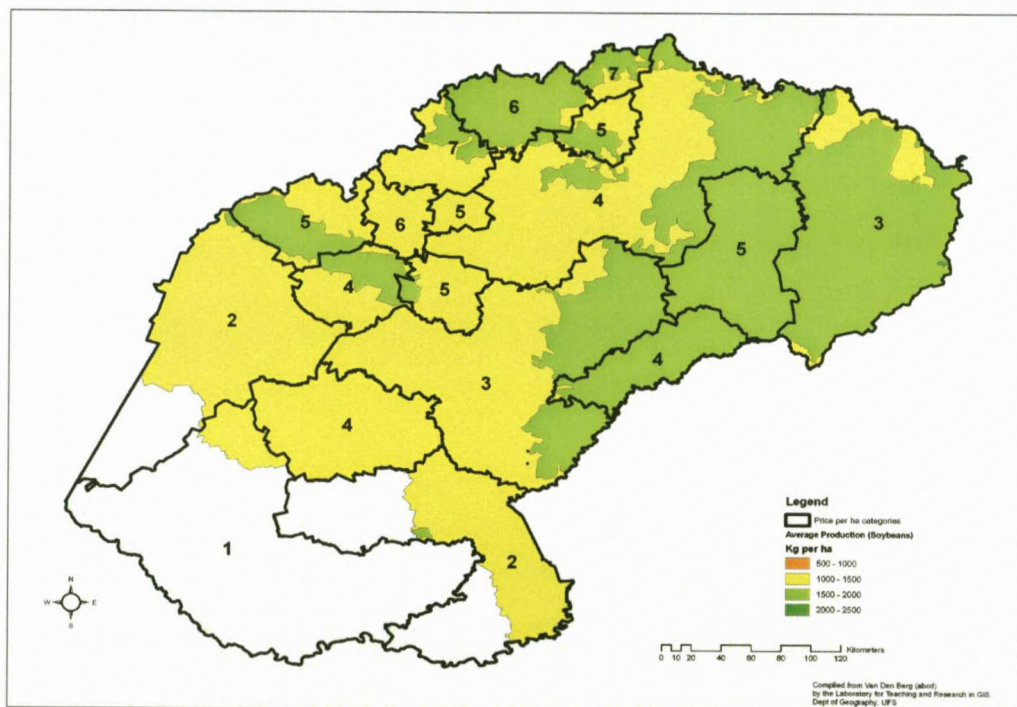
Note: Numbers refer to TARLV



**Figure 3.15: Standard deviation (%) of simulated grain sorghum yields for the Free State (preliminary estimates)**

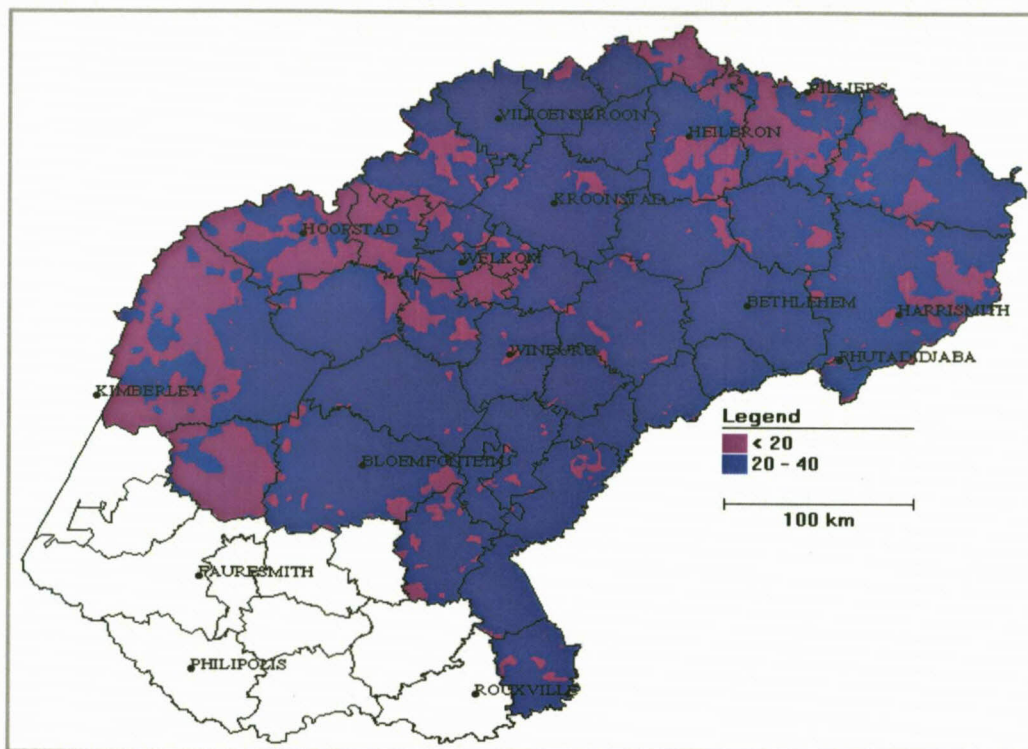
### 3.4.5 Soybeans

Viable yields for soybean production is more or less restricted to the eastern parts of the FSP (Figure 3.16). It is a highly stable crop (Figure 3.17), but the risk of excess rain is high and often results in poor quality (not included in this study). It is apparent that no correlation can be seen between TARLV and soybean yields.



**Figure 3.16: Simulated average soybean yields (1980-2005) in kg/ha for the Free State (preliminary estimates)**

Note: Numbers refer to TARLV

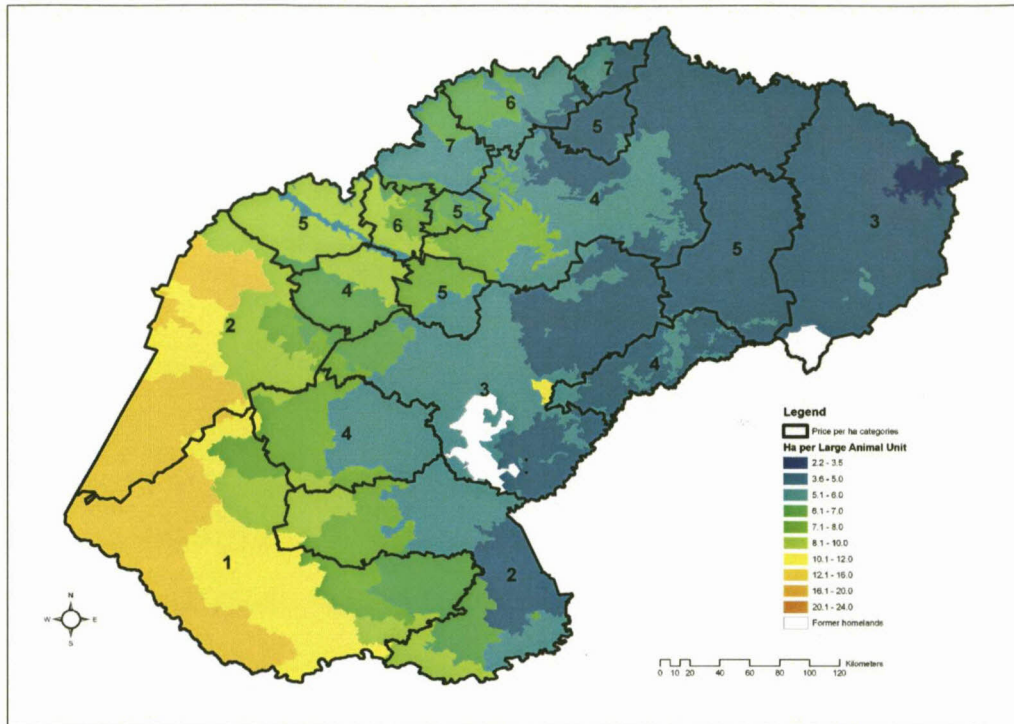


**Figure 3.17: Standard deviation (%) of simulated soybean yields for the Free State (preliminary estimates)**

### **3.4.6 Livestock**

The stocking potential expressed in livestock units per hectare was compared with different TARLV's (Figure 3.18). Although it appears that a lower TARLV correlates with low stocking density per hectare in the south-western parts of the FSP, the same cannot be said about the rest of the FSP. This suggests that one should be careful about generalising stocking density per hectare and the associated TARLV.





**Figure 3.18: Livestock stocking potential and TARLV (livestock units per ha)**

Note: Numbers refer to TARLV

### 3.4.7 Conclusion

Production capability with sound management (assumption of this approach) is simulated on a macro scale. Individual fields (parts of fields), farms etc. may differ significantly from the results above. If more detailed information is available for fields/farms etc., the same methodology can be applied to determine the viability of crop production on a smaller scale. In the decision-making process it is of the utmost importance to determine the net income over time, taking into account the input cost and price of the commodity. This will be reflected in the value of land over time. From the above analysis it is clear that crop and animal stocking potential measured in broad terms does not correlate to the broad categories of TARLV as calculated from Deeds Office data. The evaluation therefore renders cropping potential a real threat when generalising land values as obtained from the Deeds Office and linking these to cropping and stocking potential. There appears to be a myriad of

other complex issues at play when land values are determined, and these will have to be assessed at a micro level per district. The following section examines the data available from the Land Affairs Office pertaining to LRAD transactions and land reform transfers that have been carried out. The focus of this section is on determining the factors contributing to the price paid for land under the LRAD programme, which will result in a land value criterion under LRAD that will at a later stage be compared to all the different data sources.

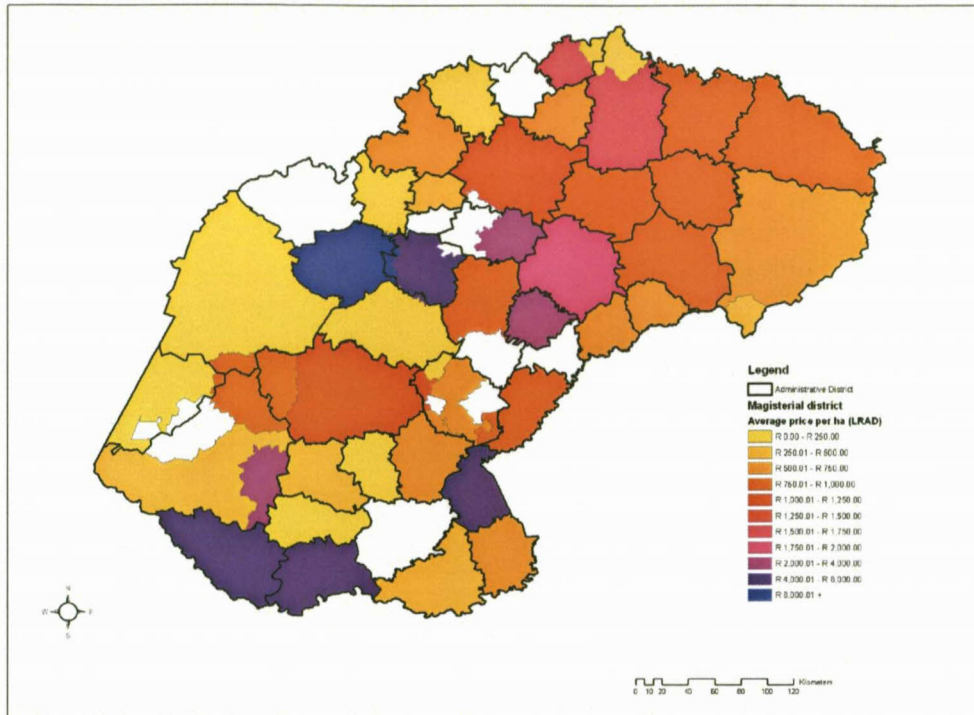
### **3.5 Land Affairs and LRAD analysis**

Details of all LRAD transactions in a region are recorded by the Land Affairs Office representing the corresponding area. The project file – the only dependable source of records – contains all the relevant documents of transfer, the grant given, the beneficiaries, business plan, farm details and valuation of the property, etc. The information used in this section of the study is based on the project files.

Cognisance must, however, be taken of the fact that the files were incomplete and lacked some critically important elements necessary to conduct an accurate analysis. Essential information, such as the date of transfer or the location of the project, had often been omitted, making it difficult to allocate the projects to the correct areas and to chronologically compare them. Files lacking vital particulars on projects could therefore not be used for this study, making prediction of the exploitable percentage of files impossible. For example, in the Bethlehem Land Affairs Office, 32.26% of the project files were incomplete based upon the absence of a magisterial district, whereas in Welkom 51.63% of the project files were deficient on the same basis (Land Affairs Office: Bethlehem, 2006; Land Affairs Office: Bloemfontein, 2006; Land Affairs Office: Welkom, 2006). Despite the absence of vital data on projects, sufficient information could be compiled to evaluate certain trends and to draw significant conclusions.

Consequently the assessment of same led to important recommendations that will hopefully enhance future data capture and hence the validity of policy inferences. Maps of the province depicting various differentiators were constructed. The generated maps were based upon the LRAD spreadsheets. Using a geographic information system (GIS) it was possible to plot the data to give a visual element to the statistics. These maps should not be viewed in isolation, but should rather be considered as part of the information gathered on a project depicting some of the key differentiators.

Figure 3.19 gives the interpretation of land values as determined by land transfers under the LRAD programme. Included in the LRAD projects were abnormal transactions such as highly intensive infrastructure transactions that caused some of the high averages in some of the districts like Bultfontein, Wepener and Philippolis. The blank areas on the map indicate that there were no LRAD activities within the selected time interval (2002 – 2005). This interval was chosen because the data in that period was in general more complete and close to the timeframes used for the other sources. From Figure 19 it is clear that little compatibility with the Deeds Office in terms of value interpretation across the FSP province is visible. The price paid for land is determined by an independent valuation agency, taking into account infrastructure, buildings and assets on the farm, in line with market value. Figure 3.19 clearly illustrates that physical and biological factors play a minor role in determining land value, since a completely random pattern of prices paid is visible against the resource background illustrated earlier. This raises the question of whether the quality of resources plays any role in the process of price discovery under the LRAD programme transactions. As mentioned previously, highly intensive operations within some of these transactions contribute to the high district average, which explains some degree of the price pattern visible, but not on an aggregate level.



**Figure 3.19: LRAD average price per hectare (2002 – 2005) in real terms (2000=100)**

Sources: Land Affairs Office, Bethlehem (2006), Land Affairs Office, Bloemfontein (2006) and Land Affairs Office, Welkom (2006)

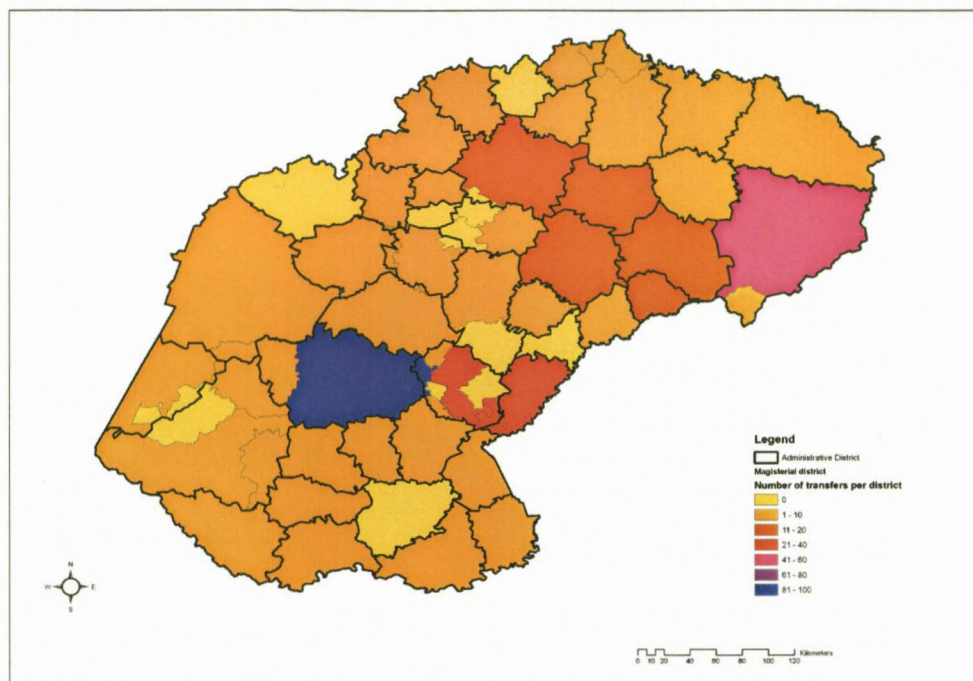
(See Appendix G, Table G1)

### 3.5.1 LRAD transfers

The next step in the analysis was to take an in-depth look at the LRAD projects to identify the different elements<sup>3</sup> in these projects. Figure 3.20 gives the total number of projects over the period 1996 – 2004. It is clear from Figure 3.20 that there is a higher concentration of LRAD projects in certain areas. The purpose of Figure 3.20 is to evaluate whether the concentration of land reform projects and transfers – keeping in mind the availability of transferable land under the willing-seller/willing-buyer principle – had a significant effect on the prices paid in a region, thus possibly explaining the pattern of land value as interpreted by Land Affairs records.

<sup>3</sup> Elements refer to information pertaining to average price per hectare paid for land, the number of beneficiaries per project, the grants given per beneficiary, etc.





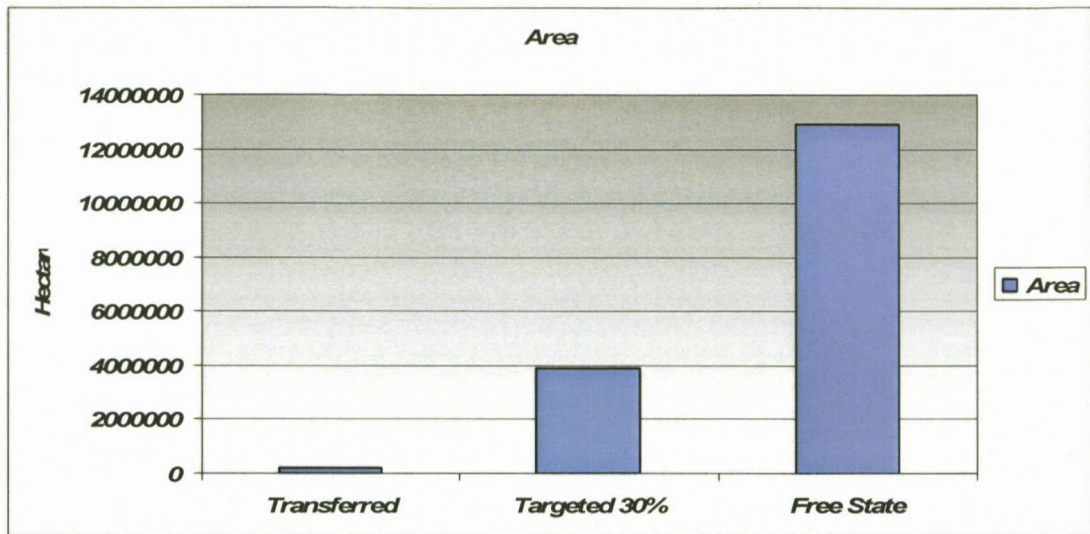
**Figure 3.20: Number of transfers per district**

Source: Land Affairs Office, Bethlehem (2006), Land Affairs Office, Bloemfontein (2006) and Land Affairs Office, Welkom (2006)

(See Appendix G Table G2)

In comparison with Figure 3.19 there seems to be very little correlation between land value under LRAD and the concentration of transactions, thus rendering concentration as a possible explanation of land value useless. The total number of hectares transferred in the FSP, as given by the different Land Affairs Offices, add up to 207 560 ha. The FSP comprises 12 930 000 ha, thus indicating that only 1.61% of the FSP has been transferred (see Figure 3.21) for the period indicated earlier. Only 5.35% of the 30% goal has been achieved. To reach the 30% goal by 2014 the amount of land transferred has to increase to 407 938 ha per year as from 2006.





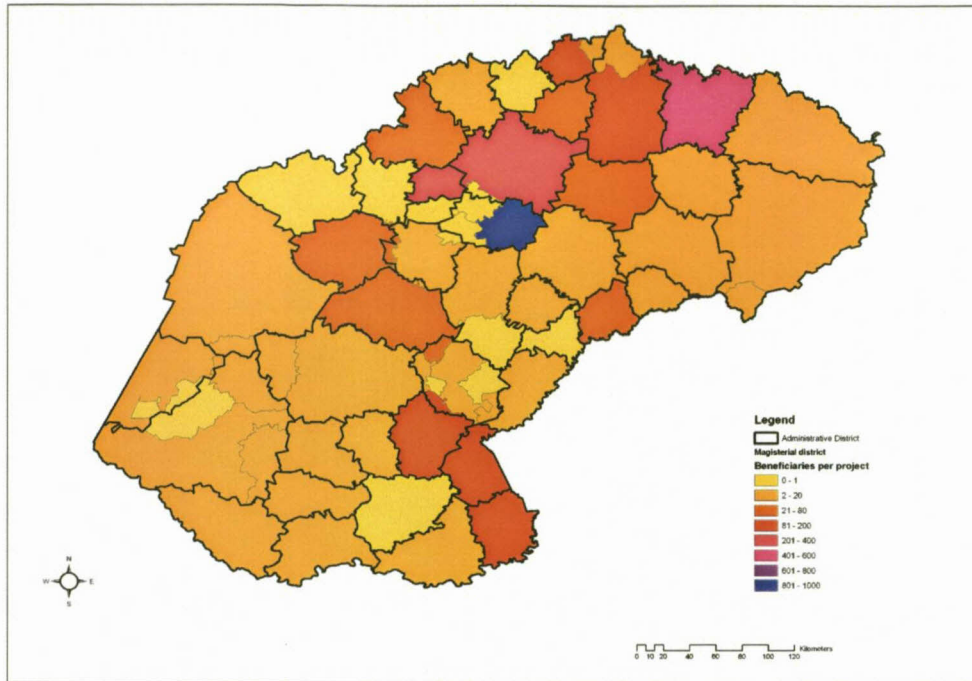
**Figure 3.21: Hectares transferred in the Free State and target per year up to 2014**

Source: Land Affairs Office, Bethlehem (2006), Land Affairs Office, Bloemfontein (2006) and Land Affairs Office, Welkom (2006)

This means that 54.4% of all farmland transactions must comprise land reform transfers to realise the target of 30% by 2014. As indicated in Table 3.2, there is an increasing amount of land available in the market and enough to reach the target of 30%.

### **3.5.2 LRAD beneficiaries**

The number of LRAD transfers in a district does not reflect the number of beneficiaries affected by the land transfers. It can be assumed that the number of beneficiaries has an impact on the sustainability of the farming operation should there be a distinction between investors and farmers within the group per farm/transfer. Figure 3.22 gives the average number of beneficiaries involved in the projects per magisterial district.



**Figure 3.22: Number of beneficiaries per project**

Source: Land Affairs Office, Bethlehem (2006), Land Affairs Office, Bloemfontein (2006) and Land Affairs Office, Welkom (2006)

(See Appendix G, Table G3)

Note that the areas of high transfer and the areas of high beneficiary concentration are not in the same regions. The high concentration of beneficiaries in projects is caused by a lack of private assets, which contributes to the grant amount given for a project to generate sufficient funds to finance the purchasing of the land. Thus, more and more people are involved in an effort to increase the amount of own contribution assets and in turn increase the grants given per project, creating two district groupings, namely farmers and investors, with potentially conflicting expectations of the farm.

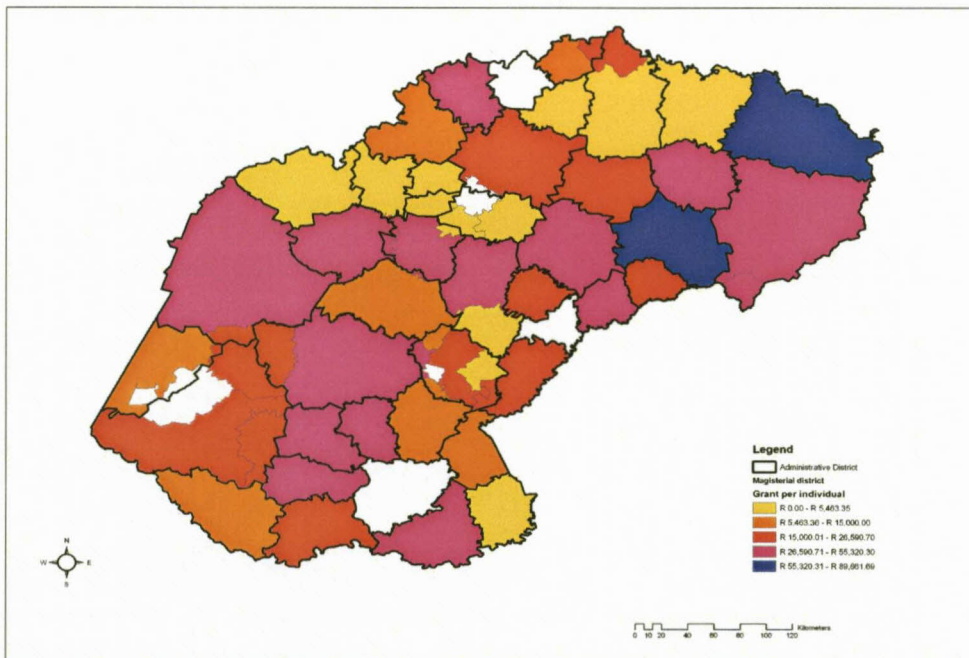
The large number of beneficiaries on a project places enormous pressure on the natural resources of the land purchased. Degradation of resource quality is an inevitable consequence. Comparing the concentration of beneficiaries involved in projects per district with the price pattern seen in Figure 3.19 also renders useless the number of beneficiaries involved in projects as a possible explanation for land value interpretation according to Land Affairs. As



explained earlier, the lack of own contribution results in larger groups of beneficiaries being involved in the projects. This is investigated in the next section.

### 3.5.3 LRAD grants

Figure 3.23 shows the LRAD grants per beneficiary. In the majority of administrative districts (also encompassing the larger area) beneficiaries received LRAD grants valued at between R26590 and R55320. In contrast, a relatively high number of beneficiaries received grants lower than R5500. The reasons for the wide gap in grants received by beneficiaries are not clear and need further investigation. Comparisons between Figure 3.22 and 3.23 support the hypothesis that higher beneficiary involvement is a consequence of lower own contributions and thus lower grants, since the districts with lower grant facilities correlate with the districts with the highest concentration of beneficiaries.



**Figure 3.23: LRAD grants per beneficiary**

Source: Land Affairs Office, Bethlehem (2006), Land Affairs Office, Bloemfontein (2006) and Land Affairs Office, Welkom (2006)

(See Appendix G, Table G4)

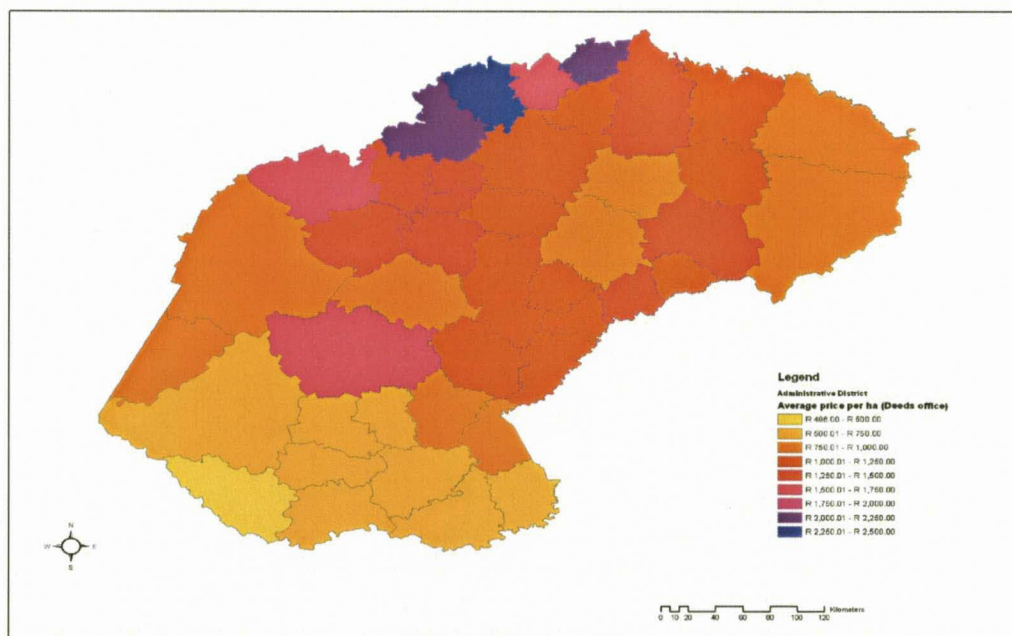
### **3.5.4 Conclusion**

Land Affairs Office records provide some indication of the factors affecting the price paid for land, e.g. highly intensive units and small plots of land that attract higher per-hectare prices. Very little correlation was recognisable between prices paid for land and the physical and biological factors, raising questions about the role played by resources in the process of price discovery. Other factors that were evaluated, such as number of transfers, number of beneficiaries and the amount of grant acquired, rendered no conclusive explanation for the price pattern as interpreted by the Land Affairs Offices. There is therefore still a need to compare the interpretation of FSP land value with the other available data sources, e.g. Land Bank. The next section compares the original Deeds Office data with real land transactions as recorded by the Land Bank. Finance to purchase land from the Land Bank is directly determined by the productive potential of the transacted land, which is the lending methodology with most commercial banks in South Africa. The aim of this section is to determine whether the Land Bank data has a higher correlation with the Deeds Office data and more specifically with the available resources in the area.

### **3.6 Land Bank analysis**

From the previous section it is clear that no conclusive evidence exists to link TARLV as calculated from the Deeds Office data to the potential of the land. For this reason a decision was made to incorporate data from Land Bank transactions. Moreover, data obtained from the Land Bank was incorporated in the analysis in hopes of providing better comparisons of transactions recorded and better describing the value indicators in the FSP land market. By comparing 'market activity', average prices, number of transactions, amount of land transacted, etc. and reports on summary statistics related to recent sales, based on data recorded by the Deeds Offices, Land Bank and LRAD land transfers, the aim is to determine whether there are significant differences in the interpretation of land values across the FSP. It must be stressed from the outset that the figures in this document cannot substitute for

on-site investigation, consultation with knowledgeable local sources, or a professional valuation (ALPRO)<sup>4</sup>. The analysis in this section was constrained due to the nature and timeframe of data on land values that was received / obtained from the Land Bank, the Department of Land Affairs and the Deeds Office. The Land Bank supplied data regarding transactions occurring in 2004, while the Deeds Office supplied data for the period 1994 to 2003, and the partially complete LRAD files spanned the period 1997 to 2005. The information sourced from the Deeds Office includes all transactions in the FSP, as used in the previous sections. Land Bank information includes only agricultural land transactions and excludes abnormal transactions like father-son land transfers or highly intensive infrastructure. Although the LRAD data spanned a longer period than the Land Bank data, it includes only transactions on LRAD projects. However, not all files could be used. Figure 3.24 shows the average price per hectare in the FSP for the period 2002 to 2003 in real terms (2000=100) as recorded by the Deeds Office. This period was chosen in order to minimise the time difference between the different data sources.



**Figure 3.24: Deeds office price per hectare (2002 – 2003) in real terms (2000=100)**

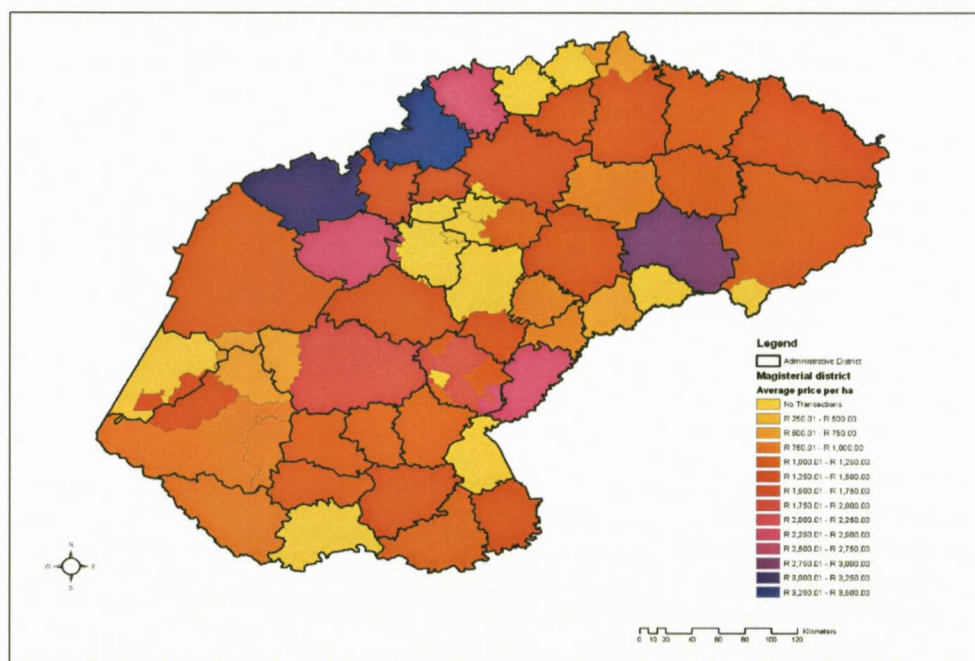
Source: Deeds Office, Bloemfontein (2006)

(Appendix E, Table E.1)

<sup>4</sup>This section draws heavily on a study "Farmland price trends in South Africa, 1994-2003" commissioned by ALPRO.



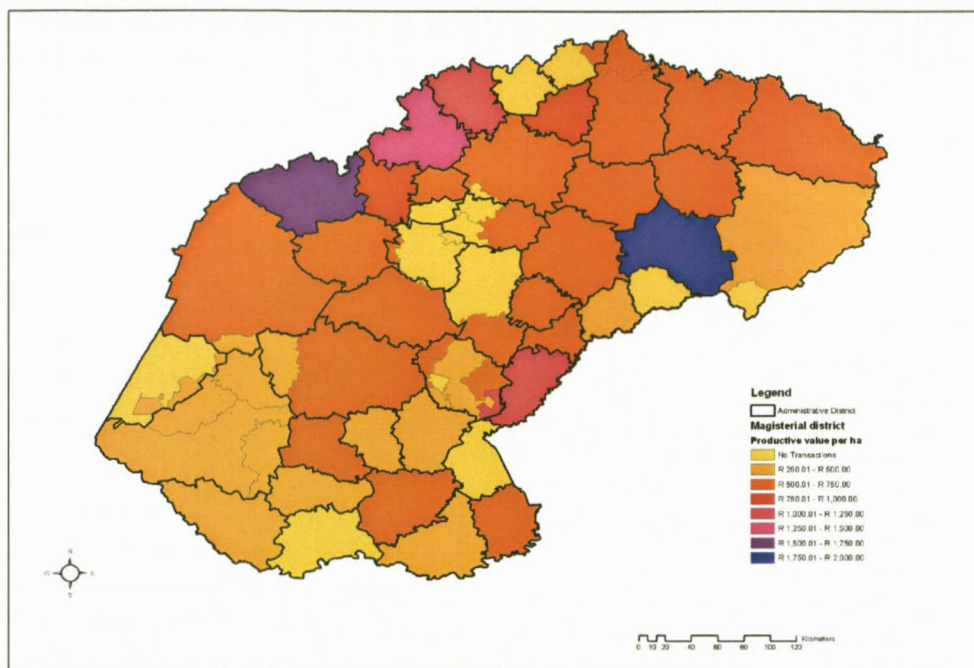
Figure 3.24 shows the average price per hectare as recorded by the Land Bank. The information received was on a magisterial district basis; with some districts having no information (abnormal transactions were excluded). The data received from the Land Bank also included with each transaction a productive valuation of the transacted unit. Productive capacity of land plays a major role in the valuation of land by the Land Bank and it was expected that there would be high correlation between the productive value and the transacted land value of a region. Figure 3.25 gives the productive value of land as linked by each Land Bank transaction.



**Figure 3.25: Land Bank transactions: Average price per hectare (from 2004) in real terms (2000=100)**

Source: Land Bank, Bloemfontein (2006)

(See Appendix F, Table F.1)



**Figure 3.26: Productive value of land**

Source: Land Bank, Bloemfontein (2006)

(See Appendix F, Table F.2)

The productive capacity valuation is derived from the farm's income-generating capacity to service its Land Bank loans<sup>5</sup>. The Land Bank uses standardised values that are multiplied with the average crop yields observed in that specific district. In the case of livestock, a standardised value is divided into the average grazing capacity of the district in calculating the productive value of that farm. Other important elements that must be taken into account are the farmer's management skills and the cost of living of the farmer's family. The valuation model of the Land Bank accounts for some of these critical issues.

The main drivers behind the productive validation of land, as determined by the Land Bank, are crop yields and grazing capacity throughout the FSP. Referring back to the information provided by ARS in the first part of this chapter, it is clear that the north-eastern and north-western regions of the FSP have the highest yields in maize production. Thus the productive value of a

<sup>5</sup> Land Bank loans are provided on the basis of the land as collateral. The value is determined from the productive value, which refers to the income-generating ability of the resources imbedded in the farm.

maize farm will be higher in these regions, attracting a higher price per hectare. Almost the same situation applies for wheat production, except that the north-eastern regions have a higher wheat yield than the north-western regions. These regions have higher productive potential, which will lead to higher transaction prices.

The productive value of a livestock farm is derived from grazing. High grazing capacity can be seen in the northern and eastern regions of the FSP. The higher rainfall in these areas is the reason for the higher grazing capacities. Lower production costs in the southern regions of the FSP make sheep production much more suitable due to fewer animal diseases and more vegetation that better suits the dietary needs of sheep. The northern and eastern regions are much more suitable for cattle production, since cattle are less affected by a wet climate and more effectively consume the sour veld in this region.

### 3.6.1 Conclusions

The comparison of the different data sources, namely Deeds Office, Land Bank and Land Affairs, in order to determine the different interpretations of land value in the FSP yielded contradictory results (Table 3.6). A correlation was drawn up to statistically compare the different sources. The data was converted to real terms with 2000=100 to render the different data sources comparable.

**Table 3.6: Correlation between data sets (2000=100)**

<b>Source:</b>	<b>LRAD</b>	<b>Deeds Office</b>	<b>Land Bank</b>	<b>Prod/ha</b>
<b>LRAD</b>	1			
<b>Deeds Office</b>	0.0825	1		
<b>Land Bank</b>	0.2186	<b>0.6969*</b>	1	
<b>Productive val/ha</b>	0.0110	<b>0.6126*</b>	<b>0.8328*</b>	1

\* = significant at 1%, \*\* = significant at 5%, t-critical = 2.79

Sources: Land Affairs Office, Bethlehem (2006), Land Affairs Office, Bloemfontein (2006), Land Affairs Office, Welkom (2006), Land Bank (2006) and Deeds Office (2006)



There was very little correlation between Deeds Office and LRAD prices per hectare. Similarly low correlation results were observed with the Land Bank data and the interpretation of productive value in the FSP as determined by real transactions. Better correlation can be seen between the Land Bank values and the transacted values recorded by the Deeds Office, which tested significant at a 1% level. This was expected since the Deeds Office records all transactions, including Land Bank transactions.

The insignificant correlation and contradictory land prices of the LRAD projects can be explained by the sale of highly intensive farms, such as broiler and vegetable farms, which could have an enormous effect on the district's average price if there were more abnormal transactions in the area than normal transactions. It has to be kept in mind that the contradiction was not only in terms of high prices but also very low prices in areas where the average price of land is very high compared to the rest of the FSP. The low correlation can be explained by the fact that there are too few comparable LRAD transactions against which the other institutions' data can be evaluated.

## CHAPTER 4

### ALTERNATIVE APPROACH

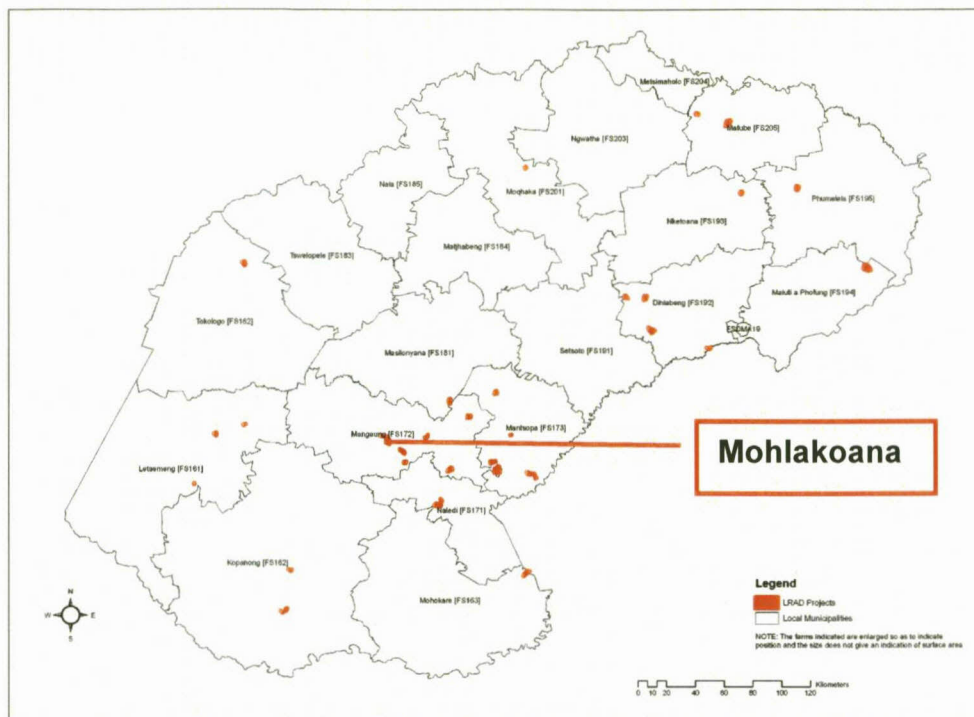
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#### 4.1 Introduction

The generalisation used in the previous sections – average price per hectare across a district – does not always accurately represent the resources for a specific farm. An alternative method was used to address this problem in the first part of this chapter, with precise determination of a project's location making use of the dedicated surveyor general's 21-digit code (SG 21-digit code) and GIS technology. The section makes use of Reasonably Homogenous Farming Area (RHFA) information to narrow down resources present in an area. The final part of this chapter combines the 21-digit code approach with resource-priced regions as determined by RHFA.

#### 4.2 Alternative approach

The 21-digit code gives the exact location of a farm and can even give an aerial photograph image of the project. GIS technology makes it possible to determine the exact resources and infrastructure available on a farm and subsequently also determine the agro-ecological elements in that area and on a specific farm. Figure 4.1 illustrates 50 farms that have been transferred post-2000, when the Land Affairs Office started applying GIS technology. The 50 projects were selected on the basis of completeness of records. Note that one dot could indicate up to five portions of a farm being allocated to different projects. The code assigned to each portion of land helps to not only determine the exact location of a farm, but also avoid a mix-up between farms with the same names in the same district. Figure 4.1 also includes a selected project outside Bloemfontein to help illustrate the possible extent to which the 21-digit code approach can be used.



**Figure 4.1: Mohlakoana project outside Bloemfontein**

Source: Centre for Research and Geography, UFS (2006)

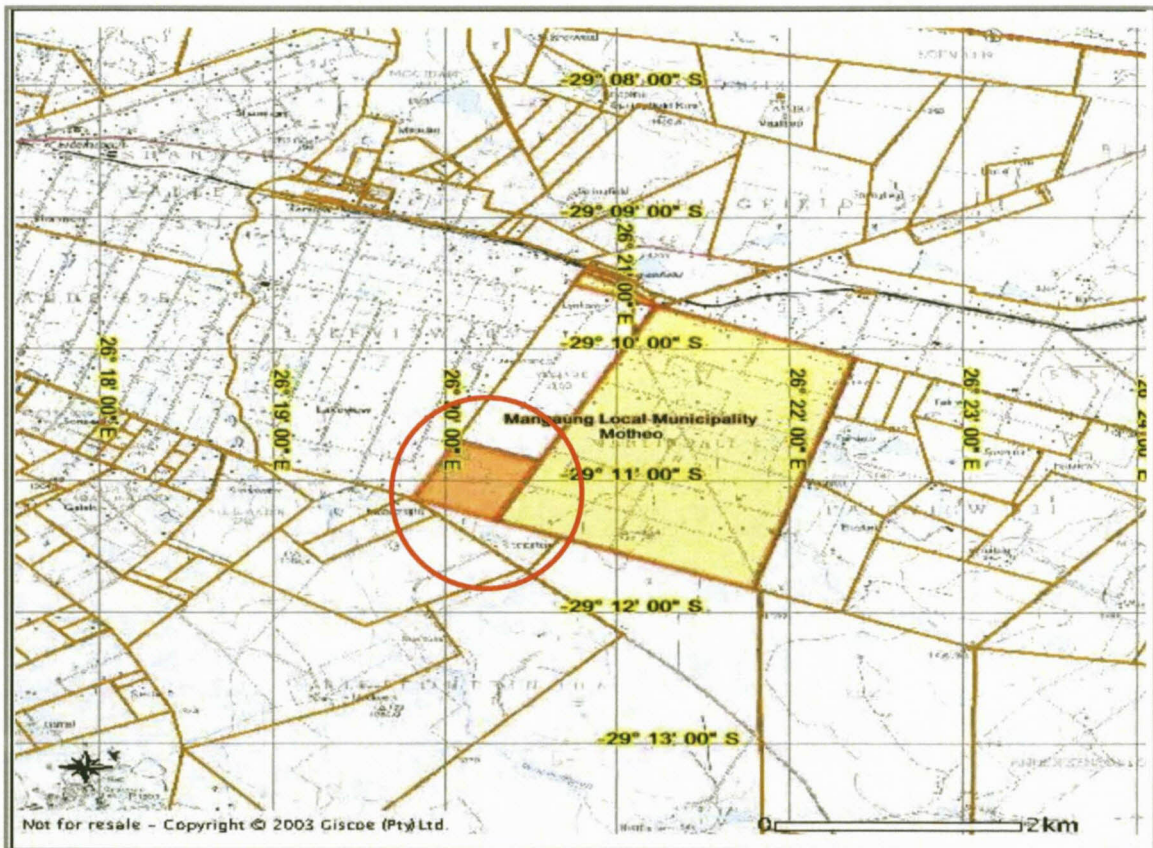
In Figure 4.1 the labelled dot is the location of an LRAD project outside Bloemfontein by the name of Mohlakoana. Table 4.1 includes the details of the Mohlakoana project. The project was implemented on a farm called Martindale number 533. The code can basically be divided up into segments that give an indication of certain areas – for instance the “F” in the 21-digit code is associated with Bloemfontein, while the “003” is related to the administrative district. The four digits (0000) that follow represent the township or agricultural holding to which the project is allocated. The ninth to sixteenth digits (00000533) give the farm number, and the last five digits (00001) give the subdivisions of a farm into portions, which in the case of LRAD occurs often.

**Table 4.1: Project information available in the LRAD files**

	Name	Farm nr	21 Digit
Farm name	Martindale	533	F0030000000053300001
Project name	Mohlakoana		

Source: Land Affairs Office, Bloemfontein (2006)

In Figure 4.2 the 21-digit code is used to locate the Mohlakoana project outside Bloemfontein on a map. Clearly this map does not give much information about the project or the agro-ecological elements present on the project. This map only provides farm and fence boundaries with main road access. In some instances large soil dams are visible, but the current state of such dams is not visible.



**Figure 4.2: Mohlakoana project near Bloemfontein**

The 21-digit code was then used to locate the farm portion using aerial photographs, as illustrated in Figure 4.3.





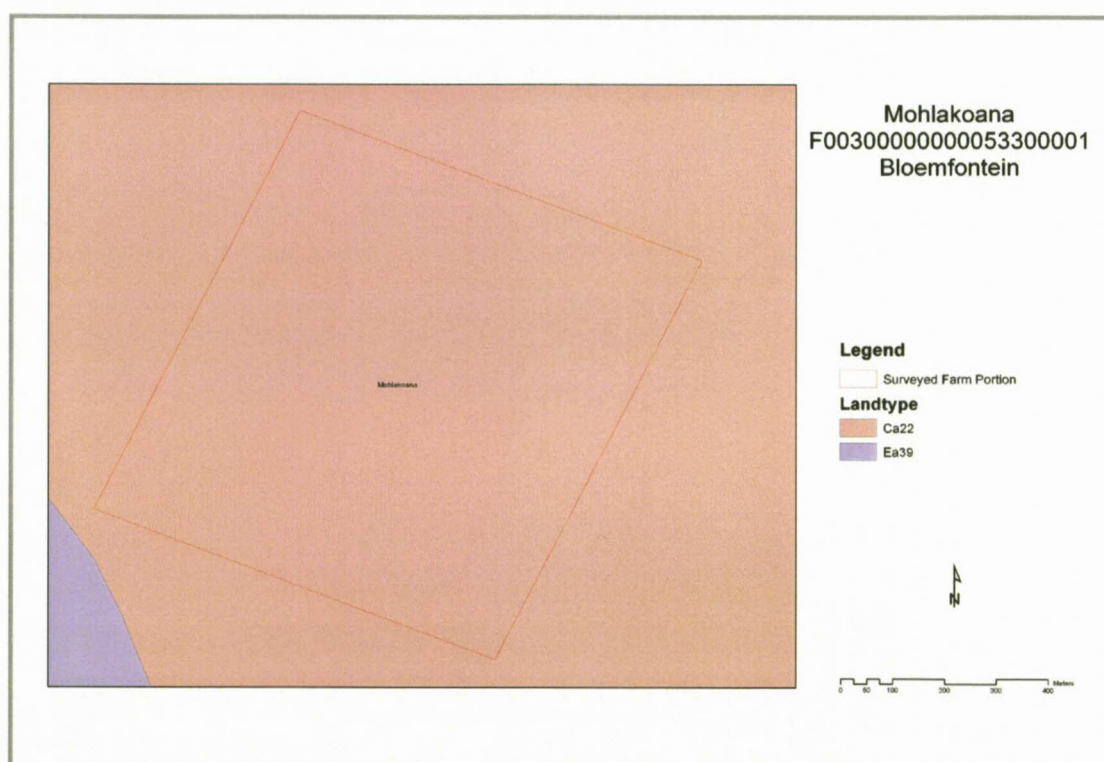
**Figure 4.3: Aerial photograph of Mohlakoana project**

Source: Centre for Research and Geography, UFS (2006)

It is possible to identify some infrastructure and resource elements present on the farm. In this case the LRAD file concluded that there was no infrastructure available on the farm. However, close inspection of the aerial photographs indicates that this is not the case. It can be seen clearly that three dams are present and that the camp includes two cement dams and one windmill.

Although the presence of infrastructure can be detected by this method, the state of such infrastructure cannot be determined. Examining the line patterns as seen in the veldt also reveals that the majority of the farm was previously cultivated land. This is an indication of arable potential if the farmer intends to plant crops. If not, the veldt has been disturbed and will most probably never recover to its original state of vegetation. It is also evident that although the majority of the farm has been arable land, there is good vegetation covering the area and little erosion is present. These characteristics render the particular farm suitable for a possible reassessment of potential, notably the fact that land that was previously cultivated needs time to be rehabilitated to

productive grazing. Other examples of aerial photographs of LRAD projects can be seen in Appendix H, where clear indications of land and soil improvements are visible, as are serious forms of erosion, water availability and vegetation cover. In the case of the Mohlakoana project the dominant resource category of Ca22 was identified as depicted by Figure 4.4 (Schoeman, Van der Walt, Monnik, Thackrah, Malherbe, & Le Roux, 2002). Category Ca22 is made up of different kinds of elements as determined by the Agricultural Research Council (ARC). For the sake of simplicity, Category Ca22 can be defined by Land Capability Classes VI – VII<sup>1</sup>.



**Figure 4.4: Dominant resource elements in the Mohlakoana project**

Source: ARC, 2006

The problem with the category description of resource elements present in the Mohlakoloana project is that it is very broad. No information refining category elements is available, thus it is not possible to determine the resource elements present at farm level, but rather only over larger areas such as managerial district level. In this regard the use of Reasonable Homogenous

<sup>1</sup> For more details regarding the Land Capability Classes see the National Department of Agriculture and capability report for South Africa.

Farming Area (RHFA) methodology may provide additional information. It gives a summary of the predominant elements present in a specific area and the natural resources available for the production of crops or grazing capacity. In the next section RHFA is employed to provide more insight into the research problem. Given the current approach, only certain areas of the FSP are investigated further in order to highlight the research problem.

### **4.3 Reasonably Homogenous Farming Area (RHFA)**

The same approach was used in a research project on the Renosterrivier district that focussed on successful integration of land reform (Botha *et al*, 2006). The Renosterrivier administrative districts (Parys, Sasolburg, Koppies, Kroonstad, Heilbron and Frankfort) were used to further investigate the application of RHFA. Two LRAD projects in each of the Renosterrivier administrative districts were randomly selected to determine the available resources and sustainable enterprises for that resource region and to compare these with the proposed production enterprises as stated in the project files. In addition, actual prices paid for the land and the value attached to the land were compared. All the other projects that have taken place in the selected district which had sufficient information available were also plotted to determine whether a pattern of land potential of projects emerges according to the location of the projects. The resource regions in each district will firstly be discussed before the two randomly selected LRAD projects in that district is evaluated. Comparisons will be drawn between the actual purchase price of the LRAD properties and various land valuation sources. These sources include Deeds Office, Senwes, ABSA and Free State Agriculture.

Cognisance should be taken of the terminology used in the subsequent sections to better understand the interpretations. In this regard see Table 4.2.

**Table 4.2: Terminology used in interpretations**

<b>Transaction details</b>	Details of the transaction involved with the transfer of land under the LRAD programme.
<b>Activities</b>	As proposed by the business plan of the LRAD project files, the enterprise that will be practised on the farm.
<b>RHFA</b>	This consists of one or more land types and has a fair degree of uniformity in respect of agricultural use, yields that can be achieved, and the production techniques applied (Ludick <i>et al.</i> , 1984).
<b>Effective depth</b>	The available soil depth to a layer that is restricted in respect of moisture, air and root penetration (Ludick <i>et al.</i> , 1984).
<b>Required depth</b>	The calculated soil depth, according to Crafford and Nott (1981), where rainfall and texture classes of the effective depth are determining factors. If the effective depth exceeds the required depth, the required depth is taken into account.

#### 4.3.1 Koppies

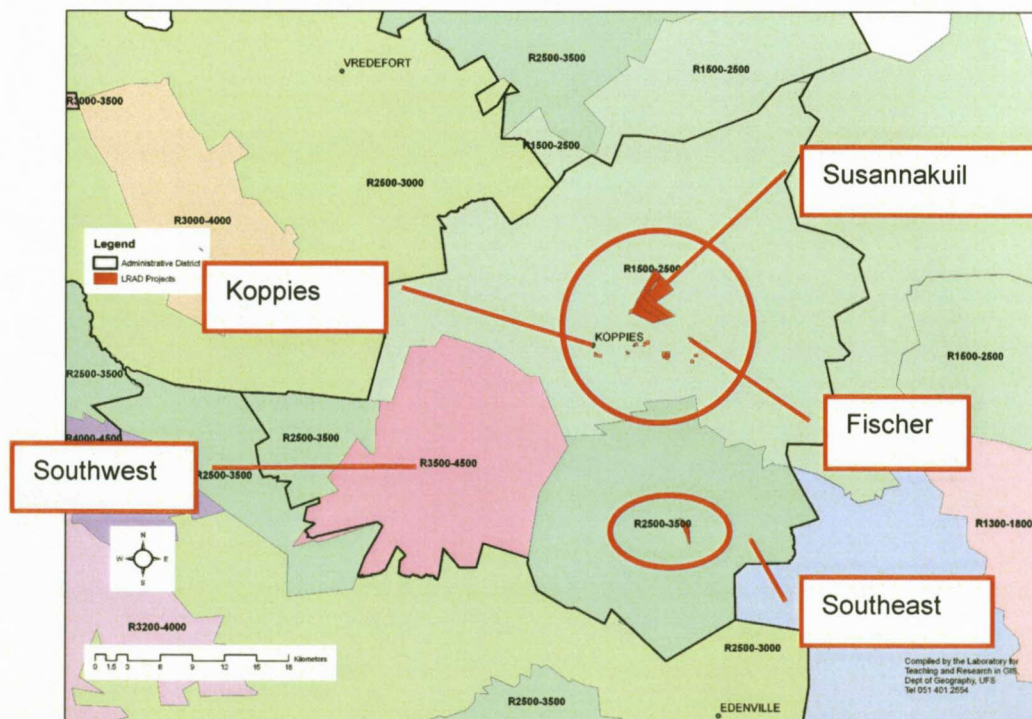
Figure 4.5 depicts the boundaries of the RHFA present in Koppies, the associated price category for the resources present in the homogenous area, the selected projects as well as the other LRAD projects in the district. Koppies are divided into four resource regions. Each of the resource regions has a different price category which in this approach were used to summarise the resource quality in comparison with the other resource regions. Resource region prices range from R1500/ha - R4500/ha in Koppies. The average rainfall ranges between 570mm/year - 630mm/year, with a grazing capacity of between 4 and 6 LSU (Large Stock Unit) per hectare. The area in the south-eastern region, can, to a large extent, only be used for grazing and is therefore less suitable for crop production. Soil in this area is not as deep as in the south-western region, but the area has a slightly higher rainfall (Table 4.3). Although 74% of the south-western region is suitable for crop production, only about 16% is currently being utilised for that purpose (See Figure 4.4 and Table). This area has deep soil and higher grazing capacity, which is reflected in the price. Two of the sources (Senwes and ABSA) consulted with regard to land values for these land types had very similar perceptions of land value for these different land types. Senwes and



Free State Agriculture assigned higher values to the land types with deeper soils.

To enable comparisons with other land price sources, namely Senwes and Free State Agriculture, values were deflated to 2005 as base year with the aim of determining whether land transactions under LRAD in the region were in line with the valuations of these institutions. The two randomly selected LRAD projects were, Fischer and Susannakuil (farm names on which LRAD projects have been implemented). Sixteen other projects were also implemented in the region as indicated by the plotted areas in Figure 4.4. Both selected LRAD projects fell into the same RHFA, and livestock farming is the more suitable enterprise for this region. In accordance with the Fischer project's proposed activities, the entire farm is being used for grazing. The activity on Susannakuil is for commonage purposes and is divided into half arable and half grazing, which in this case can be supported by the natural resources available. The actual selling price for Fischer was R1122.45/ha in 1998, which is lower than the recorded Deeds Office average of R2699 for property between 21 and 100 hectare in size (Table 3.3). The average selling price of land in 1998 in Koppies was R1232.70/ha, thus it can be concluded that the actual transaction price was aligned and even lower than expected for the area in 1998. In the case of Susannakuil the actual selling price for the property was also below the Deeds Office's size category price for land between 1001 and 5000 hectares, i.e. R426/ha. The average selling price in 2002 in Koppies was R1037/ha, which makes it clear that the Susannakuil sales price of R233.42/ha was well below the average recorded price for land in the same area. In the case of allowing for a 7% land value inflation annually, the difference in the sales price for this project of R233.42/ha (2002) is 139% lower than the inflated price in 2002 of R558.40/ha. The same result is seen in the 2005 value comparison of R258.71/ha for Fischer, against the value range of between R1500 – 2500/ha. The deflated value in 2005 of R1744/ha for Susannakuil, is within the range of land valuation of Senwes and Free State Agriculture (Table 4.3).

Both LRAD projects are located close to urban areas, which not only could have had an impact on the prices, but could also have had certain benefits as well as negative effects. A positive attribute is the fact that the farmers are close to input suppliers and market outlets, even though they may experience trouble with animal theft, communal overgrazing and veldfires, which affect the value of land negatively. It is apparent that most of the projects implemented in Koppies are close to town in “Kopjesnedersetting” (Kopjes Settlement), which has a price category of between R1500/ha and R2500/ha (Figure 4.4). Only one project falling into a higher price category can be identified in the southern region of the Koppies district, with a land value price category of between R2500/ha and R3500/ha. The other resource region identified in the Koppies district had a higher price category of between R3500 and R4500/ha due to 80% of the area being suitable for cultivation. Thus in the case of Koppies district, the majority of the projects were established on land that in relative terms were of a lower quality than other RHFA’s in the same district, but the payment for the land was in line or lower than the established RHFA for this land.



**Figure 4.4: RHFA land value with plotted LRAD projects in Koppies**  
 Source: Centre for Research and Geography, UFS (2006)

**Table 4.3: Koppies RHFA regions**

<b>Koppies</b>	<b>LRAD project</b>	<b>LRAD project</b>	<b>Other</b>	<b>Other</b>
<b>Farm name</b>	Fischer	Susannakuil		
<b>Transaction details: Size</b>	49 ha	1 037 ha		
<b>Price</b>	R 55 000	R 231 689		
<b>Price/ha</b>	R 1 744.45 (2005)	R 258.71 (2005)		
<b>Activities</b>	1. Livestock (49 ha) East	N/A Northeast	Southeast	Southwest
<b>RHFA:</b>	6023	6023	6024	6025
<b>Land type:</b>	Dc7	Dc7	Dc10	Bd21
<b>Area of land type: (ha)</b>	75988	75988	7992	52163
<b>Composition</b>	%	%	%	%
Area not available for agriculture:	3.50%	3.50%	2.50%	3.10%
Area under cultivation:	53.60%	53.60%	24.00%	80.80%
Area under grazing:	42.90%	42.90%	73.50%	16.10%
Area suitable for crop production ED>400 mm:	33.60%	33.60%	17.00%	74.00%
Area suitable for field improvement ED<400 mm:	59.50%	59.50%	43.89%	21.40%
Area suitable for grazing only:	3.40%	3.40%	36.60%	1.50%
Area more suitable for pastures:	20.00%	20.00%	6.99%	6.80%
Avg. soil depth: Effective depth/Required depth	600/460	600/460	1200/757	1000/867
Dominant terrain unit: Slope class	4	4	3	3
Grazing capacity (ha/LSU)	6	6	5	4
Long-term average rainfall	623.7	623.7	602.2	578.1
Dominant soil type	Arcadia	Arcadia	Oakleaf	Avalon
<b>Land valuation:</b>	R/ha	R/ha	R/ha	R/ha
SenWes / ABSA land value (2005)	R 1 500 – 2 500	R 1 500 – 2 500	R 2 500 – 3 500	R 3 500 – 4 500
Free State Agriculture (2005)	R 2 000	R 2 000	R 3 000	R 3 000
SenWes / ABSA grazing value (2005)	R 1 250 – 1 750	R 1 250 – 1 750	R 1 200 – 1 500	R 1 200 – 1 500

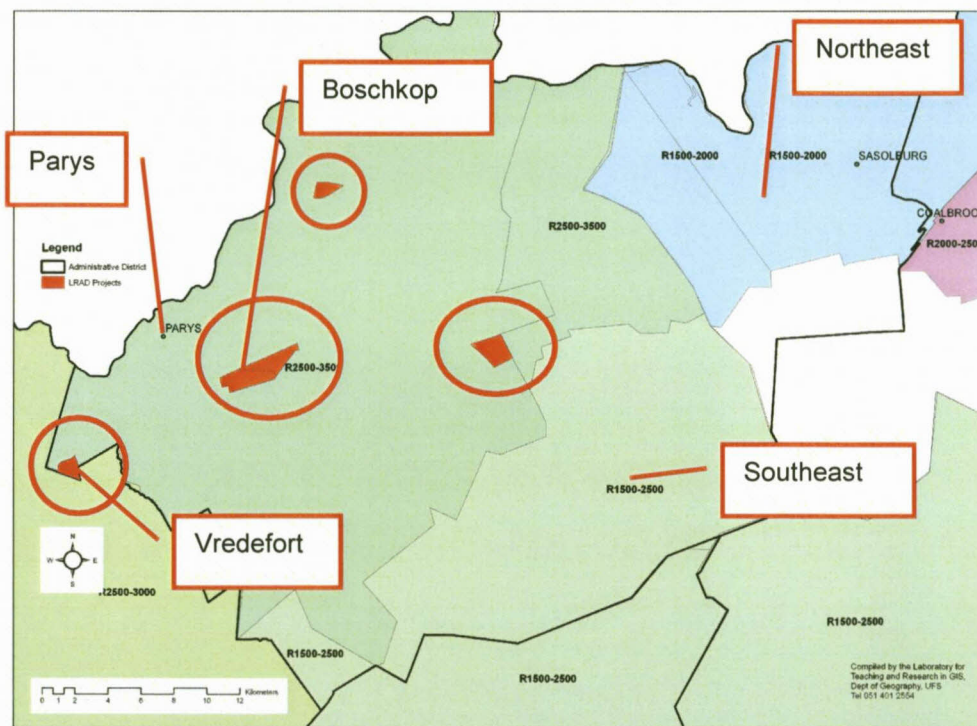
### 4.3.2 Parys

Parys can be divided into three homogenous resource regions that vary in price from R1500 - R3500/ha (Figure 4.5). The grazing capacity in Parys ranges between 4 and 8 hectare per LSU with an average annual rainfall of between 600 and 650mm per year. The north-eastern region of Parys is more suitable for crop production with its deep soils and high rainfall. The south-eastern region, on the other hand, is more suitable for grazing with its shallow soil and high rainfall of 623.7 mm per year. The grazing capacity of this area is the best in Parys, hence the slightly more expensive grazing value. Grazing capacity played a stronger role in the value of land in Parys as indicated by Free State Agriculture, although Senwes proposed a higher land value for regions with deeper soils and higher rainfall.

Both LRAD projects (Vredefort and Boschkop) are located just outside of Parys. This area can predominantly be used for grazing purposes, which both LRAD projects have as a proposed enterprise. Both projects have communal ownership, so no subdivision of the farm is available. The first project/farm, Boschkop, had a transacted price of R1873/ha (in 1998) which is higher than the perceived value recorded by the Deeds Office for land sizes between 1001 and 5000 hectares, i.e. R426/ha (Table 3.3). This may be indicative of some embedded value at the time of sale. For example, vegetable production can be extremely intensive and competitive, and expensive infrastructure and transport must be in place to allow the produce to reach the market before it expires. There is, however, no indication that this farm has supporting infrastructure to this effect, hence the inability to explain the variances. The comparison of the 2005 deflated purchase price of R2911/ha, for Boschkop fell within the range of R2500 – 3500/ha as valued by Senwes and ABSA, but outside the valuation of Free State Agriculture (R1600 – 2200/ha) for the region (Table 4.4). The Vredefort project, which has activities in both livestock and brick making, is also conveniently located if the bricks have to be transported to town, accounting at least partly for the significantly higher transacted value for the land involved. In 1999 the Deeds Office recorded a price of R760/ha for the land size category of between 501 and 1000 hectares



(Table 3.3), which was lower than the transacted price of R1070/ha. The 2005 deflated purchase price of R1560/ha for Vredefort, fell within the grazing valuation of Senwes and ABSA (R1300 – 1700/ha), but outside the land valuation of Free State Agriculture (R1600 – 2200/ha), Senwes and ABSA (R2500 – 3500/ha). The three other LRAD projects that were implemented in the Parys district fell into the highest priced resource region of between R2500 and R3500/ha. The LRAD projects are scattered evenly throughout the district, with no projects in the lowest resource region in the north-eastern region of Parys. The eastern region of Parys had no resource information available and has been represented in white. Thus, in the case of Parys district, all the LRAD projects occurred on the highest quality land in comparison to the region.



**Figure 4.5: RHFA land value with plotted LRAD projects in Parys**  
 Source: Centre for Research and Geography, UFS (2006)

**Table 4.4: Parys RHFA regions**

<b>Parys</b>	<b>Other</b>	<b>LRAD project</b>	<b>LRAD project</b>	<b>Other</b>
<b>Farm name</b>		Boschkop	Vredefort	
<b>Transaction details: Size</b>		1 516 ha	997 ha	
<b>Price</b>		R 2 840 000	R 1 070 000	
<b>Price/ha</b>		R 2 911.46 (2005)	R 1 560.10 (2005)	
<b>Activities</b>		1. Livestock 2. Vegetables	1. Livestock 2. Bricks	
<b>Region</b>	Southeast	Southeast	Southwest	Northeast
<b>RHFA:</b>	6023	6018	6018	6051
<b>Land type:</b>	Dc7	Ba38	Ba38	Bd23
<b>Area of land type: (ha)</b>	32281	22005	22005	9587
<b>Composition</b>	%	%	%	%
Area not available for agriculture:	3.50%	5.70%	5.70%	20.00%
Area under cultivation:	53.60%	34.90%	34.90%	54.50%
Area under grazing:	42.90%	59.40%	59.40%	25.50%
Area suitable for crop production ED>400 mm:	33.60%	31.60%	31.60%	46.00%
Area suitable for field improvement ED<400 mm:	59.50%	26.59%	26.59%	29.40%
Area suitable for grazing only:	3.40%	36.10%	36.10%	4.60%
Area more suitable for pastures:	20.00%	0.00%	0.00%	8.50%
Avg. soil depth: Effective depth/Required depth	600/460	800/741	800/741	900/801
Dominant terrain unit: Slope class	3	3	3	4
Grazing capacity (ha/LSU)	4	6	6	8
Long-term average rainfall	623.7	602	602	651.1
Dominant soil type	Arcadia	Hutton	Hutton	Hutton
<b>Land valuation:</b>	R/ha	R/ha	R/ha	R/ha
SenWes / ABSA land value (2005)	R 1 500 – 2 500	R 2 500 – 3 500	R 2 500 – 3 500	R 1 500 – 2 000
Free State Agriculture (2005)	R 1 600 – 2 200	R 1 600 – 2 200	R 1 600 – 2 200	R 1 600 – 2 200
SenWes / ABSA grazing value (2005)	R 1 250 – 1 750	R 1 300 – 1 700	R 1 300 – 1 700	R 1 200 – 1 500



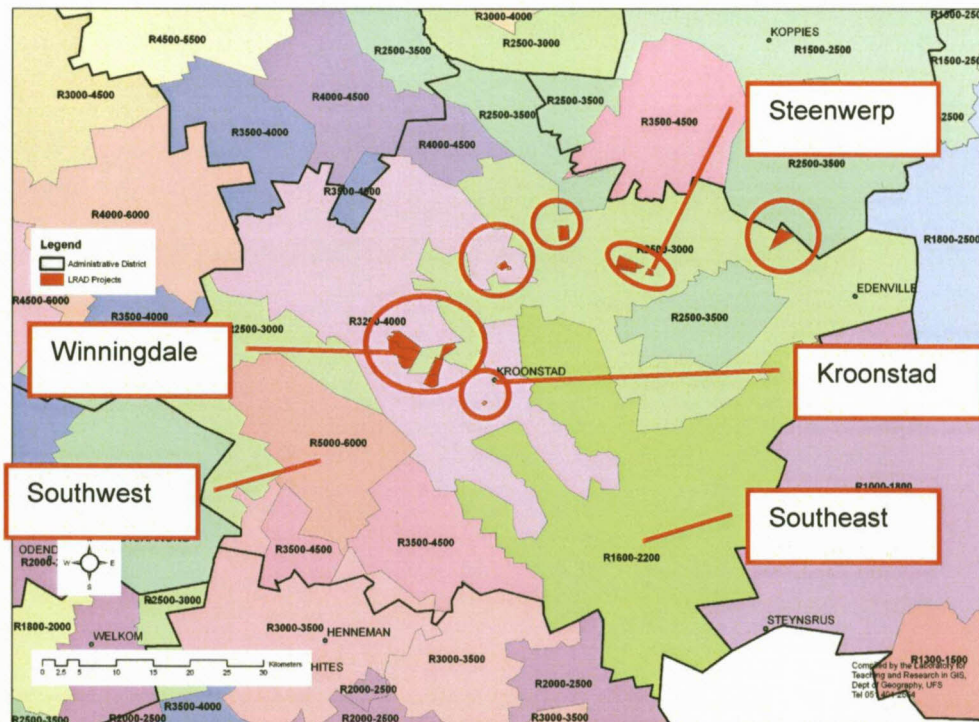
### 4.3.3 Kroonstad

Kroonstad is divided into nine (Figure 4.6) resource regions ranging from R1600 – R6000/ha. Grazing capacity in Kroonstad district ranges from 4 to 7 ha/LSU with average annual rainfall of between 570 – 630 mm. The south-eastern region of Kroonstad has restraining soil depth that limits crop production and makes the area more suitable for grazing. Currently 74% of the land type area is being used for grazing purposes and 17% for crop production. The limitations of this area can be seen in the land price. The south-western region of Kroonstad is high-potential land with deep soil and high rainfall, and more than 74% of the area is suitable for crop production. The higher potential of the land type is clearly reflected in the land price.

The two randomly selected LRAD projects are Steenwerp and Winningdale. Steenwerp has a proposed cattle-farming enterprise, which fits the resource profile for that region. 95% of the total land type area is currently being used for grazing, although parts in this area with soil deeper than 600 mm are more suitable for crop production. The Steenwerp project consists of 180 ha of arable land and the rest of the farm is being used for grazing. The crop production potential and higher grazing capacity for this land type are clearly reflected in the price. The average price for land within the size category of between 101 and 500 hectares was R1573/ha in 2003, as recorded by the Deeds Office (Table 3.3), while the average selling price for land recorded in the Kroonstad area was R1360.80/ha. Transacted land values increased by 12.8% per annum from 1999 to 2003. With regard to the transacted price of R901.47/ ha in 2003, the price paid for Steenwerp was well below its actual value. The deflated 2005 valuation of SenWes and ABSA (R2500 – 3000/ha) also indicates that land values in the region are higher than the transacted price (Table 4.5).

The LRAD project implemented on Winningdale has lower grazing capacity and extreme restrictions on soil suitable for crop production, with an effective soil depth >400 mm. The project consists of 340 ha of arable land, with the

rest of the farm being suitable for grazing. The higher rainfall for this area could contribute to the higher potential for crop production and the higher price. No actual transaction price information was available for Winningdale, but the expected size category price for land between 1001 and 5000 ha in size is R456/ha (Table 3.3) and the average price for land sold in Kroonstad in 1999 was recorded by the Deeds Office as R1113.80/ha. The resource price categories vary from R1600 - R6000/ha. Fourteen other projects were also implemented in Kroonstad district. More than half the LRAD projects that have been implemented were found to be in the resource price category of between R3500 and R4000/ha. The remaining projects are located in a region where the prices of resources are between R2500 and R3000/ha. Kroonstad is a good example of how random the resource regions can be, as well as the location of the LRAD projects implemented in a district. Thus in the case of Kroonstad district, none of the projects occurred in the low quality resource regions. All of the projects fell into the medium potential land in comparison to the region.



**Figure 4.6: RHFA land value with plotted LRAD projects in Kroonstad**  
 Source: Centre for Research and Geography, UFS (2006)

**Table 4.5: Kroonstad RHFA regions**

<b>Kroonstad</b>	<b>Other</b>	<b>LRAD project</b>	<b>LRAD project</b>	<b>Other</b>
<b>Farm name</b>		Steenwerp	Winningdale	
<b>Transaction details: Size</b>		477 ha	3 295 ha	
<b>Price</b>		R 430 003	N/A	
<b>Price/ha</b>		R 901.47 (2005)	N/A	
<b>Activities</b>		1. Cattle farming (267 ha)	1. Livestock (2 955 ha) 2. Crops (340 ha)	
<b>Region</b>	Southeast	Northeast	West	Southwest
<b>RHFA:</b>	6024	6025	6024	6037
<b>Land type:</b>	Dc10	Bd21	Dc6	Bd21
<b>Area of land type: (ha)</b>	109411	156310	68003	43523
<b>Composition</b>	%	%	%	%
Area not available for agriculture:	2.50%	1.85%	4.20%	2.80%
Area under cultivation:	24.00%	48.17%	17.30%	77.30%
Area under grazing:	73.50%	95.99%	78.50%	19.90%
Area suitable for crop production ED>400 mm:	17.00%	74.34%	1.40%	74.30%
Area suitable for field improvement ED<400 mm:	43.90%	21.50%	58.50%	21.50%
Area suitable for grazing only:	36.60%	0.89%	35.90%	1.40%
Area more suitable for pastures:	7.00%	4.05%	15.90%	3.01%
Avg. soil depth: Effective depth/Required depth	450/600	1000/867	700/900	1000/939
Dominant terrain unit: Slope class	3	3	3	3
Grazing Capacity (ha/LSU)	5	4	5	7
Long-term average rainfall	602.2	578.1	608	626
Dominant soil type	Bonheim	Avalon	Avalon	Avalon
<b>Land valuation:</b>	R/ha	R/ha	R/ha	R/ha
SenWes / ABSA land value (2005)	R 1 600 – 2 200	R 2 500 – 3 000	R 3 200 – 4 000	R 5 000 – 6 000
Free State Agriculture (2005)	R 1 700	N/A	R 1 700 – 2 500	R 2 500
SenWes / ABSA grazing value (2005)	R 1 200 – 1 500	R 1 500 – 2 000	R 1 200 – 1 500	R 1 000 – 1 500

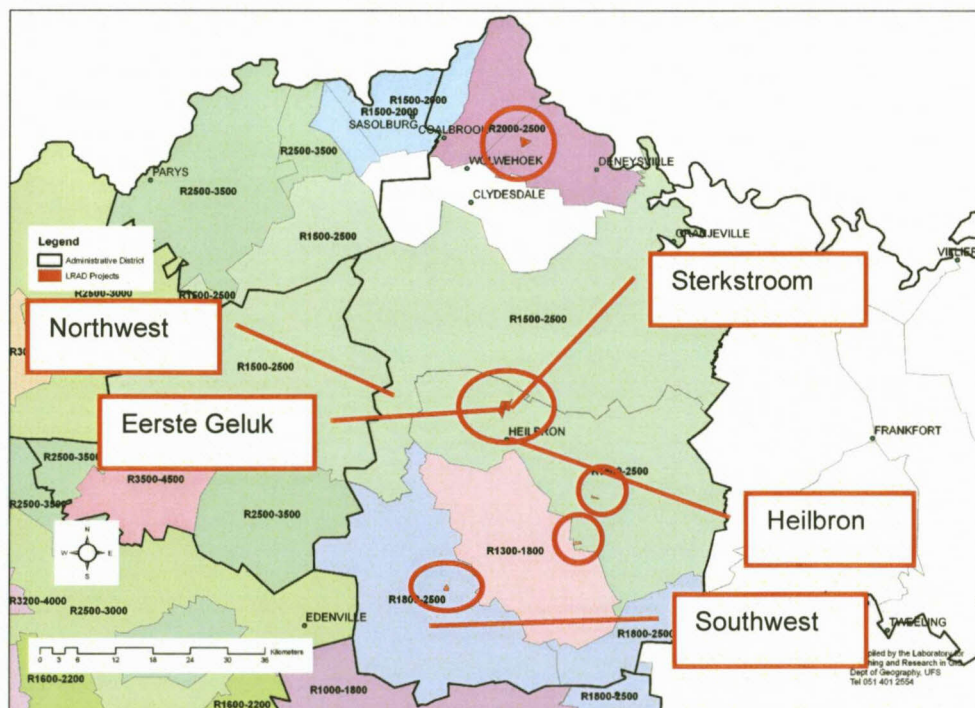
#### 4.3.4 Heilbron

Heilbron is divided into five resource regions with price categories ranging from R1300 - R2500/ha (Figure 4.7). Grazing capacity in Heilbron district ranges between 5 and 6 ha/LSU with an average annual rainfall of between 600 and 655mm. The south-western region of Heilbron district has 17% of the area suitable for crop production with 73% under grazing. A slightly higher price range (R1800 – R2500/ha) is visible due to deeper soils than in the north-western region (R1500 – R2500/ha). The north – western region consists of 33.6% suitable for crop production with 42% under grazing with a grazing capacity of 6 ha/LSU (Table 4.6).

The selected projects (Eerste Geluk and Sterkstroom) are both located to the north of Heilbron, which is dominated by the same land type. In terms of district, the northern resource region can be characterised by high grazing capacity and high rainfall but not very deep soil. The area is dominated by grazing, but 36% is suitable for crop production. The long-term rainfall of 652.2 mm per year could contribute largely to the higher price and crop production capacity. Sterkstroom is under communal ownership, and no subdivision information was available. The size category price for Sterkstroom was R426/ha in 1998 and the average price for land in Heilbron in 1998, as recorded by the Deeds Office, was R970.10/ha. The actual transaction price for Sterkstroom was R955.74/ha. The fact that Sterkstroom is under communal ownership could be the reason for the subdivision of the land into smaller portions, which could in turn explain the higher actual price compared to the size category price (Table 3.3). The 2005 deflated valuation prices were in line with the transacted price of R1485/ha for Sterkstroom as valued by SenWes (R1500 – R2500/ha). No values were available from Free State Agriculture in this region. Eerste Geluk has 35 ha set aside for arable land, and the rest of the farm is being utilised for grazing. Eerste Geluk was purchased at a transaction price of R897.96/ha, which is lower than the recorded average price for land in Heilbron in 2003, which was R1458.80/ha. According to the Deeds Office size category prices, Eerste Geluk falls below the price range with a market value of R1573/ha (Table 3.3). This specific



farm was acquired at a significantly lower price than the ruling market price at the time of the sale. The lower potential of these regions can be seen in the prices. Lower grazing capacity, shallower soil and less rain would be the drivers behind the lower price, as reflected by the SenWes land valuation (Table 4.6). The 2005 deflated values do not support the transacted price, as it falls below the range of the SenWes valuation (R1500 – R2500/ha). Information on one particular area was not available and is represented in white in Figure 4.7. The results for Heilbron concur with those for Kroonstad in that no pattern of projects is visible in a specific resource region or price category. Five other projects were implemented in Heilbron. The projects were randomly located throughout the district. The only resource region that had no LRAD projects was in fact the region with the lowest price category in the district, located to the south of Heilbron (R1300 – R1800/ha). Thus in the case of Heilbron district, all the projects occurred in medium to high quality land in comparison to the region.



**Figure 4.7: RHFA land value with plotted LRAD projects in Heilbron**  
 Source: Centre for Research and Geography, UFS (2006)

**Table 4.6: Heilbron RHFA regions**

Heilbron	Other	Other	LRAD project	LRAD project
<b>Farm name</b>			Sterkstroom	Eerste Geluk
<b>Transaction details: Size</b>			1 062 ha	245 ha
<b>Price</b>			R 1 015 000	R 220 000
<b>Price/ha</b>			R 1 485.36 (2005)	R 973.75 (2005)
<b>Activities</b>			1. Livestock	1. Livestock (210 ha) 2. Crops (35 ha)
<b>Region</b>	Southwest	Northwest	North	North
<b>RHFA:</b>	6024	6023	6049	6049
<b>Land type:</b>	Dc10	Dc7	Ea28	Ea28
<b>Area of land type: (ha)</b>	85548	68318	83215	83215
<b>Composition</b>	%	%	%	%
Area not available for agriculture:	2.50%	3.50%	4.00%	4.00%
Area under cultivation:	24.00%	53.60%	30.20%	30.20%
Area under grazing:	73.50%	42.90%	65.82%	65.82%
Area suitable for crop production ED>400 mm:	17.00%	33.60%	35.60%	35.60%
Area suitable for field improvement ED<400 mm:	43.90%	59.50%	29.90%	29.90%
Area suitable for grazing only:	36.60%	3.40%	30.50%	30.50%
Area more suitable for pastures:	7.00%	20.00%	3.00%	3.00%
Avg. soil depth: Effective depth/Required depth	450/600	600/460	600/481	600/481
Dominant terrain unit: Slope class	3	3	3	3
Grazing capacity (ha/LSU)	6	6	5	5
Long-term average rainfall	602.2	623.7	652.2	652.2
Dominant soil type	Bonheim	Arcadia	Arcadia	Arcadia
<b>Land valuation:</b>	R/ha	R/ha	R/ha	R/ha
SenWes / ABSA land value (2005)	R 1 800 – 2 500	R 1 500 – 2 500	R 1 500 – 2 500	R 1 500 – 2 500
Free State Agriculture (2005)	N/A	N/A	N/A	N/A
SenWes / ABSA grazing value (2005)	R 1 200 – 1 500	R 1 200 – 1 500	R 1 200 – 1 600	R 1 200 – 1 600

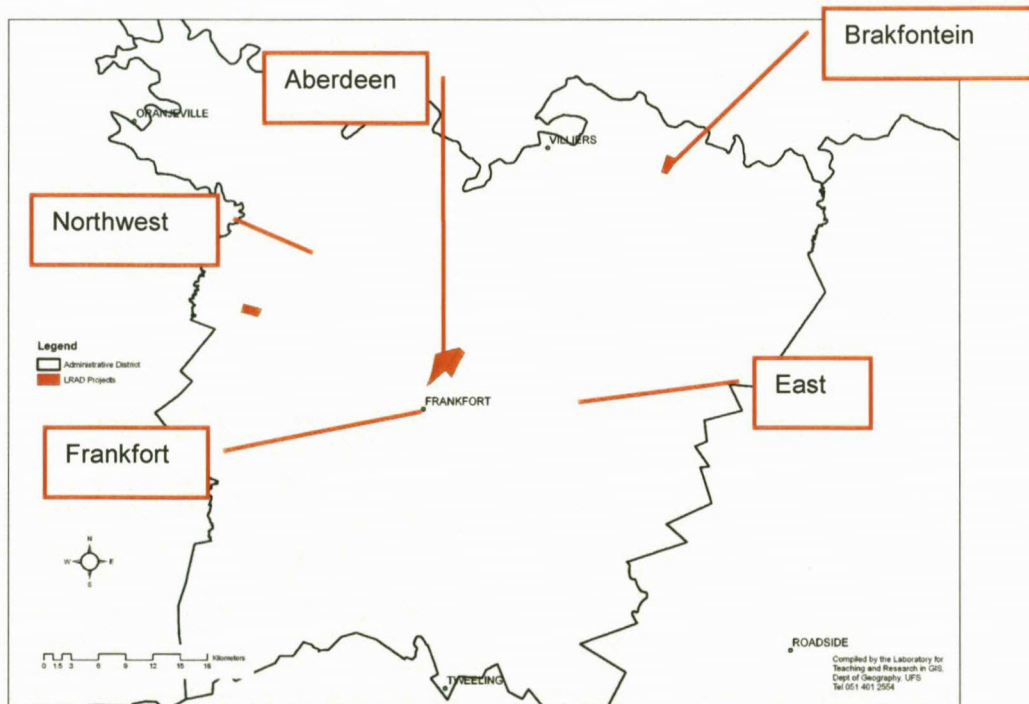


#### 4.3.5 Frankfort

No spatial information was available for Frankfort, thus no RHFA or resource information could be plotted (Figure 4.8). We thus rely only on the information provided by Table 4.7 to evaluate Frankfort district. Four resource regions can be identified from Table 4.7. Resource region prices range from R2000 – R8000/ha with annual average rainfall of between 610 – 680 mm. Grazing capacity in Frankfort district ranges between 3 and 6 ha/LSU. The higher prices in the north-western and eastern regions can be explained by the fact that there seems to be abundant water available for crop production. More than 65% of this area is under crop production and it has a lower grazing capacity than the rest of the Frankfort district. The north-western region is 53% suitable for pasture development, which could explain why it has the highest grazing capacity of the district. This area is located close to the Vaal Dam, giving this area higher production capacity. Frankfort is a typical example of the impact of water availability on land prices. The areas further away from water abundance have substantially lower prices. SenWes clearly supports this critically important resource in their valuation of farm land by associating a high land price (R4500 – R8000/ha) in this region with water in abundance.

Only two agricultural land reform projects have been recorded in Frankfort. Other projects like Aberdeen are either settlements or commonage land. Frankfort does not seem to have dominant areas that have deep soil. Aberdeen is located southeast of Frankfort and falls into an area of higher grazing capacity with the highest rainfall for the district. . The abundance of water in the case of a farm close to the Vaal Dam could have a substantial impact on land price, which could explain the higher actual transaction price of the projects in the area.

No information about the date of the transaction for either project was available and thus no comparison could be drawn in the same timeframe with similar transactions and the 2005 deflated land valuations of SenWes and Free State Agriculture, thus also no certain result could be concluded in terms of equity in land potential in Frankfort. This is a clear example of the importance of a proper record system. In the case of Frankfort no homogenous resource region information was available, but from the Table 4.7 it seems if the LRAD projects implemented in Frankfort are randomly scattered throughout the district and no clustering in a particular region is visible from Figure 4.8.



**Figure 4.8: RHFA land value with plotted LRAD projects in Frankfort**  
Source: Centre for Research and Geography, UFS (2006)

**Table 4.7: Frankfort RHFA regions**

Frankfort	LRAD project	Other	SLAG project	Other
<b>Farm name</b>	Brakfontein		Aberdeen	
<b>Transaction details: Size</b>	175 ha		704 ha	
<b>Price</b>	R 420 000		R1 366 000	
<b>Price/ha</b>	R 2 400.00		R 1 940.34	
<b>Activities</b>	1. Livestock (175 ha) Northeast	East	Settlement North	Northwest
<b>RHFA:</b>	6044	6048	6049	6050
<b>Land type:</b>	Ea77	Ea31	Ea28	Dc 15
<b>Area of land type:</b>	56000	44950	60685	5690
<b>Composition</b>	%	%	%	%
Area not available for agriculture:	5.00%	2.10%	4.00%	2.09%
Area under cultivation:	24.36%	31.00%	30.20%	70.81%
Area under grazing:	70.60%	66.90%	65.80%	27.10%
Area suitable for crop production ED>400 mm:	26.20%	24.50%	35.60%	18.21%
Area suitable for field improvement ED<400 mm:	39.60%	65.20%	29.90%	79.70%
Area suitable for grazing only:	29.20%	8.20%	30.50%	0.00%
Area more suitable for pastures:	3.30%	6.50%	0.00%	52.60%
Avg. soil depth: Effective depth/Required depth	450/1025	500/498	600/481	450/921
Dominant terrain unit: Slope class	3	3	3	1
Grazing capacity (ha/LSU)	4	5	6	3
Long-term average rainfall	683	674.3	652.2	614.1
Dominant soil type	Westleigh	Arcadia	Arcadia	Westleigh
<b>Land valuation</b>	R/ha	R/ha	R/ha	R/ha
SenWes / ABSA land value (2005)	R 2 000 – 3 500	R 3 000 – 4 500	R 4 500 – 8 000	R 4 500 – 8 000
Free State Agriculture (2005)	N/A	R 3 000	N/A	N/A
SenWes / ABSA grazing value (2005)	R 1 200 – 1 400	R 1 500 – 2 000	R 1 500 – 2 000	R 1 500 – 2 000

## 4.4 Conclusions

This chapter shows that information regarding resource potential at farm level is not easy to come by. The 21-digit approach proved to be helpful to some extent, but it was found that this approach also rely on broad generalisations. Aerial photographs can be used to examine farm resources, making it possible to see features like erosion, soil improvements, water availability and vegetation cover. Some infrastructure can also be identified, but the state of the infrastructure cannot be investigated with this approach. The introduction of the RHFA concept proved helpful in the process of breaking down resources to farm level. Within an RHFA, dominant resources like soil depth, grazing capacity, rainfall, soil types and slopes can be identified, which provides a more comprehensive breakdown of resources in a region at farm level. Comparisons were drawn between the proposed production activities that could be practised on the projects, as stated in the business plans for the projects. This made it possible to compare transaction prices with resource valuations by SenWes, ABSA and Free State Agriculture. Combining 21-digit codes, resource region valuations and RHFA proved that there is no pattern of only lower quality land being transferred; in fact majority of projects that were implemented in three of the five districts fell within medium to high potential land, in comparison to the surrounding area. The projects in the Renosterrivier region were randomly scattered across the districts and resource regions. In some cases the transacted price could be explained by the presence of high-quality resources in the area, for instance an abundance of water or deep soil types, but in some cases no explanation could be found for higher transacted prices except speculation of intensive infrastructure being present on the farm. In most cases the transacted land prices were either in line with or below the SenWes, ABSA and Free State Agriculture valuations, allowing one to conclude that in this region little overpricing occurred. It became clear that no single pattern of transaction characteristics determined prices. Incompleteness of the records once again restricted the evaluation. There is clearly a need for a single records system to record all the relevant aspects of LRAD transactions.

## CHAPTER 5

### HEDONIC PRICING MODEL

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#### 5.1 Introduction

Information regarding land reform in the FSP is very limited and not freely available, which makes it difficult to investigate the progress that has been made. The Land Affairs offices record system is incomplete and needs updating to fill in the gaps. It is therefore difficult to determine the current situation regarding LRAD projects. No examination of the onsite activity or interviews could be done due to budget constraints. Alternative methods were investigated to evaluate the projects that were selected. Restrictions were caused by the fact that aerial photography of the FSP is very expensive thus limiting the number of projects that could be investigated.

These problems and shortcomings of the data available to measure the progress made in redistribution of land and resources led to the development of a hedonic pricing model that attempts to isolate the transaction characteristics that have the most significant impact on the price paid for land under LRAD. The first part of this chapter explains hedonic regressions, the next section focuses on the theoretical inclusion of the independent variables. In the final section of this chapter, the regression is calculated and a conclusion is drawn from the results.

#### 5.2 Hedonic model approach

In economics hedonic regression, or more generally hedonic demand theory, is a method of estimating demand or prices. It decomposes the item being researched into its constituent characteristics, and obtains estimates of the value of each characteristic. In essence it assumes that there is a separate market for each characteristic. It may be estimated using ordinary least squares (OLS) regression analysis. The underlying theoretical principles of

the hedonic pricing method can be found in, amongst others, Lancaster (1971) and Berndt (1991). The literature is rich in providing guidance in terms of the factors that impact on land prices. The independent variables included in the model were: size, rent, capital improvements, grazing capacity, inflation, interest and land capability. The theoretical inclusion of the independent variables is discussed in the next section.

### **5.2.1 Productive value**

Agri Risk Specialists (ARS) specifies that the two most important natural resources that determine successful production in the Free State are the physical characteristics of the soil and rainfall (ARS, 2006). Precipitation spatial map data was given by the Department of Agriculture, Free State. These natural resources contribute to either crop or livestock production in the Free State. Grazing capacity is used to measure the productive value of land in livestock production. It is expected that there should be a negative relationship between grazing capacity and price of land since the value of grazing capacity has a negative relationship with potential. It is defined as 'the lower the value per large animal unit the higher the capacity'.

Crop production data was obtained at the Agricultural Risk Specialists (ARS) using the CERES-growth simulation model with spatial inputs that is used to simulate 25 years of historic yields for maize. Historic yields for sunflower seed were derived from the simulated maize yields. Wheat yields were simulated over the same period using the PUTU growth simulation model. Although the gap between the productive value and market value of farmland has been widening, it is hypothesized that the productive value of land and crop yields will have a positive relationship with farmland values.



### **5.2.2 Soil**

Soil physical characteristics can be a complex variable<sup>7</sup>. The Agricultural Research Council (ARC) developed a Land Capability System, also known as the Land Capability Classification System (LCC), to classify land according to the potential of the land and for general kinds of land uses. (Schoeman, Van der Walt, Monnik, Thackrah, Malherbe, Le Roux, 2002). Capability is viewed by some as the inherent capacity of land to perform at a given level for a general use, and suitability refers to the adaptability of a given area for a specific kind of land use (FAO, 1976).

LCC considers the long-term proper use of soils for crop production without degradation and starts with a soil survey including topography, soil and climate (Van Diepen, Van Keulen, Wolf & Berkhout. 1991; Sys, Van Ranst, & Debaveye, 1991). The data collected for these resources are used to identify and classify soil mapping units into different capability classes according to their actual and potential limitations. Limitations are the physical land characteristics that affect the intensity of use or require special management (Ahmed, 2003). The capability class consists of soil groups with similar relative limitations according to which they are grouped into eight classes. The degree of limitation and severity increases from Class I to Class VIII (Sys *et al.*, 1991). See Appendix A for exposition of the capability classes and land use options. It is hypothesized that there will be a negative relationship between the land capability classes and the price of farmland.

### **5.2.3 Rent income**

When expected net returns increase, the future value of farmland also increases. The larger the stream of expected returns from land, the higher is the present value of that unit of land. Thus, an increase in expected net rents should have a positive effect on the present value of farmland (Klinefelter,

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<sup>7</sup> The complexity is caused by the wide range of different combinations of soil types, slopes and soil depths; which play an important role in the physical composition and productive potential of soil.

1973). Causality comes into question here and according to Phipps (1984), farm-based return Granger cause farmland prices, but farmland prices do not cause Granger farm based returns. This supports the view that farmland prices are mainly determined within the farm sector. If farmland prices were mainly determined by non farm-based returns, a finding of causality from farmland prices to returns or independence would have been expected. A basic norm used by the Land Bank for certain production was used in calculating the rent value for widely practiced farming enterprises in the Free State which are constituted of livestock and crops.

The inherent characteristics of the farms were used in the calculation of rent value. It was expected that multicollinearity would be present in the data set since the natural resources of a farm not only affect the validation price for the property but also the flow of production income and rent value. It is hypothesized that there will be a positive relationship between the price of farmland and rent income.

#### **5.2.4 Capital gains**

Raising farmland value has been an important source of income to land owners, even to the extent that land represents an investment similar to common stock (Klinefelter, 1973). Karl Marx in the mid 1900s explained that the relative profitability of capital investments in agriculture is affected by the productivity, fertility and location of farmland, as well as by capital expenditure on land improvements. Rising land values create expectations of continued capital gains, which consequently create an increased demand for land and at the same time, tend to reduce the supply of farmland. Farmland may not be a good hedge against inflation if the net income from it is expected to yield an annual rate of return on investment of 2 to 4 %. However, if a capital gain of 4 to 6 % annually or, in the South African case as shown in Table 3.2, 14% average growth, is expected in addition to the regular income derived from farming; then farmland may compare favourably with alternative investments. The tax advantages associated with long-term capital gains often make land

more attractive as an investment (Van Schalkwyk, 1995). It is hypothesized that there will be a positive relationship between capital gain and the price of farmland.

### **5.2.5 Farm size**

It has been argued by several authors that there is an inverse relationship between farm size and productivity of farmland (Carter, 1984; Tweeten, 1964; Van Schalkwyk, 1995). In turn, productivity contributed to the explanation of the value differences in farmland. New developments such as larger machinery and better management practices have given rise to increased demand for land that enables farm enlargement as a given unit of labour and managerial resources have been able to handle larger hectares (Klinefelter, 1973). Additional hectares may enable farmers to reduce unit costs by spreading their fixed costs over a larger area (Van Schalkwyk, 1995). Tweeten (1964) has suggested that the demand for farm enlargement has been increased because of economies of size associated with larger farms. Tweeten's theory of decreasing costs holds that the increased competition in the land market for farm enlargement tends to bid up farmland values to the point where the return on land is equal to the return on capital in alternative uses on the larger, more efficient farms. It's thus hypothesized that the relationship between farm size and price of farmland will be negative.

### **5.2.6 Inflation**

Feldstein (1980) expected that inflation would have a significant effect on land prices. He explained that movement of inflation and land prices were not always in the same direction but that the value of farmland is expressed in monetary terms; the value of farmland is embodied in the currency value of the asset. If the currency value of farmland were to remain constant while inflation (a decrease in purchasing power of the currency) occurred for the general economy, it would mean that the real economic value of farmland had

declined. It is thus expected that inflation could have a positive or a negative relationship with farmland values.

### 5.2.7 Dummy variables

Dummy variables were included to test for the affect of proposed business enterprises on each of the projects. It is postulated that the business plan for each of the projects had an impact on the process to establish the price for the land since the business plan created an expectation of future income. The two dummy variables included to represent different enterprises were one each for livestock and field crop enterprises; the livestock dummy represents the base dummy variable.

Dummy variables were also included to test for structural differences in regions throughout the Free State Province. The regions were selected on the basis of similar rainfall averages. Three regions were identified namely, Southern Free State (275-400mm/year), Central Free State (401-600mm/year) and Northern Free State (601-900mm/year). The base dummy in this case is the southern region. The base dummies are captured in the constant term. It is expected that each of the regions would be different from each other due to the differences in the enterprises that can be farmed.

The proposed model to explain the value of LRAD farmland is denoted as follows:

$$RPRICE = f(LAU, YIELDS, LCC, CG, INTEREST, RENT, SIZE, INFLATION, DL, DC, DSOUTH, DCENTR, DNORTH)$$

**Table 5.1: The variables definitions are as follows:**

<b>Dependant Variable</b>	<b>Variable description</b>	
Real price per hectare (RPRICE)	The price per hectare from 2001-2004 was obtained from the Land Affairs Offices. 2004=100	
<b>Independent Variables</b>	<b>Variable description</b>	<b>Expected Sign</b>

Grazing Capacity (LAU)	Grazing capacity is expressed in terms of hectares needed to keep one large animal unit in sustainable production. The observations for each LRAD project was obtained using GIS and the spatial data set provided by the ARC	-
Yields	The three most common crops, namely maize, wheat and sunflower yields was obtained using GIS and spatial data set provided by the ARS	+
Land Capacity Class (LCC)	"Land Capability" is as defined earlier.	-
Expected capital gain (CG)	The expected capital gain 3 year moving average was calculated as $E(CG) = [3CG(t-1) + 2CG(t-2) + 1CG(t-3)]/6$ giving heaviest weight to the most recent years.	+
Commercial interest rate (INTEREST)	Interest rates were included to capture the alternative growth for capital in the market and to see whether production loans had an impact on prices paid.	+
Rent per hectare (RENT)	Rent was calculated by the same method used by Land Bank to determine rental value. This method takes the resources available on a farm into consideration when rent is calculated.	+
Farm Size (SIZE)	The size of each project was provided by the Land Affairs Offices.	-
Inflation (INFLATION)	If the value of farmland were to remain constant while inflation occurred for the general economy, it would mean that the real economic value of farmland had declined.	+/-
Dummy livestock (C)	Dummy variable can either take the value of 1 in the case of livestock production or 0 if not.	-
Dummy crops (DC)	Dummy variable can either take the value of 1 in the case of crop production or 0 if not.	+
Dummy Southern FSP (C)	Dummy variable can either take the value of 1 if the project is located in the Southern Free State or 0 if not.	-
Dummy Central FSP (DCENTR)	Dummy variable can either take the value of 1 if the project is located in the Central Free State or 0 if not.	+
Dummy Northern FSP (DNORTH)	Dummy variable can either take the value of 1 if the project is located in the Northern Free State or 0 if not	+

### 5.3 Results

Table 10 gives the results of the analysis. The model explains at 84 % of the variation in the dependant variable. The Durbin-Watson test was within reasonable range. The Augmented Dickey Fuller test was conducted and the

data was found to be stationary. The White Heteroskedasticity Test was conducted and the model was found to be free of heteroskedasticity. The model is also free of Autocorrelation.

As indicated in the previous section the expected sign for the grazing capacity variable (LAU) is negative. This is because a low value (hectares per animals) indicates that fewer hectares are necessary to feed the same or more animals, which is indicative of good grazing potential and hence the expectation that it will fetch higher prices. However, the results for LAU yielded a positive sign and were highly significant. This was unexpected and may be indicative that LRAD transactions used for this analysis did not appropriately incorporate the grazing capacity of the land. One can postulate that transactions rather considered the availability of land than attempting to get access to specific resources. This practice holds serious implications for the sustainability of livestock projects since grazing is the primary resource of feed.

**Table 5.2: Results of the hedonic price analysis**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.989941	1.261979	1.576841	0.1229
CG	0.340240	0.219244	1.551879	0.1288
INFLATION	-0.264238	0.279506	-0.945376	0.3503
INTEREST	0.232628	0.977833	0.237902	0.8132
LAU	<b>1.296275</b>	0.466760	2.777179	<b>0.0084*</b>
LCC	-0.543752	0.357802	-1.519701	0.1367
MAIZE	-0.012613	0.050465	-0.249936	0.8039
WHEAT	-0.007946	0.047489	-0.167332	0.8680
SUN	0.046948	0.039407	1.191373	0.2407
RENT	<b>0.446396</b>	0.186288	2.396268	<b>0.0215**</b>
SIZE	<b>-0.513446</b>	0.091032	-5.640263	<b>0.0000*</b>
DUMMYCENTRAL	<b>0.240440</b>	0.108565	2.214712	<b>0.0327**</b>
DUMMYNORTHERN	0.131476	0.134857	0.974924	0.3356
DUMMYCROPS	<b>0.367951</b>	0.175709	2.094090	<b>0.0428**</b>
R-squared	<b>0.842792</b>	Durbin-Watson stat		<b>1.863683</b>
Adjusted R-squared	<b>0.790389</b>	F-statistic		<b>16.08294</b>

n = 53; \* = significant at 1%; \*\* = significant at 5%

The RENT variable that relates to the availability of resources and the potential income it can generate has the expected sign and was highly significant. This was as expected since rental rates are good proxies for the



productive value of land. The significance of this variable also indicates that the micro-attributes of the land have a definite impact on the price paid for land. The fact that the LCC variable is not significant, even at the 10% level, confirms that judging the potential of land on an aggregate level is not the optimal methodology to link farm prices to the potential income the farm can generate. From this analysis, rental values of land will serve this purpose much better.

The size variable was also highly significant with a negative sign; this is as expected since there is an inverse relationship between unit price of farmland and size of farmland. According to the model, if farmland size changes by 1%, the price per hectare will change by 0.5 %.

The results confirm that land prices in the central region are much higher than in other regions. This could be explained by the proximity of the land to the major centre for economic activity, namely Bloemfontein, and the relative ease of access to major transport routes and other infrastructure.

The dummy variable for crops also has the expected sign and is highly significant. This is indicative that cropland fetches higher prices than grazing land, possibly due to the expected higher income cropland can generate. Interesting to note is that the individual crop variables were insignificant but this is probably due to the nature of the data used; i.e. district average yields that did not vary much from the long-term average.

## CHAPTER 6

### CONCLUSIONS AND RECOMMENDATIONS

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#### 6.1 Introduction

There is 100.6 million hectares of agricultural land in South Africa (excluding former homelands), of which approximately 13.7% has enough rainfall to be considered arable for farming; the remainder is used extensively for grazing (68.6%), forestry (1.2%) and nature conservation (9.6%). 7.8% of the arable land is under irrigation. The passing of various Acts since 1913 segregated the population in terms of business and residential rights (Wellington, 2003). These Acts restricted the area of land for lawful African occupation, and stripped African cash tenants and sharecroppers of their land and consequently replaced sharecropping and rent-tenant contracts with labour tenancy. In 1996, less than 1% of the population owned and controlled over 80% of farmland with white farmers owning 85.5 million hectares of farmland. Consequently, whites own six times more land in terms of quantity and quality.

The demand for land as an economic asset represents a source of identity and a symbol of citizenship in South Africa. This symbol has become an important factor, guiding policy development. South Africa's current ownership and use of agricultural land is the inevitable outcome of decades of policies favouring white commercial farmers. Historically, land reform worldwide has most often been made possible only after significant social upheaval caused by revolution, the overthrow of colonial powers, or war. Within the contexts of the land reform challenges worldwide it is important to take cognisance of different approaches that can be followed. According to Borras (2003) either state-led or market-led approaches can be followed to implement land reform. Theoretically, state-led land reform causes increased inefficiencies and unnecessary costs. These include, amongst others, low level of transparency and accountability, centralized extension services, legally contentious

processes, aggravated land market distortions with higher land prices and no exit options. These inefficiencies inevitably lead to low credit supply, low investment and high cost of land reform. Borras (2003) indicated that market-led land reform can overcome most of these economic inefficiencies. However, market-led reform has some problems of its own. These problems include land becoming unaffordable since market prices exceed the agronomic value of land, slow pace of transfer resulting in little land being transferred and few landless families benefiting from the policy (Riedinger *et al.*, 2000). Such problems can however be overcome through proper monitoring, efficient institutions and properly functioning public-private partnerships. It is clear that not all of the reform approaches are in fact as efficient as it was hoped they would be.

Examples of land reform reviewed in this study include Zimbabwe, Colombia, India and Brazil. In Zimbabwe the failure of land reform was caused by among other land being broken up into smaller tracts, destroying the economies of scale, giving it to former farm workers and peasants, who had little knowledge of how to run the farms efficiently or raise productivity. Further, the refusal of banks to lend them money has limited their ability to purchase equipment or otherwise raise capital. As a result, the drop in total farm output has been tremendous and produced widespread claims by aid agencies of starvation and famine.

In the case of India, ownership and control of land was highly concentrated in the hands of a few landlords whose main intention was to get maximum rent from their tenants. Under this arrangement, the tenant farmer had little economic motivation to develop farmland for increased production (because they would not make any money out of it). At the same time, the landlord was not particularly concerned about improving the economic condition of the farmers (because the landowner would lose money). As a result, agricultural productivity suffered and the tenants' situation deteriorated. Rich landowners often have powerful political friends, whereas the powerless poor often cannot get their voices heard. As a result, land is mostly for the urban, educated elite, which has become more a matter for housing, investment and building

infrastructure. The idea of land as a basis of livelihood – for subsistence, survival, social justice and human dignity has largely been lost, so the poor become even poorer (Sethi, 2006).

Colombia and Brazil had similar difficulties. Landlords were supportive of the programme but manipulated local governments and social elites causing little transparency and no accountability. Land prices were excessively overpriced in Colombia, while in Brazil prices decreased by up to 60%. In both countries financial support where either not sufficient or failed to achieve the objectives set by policy. Extension support in Colombia and Brazil was futile from both government and private sector resulting in a slow pace of development and no exit options.

In South Africa, LRAD was introduced as the primary programme to drive the process of redistribution and land reform to previously disadvantaged individuals. LRAD embraces a demand driven approach to land reform which theoretically causes the least distortions in the market thus being the most efficient approach to reform. Currently, there is a combination of the market-led and state-led approaches in South Africa. According to Coetzee & Jooste (2004) the performance of the LRAD programme was poor due to vague objectives, lack of capacity in the DLA, lack of information and optimistic business plans ignoring the realities of low returns on investment, which are all responsibilities associated with the government institutions. The result is conflict in underlying principles of equity and efficiency, socialism and capitalism. Addressing the underlying conflict gives rise to slow delivery in terms of land reform and consequently frustration in both public and private sectors.

Taking the five lessons learned in international experiences of land reform, discussed in Chapter 2 and comparing it against the South African experience provided some potent arguments that pointed out that there are serious problems surrounding the progress of land reform in South Africa (Christiansen, 1996):

- The speed of implementation of the programme;
- Economic viability of the farm models;
- Political acceptability and legitimacy of the programme;
- Clear definition of the role that the public sector can and will play; and
- Land reform is only one part of a comprehensive programme of economic reconstruction.

Meaningful progress to empower previously disadvantaged communities in primary agriculture will have to take into account productivity differences in resources as well as the value of such resources since the transformation target specifies not only 30% of agricultural land, but 30% of medium to high potential white owned agricultural land. The lack of complete and reliable data on land use and potential makes it difficult to assess the availability of land in South Africa's white commercial sector (Van Zyl, *et al*, 1996). However, it is known that very little information currently exists on the relative distribution of resources used in agriculture. Thus, the need to also identify different sources that are available that record transactions relating to land reform and an in-depth look at the usability of such information. The lack of this type of information is not conducive to efficient policy development and implementation of land reform at national and provincial level. If this shortcoming is not adequately addressed the outcome of land reform could potentially bring about even more challenging problems than those of the current situation, at great cost to society.

Given the aforementioned background this study focussed on examining potential approaches that can be followed to determine whether land is equitably and fairly distributed.

## **6.2 Data sources and land uses in the Free State Province**

Chapter 2 focused on the establishment of a price criterion into categories to evaluate value trends when linked to agro-ecological characteristics of land. These characteristics were subdivided into physical and biological factors,

which were tested against the price criterion. It was hypothesised that the profitability of land influences the value of land; thus the uses of land were also tested against the price criterion.

### ***6.2.1 Agro-ecological delineation with TARLV***

Transacted values from the Deeds Office provided no indication of the imbedded values of farmland upon change of ownership, nor did they shed any light on differentiators. An independent analysis of land value trends per various size categories was conducted for each district in the FSP. Size was the only differentiation that was made, and no further breakdown of factors or elements influencing price was obtained from the Deeds Office (Deeds Office, 2005). Subsequently, the apparent correlation between agro-ecological variables, land capability and TARLV was tested, but no clear correlation was found. This calls into question the usability of Deeds Office data to explain the differences in land values between different administrative districts, other than explaining that smaller plots of land are more expensive than larger plots of land. In addition, it said nothing about price differences in an administrative district.

### ***6.2.2 Land use possibilities and TARLV categories***

Production capability with sound management (assumption of this approach) is simulated on a macro scale. If more detailed information is available for fields/farms etc., the same methodology can be applied to determine the viability of crop production on a smaller scale. In the decision-making process it is of the utmost importance to determine the net income over time, taking into account the input cost and price of the commodity. This should be reflected in the value of land over time. From the analysis it was clear that crop and animal stocking potential measured in broad terms does not correlate to the broad categories of TARLV as calculated from Deeds Office data. The evaluation therefore rendered cropping potential a real threat when generalising land values as obtained from the Deeds Office and linking these to cropping and stocking potential. There appeared to be a myriad of other



complex issues at play when land values are determined, and these will have to be assessed at a micro level per district.

### **6.2.3 *Land Affairs and LRAD analysis***

Very little correlation was recognisable between prices paid for land and the physical and biological factors at a macro level, raising questions about the role played by resource characteristics on a macro level in the process of price discovery. Other factors that were evaluated, such as number of transfers, number of beneficiaries and the amount of grant acquired, rendered no conclusive explanation for the price pattern as interpreted by the Land Affairs Offices. There was therefore still a need to compare the interpretation of FSP land value with the other available data sources, e.g. Land Bank that considers resource potential at a more micro level.

### **6.2.4 *Land Bank analysis***

The comparison of the different data sources, namely Deeds Office, Land Bank and Land Affairs, in order to determine the different interpretations of land values in the FSP yielded contradictory results. A correlation analysis was done to statistically compare the different sources. There was very little correlation between Deeds Office and LRAD prices per hectare. Similarly low correlation results were observed with the Land Bank data and the interpretation of productive value in the FSP as determined by real transactions. Better correlation could be seen between the Land Bank values and the transacted values recorded by the Deeds Office, which tested significant at a 1% level. This was expected since the Deeds Office records all transactions, including Land Bank transactions.

The insignificant correlation and contradictory land prices of the LRAD projects could be explained by the sale of highly intensive farms, such as broiler and vegetable farms, which could have an enormous effect on a district's average price if there were more abnormal transactions in the area

than normal transactions. The low correlation was explained by the fact that there are too few comparable LRAD transactions against which the other institutions data could be evaluated.

### **6.3 Alternative approach**

The generalisation used in the Chapter 3 – average price per hectare across a district – did not always accurately represent the resources for a specific farm. An alternative method was used to address this problem by précis determination of a project's location making use of the dedicated surveyor general's 21-digit code (SG 21-digit code) and GIS technology. By combining RHFA information with the précis location of a LRAD project, using the 21-digit code, narrowed down the resources present in a area

#### ***6.3.1 Reasonably Homogenous Farming Area (RHFA)***

The 21-digit approach proved to be helpful to some extent to identify LRAD projects, but it was found that this approach also rely on broad generalisations. Aerial photographs can be used to examine farm resources, making it possible to see features like erosion, soil improvements, water availability and vegetation cover. Some infrastructure could also be identified, but the state of the infrastructure cannot be investigated with this approach. The introduction of the RHFA concept proved helpful in the process of breaking down resources to farm level. Within an RHFA, dominant resources like soil depth, grazing capacity, rainfall, soil types and slopes could be identified, which provided a more comprehensive breakdown of resources in a region at farm level.

Comparisons were drawn between the proposed production activities that could be practised on the projects, as stated in the business plans for the projects. This made it possible to compare transaction prices with resource valuations by SenWes, ABSA and Free State Agriculture. Combining 21-digit codes, resource region valuations and RHFA proved that there was no pattern

of only lower quality land being transferred; in fact the majority of projects that were implemented in the five districts evaluated fell within medium to high potential land, in comparison to the surrounding area. The Renosterrivier region (Northern Free State) falls within the region previously known as the Highveldt region which had RHFA information available for the analysis. The projects in the Renosterrivier region were randomly scattered across the districts and resource regions. In some cases the transacted price could be explained by the presence of high-quality resources in the area, for instance an abundance of water or deep soil types, but in some cases no explanation could be found for higher transacted prices except speculation of intensive infrastructure being present on the farm. In most cases the transacted land prices were either in line with or below the SenWes, ABSA and Free State Agriculture valuations, allowing one to conclude that in this region little overpricing occurred. It became clear that no single pattern of transaction characteristics determined prices. Incompleteness of the records once again restricted the evaluation. There is clearly a need for a single records system to record all the relevant aspects of LRAD transactions.

#### **6.4 Hedonic pricing model**

Information regarding land reform in the FSP is very limited and not freely available, which made it difficult to investigate the progress that has been made. Up to this point none of the previous approaches gave conclusive results as to which characteristics determine and influence the price of land under LRAD. These problems and shortcomings of the data available to measure the progress made in redistribution of land and resources led to the development of a hedonic pricing model that attempted to isolate the transaction characteristics that have the most significant impact on the price paid for land under LRAD. The independent variables included in the model were: size, rent, capital improvements, grazing capacity, inflation, interest and land capability.

### 6.4.1 Results

- Grazing capacity variable (LAU) yielded a positive sign and was highly significant. This was unexpected since a low value (hectares per animals) indicates that fewer hectares are necessary to feed the same or more animals, which is indicative of good grazing potential and hence the expectation that it will fetch higher prices. This indicated that LRAD transactions used for this analysis did not appropriately incorporate the grazing capacity of the land. This practice holds serious implications for the sustainability of livestock projects since grazing is the primary resource of feed.
- The RENT variable had the expected sign and was highly significant. This was as expected since rental rates are good proxies for the productive value of land. The significance of this variable also indicates that the micro-attributes of the land have a definite impact on the price paid for land.
- The LCC variable was not significant, even at the 10% level, confirming that judging the potential of land on an aggregate level is not the optimal methodology to link farm prices to the potential income the farm can generate. Rental values of land serves this purpose much better.
- The size variable was highly significant with a negative sign; this was as expected since there is an inverse relationship between unit price of farmland and size of farmland. According to the model, if farmland size changes by 1%, the price per hectare will change by 0.5 %.
- Land prices in the central region were much higher than in other regions. This could be explained by the proximity of the land to the major centre for economic activity, namely Bloemfontein, and the relative ease of access to major transport routes and other infrastructure.

- The dummy variable for crops had the expected sign and was highly significant. This was indicative that cropland fetches higher prices than grazing land, possibly due to the expected higher income cropland could generate.

## 6.5 Conclusions

The land reform process forms part of a focused effort to restore and redress past imbalances in land ownership and to create access to land and economic opportunities for previously disadvantaged people in agriculture. Given the political and social sensitive nature of this endeavour, as well as the specific goals set by government to address historical injustices it is vitally important that the exact nature and progress of the land reform process can be quantified. This will provide valuable guidelines to national, as well as provincial governmental organs to monitor the process and design programmes to ensure efficient and timely delivery of land reform objectives. This study argues that the potential of the land that are transferred should also be accounted for.

This study shows that not only are the targets far from being met, but that there are currently no proper systems in place to monitor the ongoing process of land reform in the FSP (it could be hypothesized that this is also the case in the other provinces of South Africa). There are no apparent correlation between land prices and the potential of the resources in the FSP when investigated on an aggregate level. There is also a poor correlation between different sources that provide information on land prices. This situation renders it very difficult to make specific conclusions on the equity in natural resource use. The hedonic model focusing on LRAD projects in the FSP shows that Rent, Size, Location of the land and the Type of enterprise significantly affected the price paid for land. The analysis also reveals that the current information on Land Capability is not optimally suited to link farm prices to the potential income the farm can generate. Rental values of land will serve this purpose much better. The results obtained from this study

provided no evidence that land transferred were only in areas of low quality resources nor that such land was overpriced.

## **6.6 Recommendations**

- Resource audits needs to be compiled to such detail equalling and improving the information received from the RHFA. These audits should give a qualitative value to land.
  
- A proper record system needs to be developed recording all land reform transactions, gathering the relevant information regarding land potential and land use post transfer. Neglecting to do the aforementioned could result in incorrect policy recommendations.

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## Appendix A:

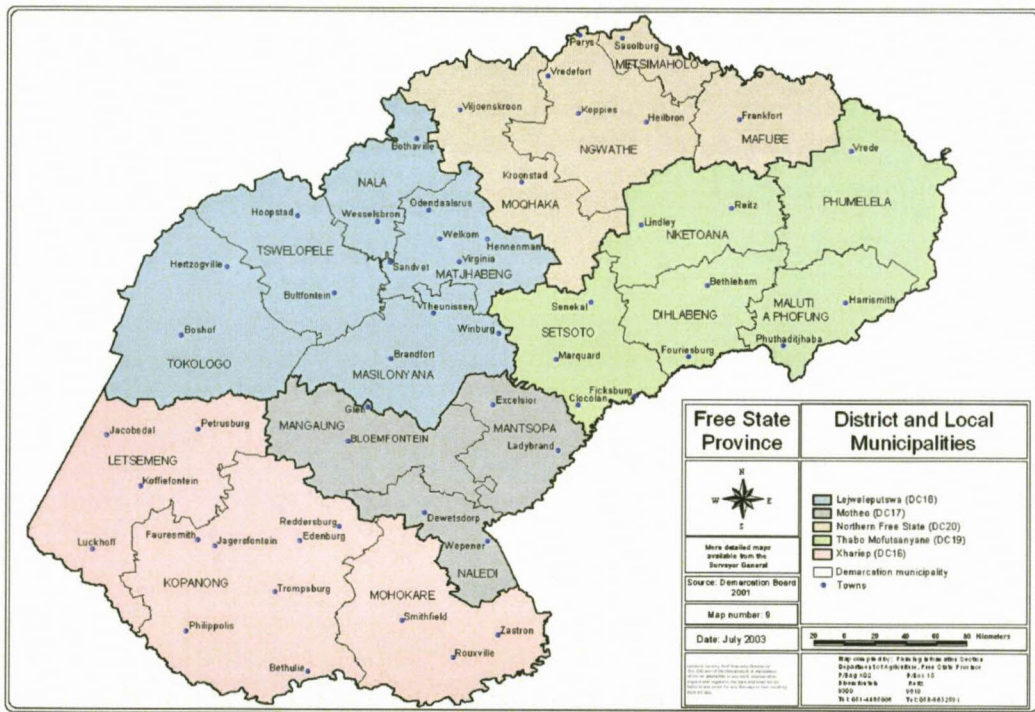
**Table A1: Conversion from Managerial Districts to Administrative Districts**

Managerial Distr →	Admin Distr	Managerial Distr →	Admin Distr
BETHLEHEM	BETHLEHEM	MARQUARD	MARQUARD
KRANSFONTEIN	BETHLEHEM	ALLANRIDGE	ODENDAALSRUS
KESTELL	BETHLEHEM	ODENDAALSRUS	ODENDAALSRUS
CLARENS	BETHLEHEM	KUTLWANONG	ODENDAALSRUS
SPRINGFONTEIN	BETHULIE	PARYS	PARYS
BETHULIE	BETHULIE	PETRUSBURG	PETRUSBURG
BLOEMFONTEIN	BLOEMFONTEIN	PHILIPPOLIS	PHILIPPOLIS
DE BRUG	BLOEMFONTEIN	DONKERPOORT	PHILIPPOLIS
GLEN	BLOEMFONTEIN	ORANJEKRAAG	PHILIPPOLIS
KAFFERRIVIER	BLOEMFONTEIN	REDDERSBURG	REDDERSBURG
HERTZOGVILLE	BOSHOF	REITZ	REITZ
BOSHOF	BOSHOF	KRUISPAD	REITZ
DEALESVILLE	BOSHOF	ROUXVILLE	ROUXVILLE
BOTHAVILLE	BOTHAVILLE	SASOLBURG	SASOLBURG
SOUTPAN	BRANDFORT	COALBROOK	SASOLBURG
FLORISBAD	BRANDFORT	WOLWEHOEK	SASOLBURG
BRANDFORT	BRANDFORT	CLYDESDALE	SASOLBURG
VERKEERDEVLEI	BRANDFORT	DENEYSVILLE	SASOLBURG
BULTFONTEIN	BULTFONTEIN	SENEKAL	SENEKAL
CLOCOLAN	CLOCOLAN	RIETSPRUIT	SENEKAL
DEWETSDORP	DEWETSDORP	PAUL ROUX	SENEKAL
EDENBURG	EDENBURG	HIBERNIA	SENEKAL
EXELSIOR	EXELSIOR	SMITHFIELD	SMITHFIELD
TWEESPRUIT	EXELSIOR	TABA-NCHU	THABA 'NCHU
LUCKHOFF	FAURESMITH	MORAKGO	THABA 'NCHU
FAURESMITH	FAURESMITH	SPITSKOP	THABA 'NCHU
FICKSBURG	FICKSBURG	SEDIBA	THABA 'NCHU
ROSENDAL	FICKSBURG	ROOIFONTEIN	THABA 'NCHU
HARMONIA	FICKSBURG	MAROTO	THABA 'NCHU
FOURIESBURG	FOURIESBURG	TABANE	THABA 'NCHU
VILLIERS	FRANKFORT	KOMMISSIEDRIF	THABA 'NCHU
FRANKFORT	FRANKFORT	GLADSTONE	THABA 'NCHU
TWEELING	FRANKFORT	YOXFORD	THABA 'NCHU
HARRISMITH	HARRISMITH	BARCLAVAR	THABA 'NCHU
WARDEN	HARRISMITH	RIETFONTEIN	THABA 'NCHU
ABERFELDY	HARRISMITH	KLIFFONTEIN	THABA 'NCHU
VERKYKERSKOP	HARRISMITH	THERON	THEUNISSEN
SWINBURNE	HARRISMITH	THEUNISSEN	THEUNISSEN
VAN REENEN	HARRISMITH	TROMPSBURG	TROMPSBURG
HEILBRON	HEILBRON	VENTERSBURG	VENTERSBURG
ORANJEVILLE	HEILBRON	VILJOENSKROON	VILJOENSKROON
WHITES	HENNENMAN	VIRGINIA	VIRGINIA
HENNEMAN	HENNENMAN	VREDE	VREDE
HOOPSTAD	HOOPSTAD	CORNELIA	VREDE
JACOBSDAL	JACOBSDAL	ROADSIDE	VREDE
JAGERSFONTEIN	JAGERSFONTEIN	STEELS DRIFT	VREDE

Managerial Distr →	Admin Distr	Managerial Distr →	Admin Distr
CHARLESVILLE	JAGERSFONTEIN	MEMEL	VREDE
KOPPIES	KOPPIES	VREDEFORT	VREDEFORT
KROONSTAD	KROONSTAD	WELKOM	WELKOM
EDENVILLE	KROONSTAD	RIEBEECKSTAD	WELKOM
LADYBRAND	LADYBRAND	DRIE KOP	WEPENER
MODDERPOORT	LADYBRAND	WEPENER	WEPENER
MARSEILLES	LADYBRAND	VAN STADENSUS	WEPENER
THABA PHATSHWA	LADYBRAND	WESSELSBRON	WESSELSBRON
KOMMISSIEPOORT	LADYBRAND	ALDAM	WINBURG
HOBHOUSE	LADYBRAND	WINBURG	WINBURG
STEYNSRUS	LINDLEY	WITSIESHOEK	WITSIESHOEK
LINDLEY	LINDLEY	PHUTHADITHABA	WITSIESHOEK
ARLINGTON	LINDLEY	ZASTRON	ZASTRON
PETRUS STEYN	LINDLEY		

## Appendix B

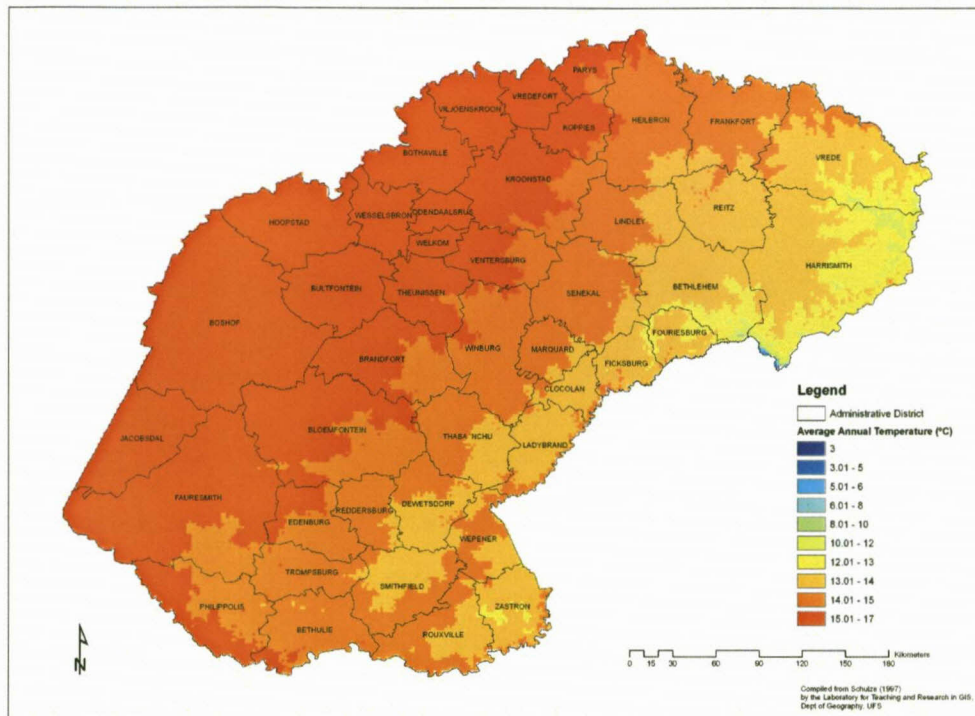
The Free State Province consists of 5 district municipalities: Xhariep (DC16), Motheo (DC17), Lejweleputswa (DC18), Thabo Mofutsayane (DC19) and Northern Free State (DC20). These district municipalities are subdivided into administrative municipalities, local municipalities and also into magisterial municipalities.



**Figure B1: District municipalities of the Free State**

Source: Department of Agriculture, Free State (2003)

## Appendix C



**Figure C1: Average temperature in the Free State**

Source: Centre for research and Geography, UFS (2006)

## Appendix D

**Table D.1: Delineation of capability classes**

CLASS	DESCRIPTION
I	❖ Land in this class has few limitations that restrict its use
II	<ul style="list-style-type: none"> <li>❖ It may be used for cultivated crops, but with less latitude in the choice of crops or management practices than Class I.</li> <li>❖ The limitations are few and the practices are easy to apply.</li> <li>❖ Limitations may include singly or in combination the effects of:               <ul style="list-style-type: none"> <li>➤ Gentle slopes.</li> <li>➤ Moderate susceptibility to wind and water erosion.</li> <li>➤ Less than ideal soil depth.</li> <li>➤ Somewhat unfavourable soil structure and workability.</li> <li>➤ Slight to moderate salinity or solidity easily corrected but likely to recur.</li> <li>➤ Occasional damaging flooding..</li> </ul> </li> <li>❖ Wetness correctable by drainage but existing permanently as a moderate limitation.</li> <li>❖ Slight climatic limitations on soil use and management</li> </ul>
III	<ul style="list-style-type: none"> <li>❖ Land in this class has severe limitations that reduce the choice of plants or require special conservation practices, or both. It may be used for cultivated crops, but has more restrictions than Class II. When used for cultivated crops, the conservation practices are usually more difficult to apply and to maintain.</li> <li>❖ Limitations may result from the effects of one or more of the following:               <ul style="list-style-type: none"> <li>➤ Moderately steep slopes.</li> <li>➤ High susceptibility to water or wind erosion or severe adverse effects of past erosion.</li> <li>➤ Frequent flooding accompanied by some crop damage.</li> <li>➤ Very slow permeability of the subsoil.</li> <li>➤ Wetness or some continuing waterlogging after drainage.</li> <li>➤ Shallow soil depth to bedrock, hardpan, fragipan or claypan that limit the rooting zone and the water storage.</li> <li>➤ Low water-holding capacity.</li> <li>➤ Low fertility not easily corrected.</li> <li>➤ Moderate salinity or solidity.</li> </ul> </li> <li>❖ Moderate climatic limitations.</li> </ul>

CLASS	DESCRIPTION
IV	<ul style="list-style-type: none"> <li>❖ Land in this class has very severe limitations that restrict the choice of plants, require very careful management, or both.</li> <li>❖ Restrictions to land use are greater than those in this class and the choice of plants is more limited.</li> <li>❖ It may be well suited to only two or three of the common crops or the harvest produced may be low in relation to inputs over long period of time.</li> </ul>
V	<ul style="list-style-type: none"> <li>❖ Land in this class has little or no erosion hazard but have other limitations impractical to remove that limit its use largely to pasture, range, woodland or wildlife food and cover. These limitations restrict the kind of plants that can be grown and prevent normal tillage of cultivated crops. Pastures can be improved and benefits from proper management can be expected.</li> </ul>
VI	<ul style="list-style-type: none"> <li>❖ Land in this class has severe limitations that make it generally unsuited to cultivation and limit its use largely to pasture and range, woodland or wildlife food and cover.</li> </ul>
VII	<ul style="list-style-type: none"> <li>❖ Land in this class has very severe limitations that makes it unsuited to cultivation and that restrict its use largely to grazing, woodland or wildlife.</li> <li>❖ Restrictions are more severe than those for Class VI because of one or more continuing limitations that cannot be corrected, such as: <ul style="list-style-type: none"> <li>➤ Very steep slopes.</li> <li>➤ Erosion.</li> <li>➤ Shallow soil.</li> <li>➤ Stones.</li> <li>➤ Wet soil.</li> <li>➤ Salts or sodicity.</li> <li>➤ Unfavourable climate.</li> </ul> </li> </ul>
VIII	<ul style="list-style-type: none"> <li>❖ Land in this class has limitations that preclude its use for commercial plant production and restrict its use to recreation, wildlife, water supply or aesthetic purposes.</li> </ul>

Source: ARC



## Appendix E

Table E.1: Average real prices of land per district as calculated from Deeds Office data

District	Average Real prices from 1993 – 2003 (R/ha)	Category	District	Average Real prices from 1993 – 2003 (R/ha)	Category
Phillippolis RD	372.12	1	Fouriesburg RD	1004.42	4
Trompsburg RD	392.12	1	Lindley RD	1013.48	4
Bethulie RD	415.56	1	Welkom RD	1087.25	4
Fauresmith RD	485.01	1	Kroonstad RD	1112.36	4
Smithfield RD	496.98	1	Ventersburg RD	1141.97	4
Reddersburg RD	507.22	2	Heilbron RD	1152.95	4
Zastron RD	510.00	2	Ficksburg RD	1157.54	4
Edenburg RD	534.85	2	Frankfort RD	1184.19	4
Rouxville RD	570.65	2	Bloemfontein RD	1190.86	4
Wepener RD	612.70	2	Clocolaan RD	1191.33	4
Dewetsdorp RD	630.76	2	Bultfontein RD	1219.79	4
Boshof RD	707.43	2	Reitz RD	1242.51	5
Jacobsdal RD	736.76	2	Koppies RD	1299.67	5
Ladybrand RD	835.74	3	Bethlehem RD	1313.89	5
Winburg RD	843.54	3	Theunissen RD	1347.05	5
Thaba'Nchu RD	855.14	3	Hoopstad RD	1410.97	5
Senekal RD	856.37	3	Odendaalsrus RD	1414.50	5
Brandfort RD	875.77	3	Vredefort RD	1512.33	6
Vrede RD	949.67	3	Wesselsbron RD	1544.70	6
Harrismith RD	960.15	3	Viljoenskroon RD	1723.96	6
Marquard RD	994.78	3	Bothaville RD	1752.22	7
			Parys RD	1837.96	7

## Appendix F

**Table F.1: Land Bank price per hectare**

Districts	Average P/ha (Real 2000=100)	Districts	Average P/ha (Real 2000=100)
Bethlehem	2831.88	Ladybrand	2259.21
Bloemfontein	1766.25	Lindley	816.17
Boshof	1102.17	Marquard	900.29
Bothaville	3395.11	Odendaalsrus	1519.97
Brandfort	1375.25	Petrusburg	679.34
Bultfontein	2408.48	Philippolis	825.45
Clocolan	919.34	Reddersburg	1192.37
Dewetsdorp	1157.89	Reitz	1111.91
Edenburg	1222.02	Rouxville	1093.54
Excelsior	1468.64	Sasolburg	666.5
Fauresmith	793.79	Senekal	1430.75
Ficksburg	718.95	Smithfield	1277.95
Frankfort	1232.77	Thaba-Nchu	1817.45
Harrismith	1213.67	Trombsburg	1015.17
Heilbron	1284.59	Ventersburg	1191.53
Hoopstad	3065.93	Viljoenskroon	2259.79
Jagersfontein	909.05	Vrede	1315.88
Koffiefontein	1346.82	Wesselsbron	1718.63
Koppies	1295.46	Zastron	1269.11
Kroonstad	1605.74		

**Table F.2: Productive value of land**

District	Average prod value per ha	District	Average prod value per ha
Bethlehem	1778.34	Petrusburg	317.95
Bloemfontein	522.40	Philippolis	294.29
Boshof	504.67	Reddersburg	499.67
Bothaville	1418.56	Reitz	595.51
Brandfort	558.01	Rouxville	429.98
Bultfontein	742.73	Sasolburg	632.77
Clocolan	573.83	Senekal	567.13
Dewetsdorp	425.18	Smithfield	608.86
Edenburg	520.42	Thaba-Nchu	428.57
Excelsior	525.57	Trombsburg	401.31
Fauresmith	398.86	Ventersburg	606.53
Ficksburg	451.82	Viljoenskroon	1184.52
Frankfort	646.55	Vrede	611.47
Harrismith	453.77	Wesselsbron	851.06

District	Average prod value per ha	District	Average prod value per ha
Heilbron	625.00	Zastron	538.46
Hoopstad	1505.47	Theunissen	No information available
Jagersfontein	385.85	Virginia	No information available
Koffiefontein	483.19	Wepener	No information available
Koppies	766.51	Welkom	No information available
Kroonstad	732.57	Vredefort	No information available
Ladybrand	1013.70	Witsieshoek	No information available
Lindley	531.25	Winburg	No information available
Marquard	619.60	Bethulie	No information available
Odendaalsrus	559.14		

## Appendix G

**Table G.1: LRAD average price per hectare**

District	Average P/ha (Real 2000=100)	District	Average P/ha (Real 2000=100)
Bethlehem	757.29	Marquard	2948.44
Bethulie	5597.78	Odendaalsrus	375.66
Bloemfontein	1110.66	Parys	1745.96
Boshof	167.70	Petrusburg	827.54
Bothaville	700.93	Philippolis	5479.47
Brandfort	0	Witsieshoek	290.62
Bultfontein	14530.30	Reddersburg	0
Dewetsdorp	605.58	Reitz	790.84
Edenburg	419.59	Rouxville	462.78
Fauresmith	373.51	Sasolburg	0
Ficksburg	536.34	Senekal	1756.65
Fouriesburg	724.68	Thaba 'Nchu	633.47
Frankfort	948.66	Theunissen	5977.51
Harrismith	666.40	Trombsburg	198.00
Heilbron	1643.34	Ventersburg	2059.28
Jacobsdal	0	Viljoenskroon	0
Jagersfontein	2063.22	Vrede	888.33
Koppies	665.84	Wepener	4180.73
Kroonstad	1230.31	Wesselsbron	0
Ladybrand	953.03	Winburg	833.23
Lindley	908.18	Zastron	634.62

**Table G.2: Transfers per district**

Districts	Total transfers per district	Districts	Total transfers per district
Bethlehem	13	Marquard	3
Bethulie	5	Odendaalsrus	4
Bloemfontein	99	Parys	5
Boshof	1	Petrusburg	8
Bothaville	4	Philippolis	7
Brandfort	4	Witsieshoek	4
Bultfontein	2	Reddersburg	1
Dewetsdorp	7	Reitz	7
Edenburg	2	Rouxville	1
Fauresmith	1	Sasolburg	1
Ficksburg	3	Senekal	17
Fouriesburg	12	Thaba 'Nchu	21
Frankfort	4	Theunissen	4

Districts	Total transfers per district	Districts	Total transfers per district
Harrismith	52	Trombsburg	1
Heilbron	7	Ventersburg	4
Jacobsdal	1	Viljoenskroon	1
Jagersfontein	2	Vrede	4
Koppies	7	Wepener	1
Kroonstad	19	Wesselsbron	1
Ladybrand	28	Windburg	2
Lindley	14	Zastron	9

**Table G3: Beneficiaries per project**

Districts	Beneficiaries per project	Districts	Beneficiaries per project
Bethlehem	18	Marquard	6
Bethulie	7	Odendaalsrus	390
Bloemfontein	5	Parys	103
Boshof	14	Petrusburg	7
Bothaville	55	Philippolis	12
Brandfort	38	Witsieshoek	3
Bultfontein	24	Reddersburg	10
Dewetsdorp	84	Reitz	5
Edenburg	3	Rouxville	11
Fauresmith	7	Sasolburg	6
Ficksburg	21	Senekal	14
Fouriesburg	10	Thaba 'Nchu	17
Frankfort	532	Theunissen	7
Harrismith	9	Trombsburg	5
Heilbron	98	Ventersburg	883
Jacobsdal	6	Viljoenskroon	7
Jagersfontein	9	Vrede	9
Koppies	30	Wepener	84
Kroonstad	313	Wesselsbron	0
Ladybrand	10	Winburg	9
Lindley	23	Zastron	106

**Table G4: Grant per beneficiary**

District	Beneficiaries	Grant	Grant per beneficiary
Bethlehem	79	R 5,223,334.00	R 66,118.15
Bethulie	35	R 868,254.00	R 24,807.26
Bloemfontein	455	R 21,631,369.00	R 47,541.47
Boshof	14	R 569,149.00	R 40,653.50
Bothaville	220	R 2,475,613.00	R11,252.79
Brandfort	152	R 1,311,064.00	R 8,625.42

District	Beneficiaries	Grant	Grant per beneficiary
Bultfontein	47	R 2,043,830.00	R 43,485.74
Dewetsdorp	589	R 7,258,082.00	R 12,322.72
Edenburg	6	R 243,457.00	R40,576.17
Fauresmith	7	R 144,861.00	R 20,694.43
Ficksburg	64	R2,230,736.00	R 34,855.25
Fouriesburg	122	R 3,173,773.00	R26,014.53
Frankfort	2126	R1,929,863.00	R 907.74
Harrismith	194	R 6,358,445.00	R32,775.49
Heilbron	684	R2,650,627.00	R3,875.19
Jacobsdal	6	R 90,000.00	R15,000.00
Jagersfontein	18	R 395,520.00	R21,973.33
Koppies	207	R1,130,914.00	R 5,463.35
Kroonstad	530	R 8,914,691.00	R 16,820.17
Ladybrand	270	R 7,179,488.00	R26,590.70
Lindley	204	R 4,241,588.00	R 20,792.10
Marquard	17	R 315,999.00	R 18,588.18
Odendaalsrus	1559	R 6,131,638.00	R 3,933.06
Parys	516	R 4,646,369.00	R9,004.59
Petrusburg	52	R 983,290.00	R18,909.42
Philippolis	85	R 565,167.00	R 6,649.02
Reddersburg	10	R 553,203.00	R55,320.30
Reitz	38	R 1,285,152.00	R 33,819.79
Rouxville	11	R 409,663.00	R 37,242.09
Sasolburg	6	R152,503.00	R 25,417.17
Senekal	112	R4,147,528.00	R37,031.50
Thaba 'Nchu	260	R4,653,838.00	R17,899.38
Theunissen	28	R 1,103,981.00	R39,427.89
Trompsburg	5	R176,853.00	R 35,370.60
Ventersburg	3532	R 2,028,470.00	R574.31
Viljoenskroon	7	R 230,280.00	R32,897.14
Vrede	26	R 2,331,204.00	R89,661.69
Wepener	84	R 776,700.00	R 9,246.43
Wesselsbron	0	R 899,337.00	R -
Winburg	18	R 569,709.00	R 31,650.50
Witsieshoek	13	R 524,550.00	R 40,350.00
Zastron	958	R2,934,104.00	R3,062.74

Appendix H: Arial Photos









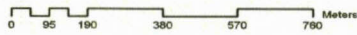


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**Legend**

 Farm boundary