ECONOMIC LITERACY AS A FACTOR AFFECTING ALLOCATIVE EFFICIENCY

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MASTER OF SCIENCE IN AGRICULTURAL ECONOMICS

In the

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DECLARATION

I Esté van der Merwe hereby declare that this dissertation submitted by me for the degree of Master of Science (M.Sc. Agric) Agricultural Economics, at the University of the Free State, is my own independent work and has not previously been submitted by me to any other university. I furthermore cede copyright of the dissertation in favour of the University of the Free State.

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"die werklikheid toets jou soms aan jou drome, om te kyk of jy die moed het om hulle in te haal..." **(Kringe in 'n bos)**

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ABSTRACT

The main objective of this study was to explore the relationship between economic literacy and allocative efficiency of small-scale producers in South Africa.

The study was conducted in Eksteenskuil, where small-scale producers export raisins via the fairtrade initiative. Data regarding production inputs and their relative prices was gathered by means of a structured questionnaire survey. The allocative efficiency of farmers was calculated by means of cost efficiency, using a mathematical linear programming technique called Data Envelopment Analysis (DEA). The inputs that were used to calculate the respondents' cost efficiency were fertiliser in the form of nitrogen, phosphate and potassium, labour, and fuel. It was hypothesised that economic literacy of individuals will have an effect on the ability of the producers to allocate their resources efficiently. The economic literacy of respondents was measured by means of proxy variables presented in the questionnaire. The economic literacy variables were regressed on cost efficiency by making use of the Tobit Regression Model since the dependent variable is bounded from above.

The results from the DEA showed substantial inefficiencies among the small-scale raisin producers of Eksteenskuil, indicating that a significant capacity for cost efficiency improvement exists. By improving cost efficiency of producers, profit of producers will also increase. Economic literacy of raisin producers was measured to be below average. The total economic literacy score of respondents was found not to have a significant effect on their cost efficiency. However, some of the individual proxies for economic literacy were found to influence cost efficiency. Economic literacy questions were divided into two groups. The applied economic concept group: where respondents needed to think about the question, exhibit knowledge and make a rational decision. And the comprehension economic concept group: where respondents' knowledge on economics surrounding their farms, was tested. Interestingly, only questions from the applied economic concept group were found to have a statistically significant effect on the cost efficiency of respondents. Socio-economic factors of respondents were further measured in order to understand the characteristics associated with higher economic literacy levels of respondents. The hypothesised socio-economic factors were regressed on the statistically significant economic literacy questions found in the Tobit Regression Model. A Probit Regression Model and an Ordinary Least Squares (OLS) Regression Model were used to determine the effect of socio-economic factors on specific economic literacy questions. Most of the factors that were statistically significant in influencing economic literacy, relate to activities

undertaken by the farmers to increase human capital. Other factors that were found to contribute to economic literacy, relate to farm specific factors like farm size and specialisation.

The results show that economic literacy does affect the decision-making ability of individuals when it comes to the allocation of production inputs. Cost inefficiencies can be improved by improving the economic literacy of respondents. One of the important ways to improve economic literacy of small-scale producers is by simplified, goal-oriented, practical training related to the individuals' specific farming practices.

Keywords: Allocative Efficiency, Cost Efficiency, Economic Literacy, Data Envelopment Analysis, Tobit Regression, Probit Regression, Ordinary Least Squares Regression.

OPSOMMING

Die hoofdoel van hierdie studie was om die verhouding tussen ekonomiese geletterdheid en allokasie doeltreffendheid van kleinskaalse produsente in Suid Afrika te verken.

Die studie is uitgevoer in Eksteenskuil, waar kleinskaalse produsente rosyne uitvoer via die fairtrade inisiatief. Data in verband met produksie insette en inset pryse, is deur middel van ‘n gestruktureerde vraelys ingesamel. Die allokasie doeltreffendheid van produsente is bereken deur die meet van koste doeltreffendheid, met behulp van ‘n wiskundige lineêre programmeringstegniek, wat Data Envelopment Analysis (DEA) genoem word. Die insette wat gebruik is om koste doeltreffendheid van produsente te bereken sluit kunsmis in die vorm van stikstof, fosfaat en kaluim, arbeid, en brandstof in. ‘n Hipotese is gevorm dat ekonomiese geletterdheid van produsente ‘n uitwerking sal hê op die vermoë van die produsente om hul hulpbronne doeltreffend te allokeer. Die ekonomiese geletterdheid van die produsente is deur middel van ‘n ekonomiese geletterdheid vraelys gemeet. Die effek wat die ekonomiese geletterdheid vrae op koste doeltreffendheid het, is gemeet deur van die Tobit Regressie Model gebruik te maak omdat die afhanklike veranderlike van bo begrens is.

Die DEA resultate het ‘n aansienklike koste-ondoeltreffendheid onder die kleinskaalse rosyntjie produsente van Eksteenskuil gevind. Dit dui aan dat daar ‘n beduidende kapasiteit vir koste doeltreffendheid verbeteringe bestaan. Deur die koste doeltreffendheid van produsente te verbeter sal die wins wat produsente maak ook toeneem. Die ekonomiese geletterdheid van rosyntjie produsente blyk onder gemiddeld te wees. Die totale ekonomiese geletterdheid telling van produsente is gevind om nie ‘n betekenisvolle uitwerking te hê op die koste doeltreffendheid waarmee hul produseer nie. Daar is egter gevind dat van die individuele ekonomiese geletterdheid vrae ‘n betekenisvolle uitwerking op die koste doeltreffendhied van produsente het. Die verskillende ekonomiese geletterdheid vrae is in twee groepe gedeel. Die eerste groep, die toegepaste ekonomiese konsep groep, vra dat produsente moes dink oor die vraag, kennis moes toon, en ‘n rasionele besluit moes neem. In die tweede groep, die begrip van ekonomiese konsepte groep, is hul kennis van ekonomiese konsepte, met betrekking tot hul plaas getoets. Slegs ekonomiese geletterdheid vrae uit die toegepaste ekonomiese konsep groep het ‘n betekenisvolle uitwerking op koste doeltreffendheid van produsente gehad. Sosio-ekonomiese faktore van die produsente is verder gemeet ten einde die eienskappe wat verband hou met ‘n hoër eknomiese geletterdheidsvlak van produsente, te verstaan. Die effek van sosio-ekonomiese faktore is gemeet op die ekonomiese geletterdheid vrae wat betekenisvol gevind is in die Tobit Regressie Model. ‘n Probit Regressie

Model en ‘n gewone Kleinste Kwadrate (OLS) Regressie Model is gebruik om die effek van sosio-ekonomiese faktore op die spesifieke ekonomiese geletterdheid vrae te bepaal. Die meeste van die sosio-ekonomiese faktore wat betekenisvol gevind is om ekonomiese geletterdheid van produsente te beinvloed; is sosio-ekonomiese faktore wat verband hou met die verhoging van menslike kapitaal van produsente. Ander faktore wat betekenisvol gevind is, sluit plaas spesifieke faktore soos grootte van die plaas en spesialisasie op die plaas in.

Die resultate het getoon dat sekere aspekte van ekonomiese geletterdheid wel ‘n effek het op die doeltreffendheid waarmee produsente insette allokeer. Koste ondoeltreffendheid kan verbeter word deur die verbetering van die ekonomiese geletterdheid van produsente. Een van die belangrikste maniere om die ekonomiese geletterdheid van kleinskaalse produsente te verbeter is deur vereenvoudigde, doelgerigte praktiese opleiding aan te bied wat van toepassing is op die produsente se spesifieke boerderypraktyke.

Sleutelwoorde: Allokeerbare doeltreffendheid, koste doeltreffendheid, ekonomiese geletterdheid, “Data Envelopment Analysis” (DEA), Tobit Regressie Model, Gewone Kleinste Kwadrate (OLS) Regressie Model.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND AND MOTIVATION

The agricultural sector has always been an important component of the South African economy; in spite of the fact that primary agriculture only contributed 2.7% to the total GDP (Gross Domestic Product) of South Africa in 2008 (National Department of Agriculture, 2009). Although the share of primary agriculture in the economy is relatively small, its overall importance should be considered in the context of its linkages with employment opportunities, especially in the rural areas, the role in earning foreign exchange and economic inter regional linkages. Since after the apartheid regime, South Africa's government aimed to create a new integrated agricultural economy where both large and small-scale farmers can compete on local and international commodity markets (National Department of Agriculture, 2001). Agricultural policy intended to contribute to poverty alleviation at rural, urban and national level by reducing food prices, creating employment, increasing real wages and improving farm income (Machethe, 2004).

Low economic development among the previously disadvantaged and high levels of unemployment in South Africa, make small-scale irrigation schemes of great importance for the income of many families in South Africa (Metcalf-Wallach, 2007). Perret (2002) stated that small-scale irrigation schemes could play an important role in rural development because of their potential to provide food security, income and employment opportunities. Small-scale farmers are seen as representing evolutionary steps on a linear growth path from subsistence farmers by means of small-scale farming to commercial farming (van Averbeke & Mohamed, 2006). The challenge for South African smallholder development policy is to create the necessary conditions and motivations to enable smallholders to grow from subsistence farming to commercial producers, competing in local and international markets.

Enabling smallholders to become commercial producers is a challenge due to the small scale of their operations and poor access to markets that often leads to small profit or no profit at all. Production costs that rise faster than output prices (cost price squeeze) and declining productivity contribute further to a decline in profits. Profit can be raised by improving efficiency of production and by reducing cost by allocating inputs efficiently, given their respective prices (Reddy, 2003). Gains in efficiency are particularly important since efficient farms are more likely to generate higher incomes and thus stand a better chance of surviving and prospering (Bravo-Ureta & Pinheiro, 1993). Reddy

(2003) stated that improving farm management practices and resource allocation can raise farm level efficiency and therefore profit. By examining the level and determinants of allocative efficiency small-scale farmers may be assisted in the improvement of utilising inputs in optimal proportions, and hence produce at minimum possible cost (Coelli, Rahman, & Thirtle, 2002).

To improve the efficiency of resource allocation a farmer must not only evaluate the technical relationship between inputs and outputs, but the farmer must also be able to apply economic concepts to achieve efficiency improvements. Thus, a certain level of economic literacy is required. Economic literacy gives an indication of the type of economic knowledge individuals possess and their ability to master tasks related to economic issues (Kotte & Witt, 1995). Economic literacy is concerned with the levels of understanding important economic concepts such as scarcity, tradeoffs, market forces and recognising the importance of incentives. Financial literacy is an important component of economic literacy and refers to the understanding of concepts like opportunity cost and choice, prices and markets, money and banking, and supply and demand. Economic education without financial literacy can result in individuals understanding the theory but not adequately applying it practically. However, improving financial literacy without individuals understanding the bigger economic environment could complicate managerial ability of decision makers, since individuals may understand "how to", but not "when" and "why". Schilling (2007) stated that economic literacy must be accompanied by financial education and that economic- and financial literacy should not be a matter of one or the other. By improving financial literacy, improvement in economic literacy will follow. A lack of financial literacy however, remains a major challenge in South Africa especially in poor households and communities (Piprek, Dlamini, & Coetzee, 2004). Particularly in cases where the formal education system has fallen short of achieving adequate financial literacy levels among communities who were marginalised by earlier political dispensation. Small-scale farmers typically resort under the poor households who were marginalised by the previous political dispensation of South Africa; hence their economic literacy levels are expected to be low.

1.2 PROBLEM STATEMENT

Although the profitability of small-scale farming in South Africa is widely recognised to be low, the extent to which inefficient allocation of resources contributes to the problem of low profitability remains uncertain. Furthermore uncertainty exists whether economic literacy levels of the decision makers will improve the ability of the farmers to allocate their inputs efficiently in order to increase their profit.

Ample research abroad has focussed on the measurement of and identifying factors affecting technical and allocative efficiency within an agricultural context (Ajibefun, & Daramola, 2003; Coelli, Rahman, & Thirtle, 2002; and Bravo-Ureta, & Pinheiro, 1997). Attempts to quantify the extent and determinants of allocative efficiency among small-scale producers are relatively less researched, especially in South Africa.

Badunenko, Fritsch, & Stephan, (2006) found this quite surprising since economists were traditionally attracted to allocative efficiency to answer questions concerned with the optimal combination of inputs to produce output at a minimum cost, and the role of efficiency in the competitive position of the business. Speelman, Frija, Farolfi, Buysse, D'Haese & D'Haese (2008) and Piesse, Von Bach, Thirtle & van Zyl (1996) investigated technical and allocative efficiency in smallholder South African agriculture and found substantial technical and allocative inefficiencies to exist. These authors however did not explore the factors that will influence allocative efficiency. Khaile (2012) measured the technical efficiency of small-scale raisin producers of Eksteenskuil and the factors that will influence technical efficiency of the producers. The efficiency with which the small-scale raisin producers allocate their resources however has not been measured, and limited knowledge still exists on economic literacy as a factor affecting allocative efficiency of small-scale producers.

No research was found within South Africa on economic literacy as a factor affecting allocative efficiency. Research done on economic literacy is mainly focussed on school- and college students abroad. Within South Africa, Lebete (2011) did a study on factors affecting the economic literacy of agricultural economic students and found that economic education, gender, race and age had an effect on economic literacy of the students. However, no studies in South Africa were found measuring the economic literacy or financial literacy of small-scale producers.

1.3 RESEARCH OBJECTIVES

The main objective of this study is to explore the relationship between economic literacy and allocative efficiency of small-scale raisin producers in Eksteenskuil.

The main objective will be reached through the completion of the following sub-objectives.

a) The first sub-objective is to quantify the level of allocative efficiency at production level in order to determine the extent to which allocative efficiency contributes to low levels of profitability. Allocative efficiency will be measured by making use of a cost minimising approach, where the ratio of the actual cost of production to the minimum possible cost of production will be calculated with DEA.

b) Within this study it is hypothesised that economic literacy will have an influence on the ability of the farmers to select the combination of production inputs that will minimise production cost. For this reason the second sub-objective is to quantify economic literacy levels of the small-scale raisin producers.

c) Within the third sub-objective the relationship between the economic literacy of respondents and their allocative efficiency will be explored, to see whether or not economic literacy does

affect the ability of small-scale producers to produce at a cost minimising input combination and hence have an effect on their profitability.

d) The fourth sub-objective is to explore the socio-economic characteristics that influence the economic literacy of small-scale producers in Eksteenskuil in order to better understand the characteristics associated with higher economic literacy levels. Such information may contribute to the improvement of small-scale producers' economic literacy levels and in turn improve profitability of these producers.

1.4 CHAPTER OUTLINE

The rest of the thesis is organised in five remaining chapters. **Chapter two** provides an overview of the relevant literature on allocative efficiency and economic literacy. Included in Chapter 2 is an introduction on efficiency and how to measure efficiency. The chapter further provides a background to economic literacy, factors that were found to influence economic literacy, and techniques employed to measure economic literacy. **Chapter three** provides the sampling techniques used, questionnaire design, and the characteristics of respondents. In **Chapter four** the methodological framework is discussed. **Chapter five** gives a presentation and discussion of results obtained. The final chapter, **Chapter six**, includes a summary of the study, the final conclusions made from the study and possible implications for policymakers.

CHAPTER 2

LITERATURE REVIEW

Chapter two provides an overview of relevant literature on efficiency and economic literature. The chapter is divided into two main sections. The first section includes a discussion of the theory of efficiency, with specific reference to allocative efficiency, the different forms of allocative efficiency and the approaches to measure efficiency. The second section focuses on economic literacy more specifically, the background of economic literacy, the measurement of economic literacy and factors that affects economic literacy.

2.1 THEORY OF EFFICIENCY

2.1.1 INTRODUCTION

Many researchers and policymakers have focused their attention on the adoption of new technologies to increase farm productivity and income. Lately however, major technology gains have been largely exhausted across the developing world, thus attention to productivity gains arising from a more efficient use of existing technology is justified (Bravo-Ureta & Pinheiro, 1993). Improving efficiency would assist farmers to be more cost effective than introducing new technologies as a means of increasing agricultural output (Omonona, Egbetokum & Akanbi, 2010). Thus, small-scale farmers should strive to be efficient in production to meet their own food security needs as well as to earn a decent living in both on- and off-farm investment. Owuor & Shem (2009) stated that more efficient farms are more likely to generate higher incomes and thus stand a better chance of surviving and prospering.

Efficiency refers to the global relationship between all outputs and inputs in a production process (Speelman *et al.,* 2008). Transforming inputs such as capital labour and land into outputs such as goods and services is known as the production process. The basic theory of production is thus simply a function of constrained optimisation. A producer attempts to organise resources into a production unit where the ultimate objective may be output maximisation, cost minimisation, profit maximisation or utility maximisation, or a combination of the four (Oluwatayo, Sekumade & Adesoji, 2008). The manager will be concerned with efficiency to achieve the objective of production. Ajibefun & Daramola (2003) indicated that domestic firms competing in the international markets must adopt available technology more efficiently in order to compete effectively against international producers.

The measurement of efficiency is very important since it can lead to significant resource savings, which in turn can have an important effect on policy formulation and farm management (Bravo-Ureta & Rieger, 1991). Productive efficiency measurement finds its origin in a paper published by Farrell in 1957, where the purpose of the paper was to measure productive efficiency while taking all inputs into account. By doing so, an estimate of an applicable production function is obtained. Farrell (1957) stated that if economic planning is to concern itself with particular industries, it is important to know how far a given industry can be expected to increase output by simply increasing efficiency, without absorbing further resources. Over the years several extensions to Farrell's deterministic model have been made by Aigner & Chu (1968), Aigner, Lovell & Schmidt (1977), Meeusen & van den Broeck (1977), Charnes, Cooper & Rhodes (1978), Sch+midt (1980), Greene (1980) and Banker, Charnes & Cooper (1984) among others. Efficiency measures can be separated into three different efficiency measures: technical, allocative and economic efficiency (Speelman *et al.,* 2008). These measures are discussed below.

2.1.1.1 Technical Efficiency

Farrell (1957) stated that technical efficiency is achieved when producing the maximum output from a given set of inputs, or to produce a given amount of output by using the minimum feasible amount of inputs. These two definitions of technical efficiency are known as the output oriented and input oriented efficiency measures, respectively (Coelli, Rahman & Thirtle, 2002). Technical efficiency can further be separated into two components namely scale efficiency and pure technical efficiency (Speelman *et al.,* 2008). Scale efficiency relates to the most efficient scale of operation in the sense of maximising average productivity. Pure technical efficiency is obtained when scale effects are separated from the technical efficiency.

Technical efficiency can be defined as the ratio of the least possible amount of inputs, compared to the actual amount of inputs, used for producing a given amount of output (Farrell, 1957). The ratio ranges between zero and one, and the lower the ratio the lower the efficiency of the production process (Ozkan, Ceylan & Kizilay, 2009). Ogunyinka & Ajibefun (2004) stated that technical efficiency in itself is a measure of farm performance and is a major component of productivity. Technical efficiency can be an indication of whether a farm is using the best available technology, and can be a reflection of the ability of a farm to obtain maximum output given a set of inputs. By assessing technical efficiency an output expansion, input preserving or a combination of both can be achieved. After the technical efficiency has been improved the next step is to improve the allocative efficiency of farmers, if allocative inefficiencies exist.

2.1.1.2 Allocative Efficiency

Once production on farms becomes technically efficient, the issue of allocative efficiency would arise (Chukwuji, Inoni, Ogisi & Oyaide, 2006). Allocative efficiency can be described as a measure of a

firm's ability to use factors of production in the best combinations given the factor price, which can also be called the price efficiency of production (Farrell, 1957). Allocative efficiency can be defined as the ratio of total cost of producing one unit of an output to total cost of producing the same unit of output, while using optimal factor combinations in a technically efficient manner (Chukwuji *et al.,* 2006). A farm is said to be allocatively efficient if the ratio of the marginal products (MP_x) between all inputs is equal to the ratio of the input prices $MP_{xi} / MP_{x1} = P_i / P_1$ and thus the ability of the farm to produce where the marginal rate of technical substitution between any two of its inputs is equal to the ratio of corresponding input prices (Ajibefun & Daramola, 2003).

According to Omonona, Egbetokun & Akanbi, (2010) allocative efficiency is a condition for profit maximisation. By considering the cost of inputs in relation to expected revenue that would be generated from the inputs, the least cost method will be the most efficient (Chukwuji *et al.*, 2006). The condition for profit maximisation under perfectly competitive markets is that a farm must be able to equate the marginal value product (MVP) of each resource employed to its unit cost, requiring that the extra revenue obtained from employing an extra unit of resource must be equal to its unit cost (Chukwuji *et al.,* 2006). Farms that are perfectly allocative efficient are operating at the point where the isoquant and isocost line in the production frontier is tangent. Profit maximising producers can be described as allocatively inefficient if they fail to allocate inputs optimally, given input and output prices (Kumbhakar & Wang, 2006). Inefficiencies experienced by farmers are an indication of how the agricultural output can be improved through the reallocation of resources, making measuring allocative efficiency very important. Allocative efficiency can be measured if input price information is available. However Inoni (2007) found that to estimate resource-use efficiency the determination of parameters such as marginal physical product (MPP), marginal factor cost (MFC), and marginal value product (MVP) is required.

Allocative efficiency can be interpreted in a similar way as technical efficiency, where the ratio ranges between zero and one. The smaller the ratio, the less efficient the resource allocation (Ozkan, Ceylan & Kizilay, 2009). Under or over utilisation of inputs will explain the inefficiency in resource allocation. Failure to minimise cost, or uncontrolled random exogenous shocks, like uncertainty in input or output prices, explains the incorrect utilisation of inputs (Ajibefun & Daramola, 2003). Ogunniyi (2008) stated that farmers need to be more efficient in their production activities and also be responsive to market indicators; so they can utilise scarce resources efficiently to increase productivity as well as profitability. By allocating resources efficiently an increase in productivity will be achieved, followed by an increase in farmers' income.

According to Cooper, Seiford & Tone (2006) two different scenarios exist for measuring allocative efficiency. One where prices and costs are the same for farms whose allocative efficiencies are being measured. And one where different prices and cost exists for the different farms being measured. In actual business, common prices and cost for all farms are not always valid so various

measures of allocative efficiency were developed. This includes profit efficiency, revenue efficiency and cost efficiency.

2.1.1.2.1 Profit Efficiency

According to Ali & Flinn (1989) profit efficiency can be defined as the ability of a farm to achieve the highest possible profit, given the prices and levels of fixed factors of the farm. In this context profit inefficiencies is defined as the loss of profit from not operating on the frontier.

Profit efficiency is a broader concept than cost efficiency and revenue efficiency (Maudos, Pastor, Pérez, & Quesada, 1999). The effect of the choice of a certain vector of production, both on cost and revenues, is taken into account by profit efficiency. The purpose is to find a profit maximisation mix in the production possibility set (Cooper, Seiford & Tone, 2006). Maximising profits not only require that goods and services are produced at minimum cost but also demand maximum revenue. Respondent A's profit efficiency can be calculated as follow:

Profit Efficiency (PE) = $py_0 - cx_0 \Big/ py^* - cx^*$

Where p is the price for output y, c is the price of input x used, y_0 is the actual output from production, y^* is the possible output that can be attained from production, x_0 is the actual input used to produce a given volume of output and x^* is the minimum possible input that can be used to produce a given volume of output (Cooper, Seiford & Tone, 2006). Profit efficiency lies between zero and one. Below one gives an indication that respondents are producing at a profit inefficient level and the smaller the ratio, the lower the profit efficiency. Profit efficient respondents have a score of one.

2.1.1.2.2 Revenue Efficiency

Revenue efficiency is defined as the ratio between the maximum possible income at a given price, and the actual income incurred to produce at that price (Cooper, Seiford & Tone, 2006). Revenue efficiency for respondent A is measured as follow:

Revenue Efficiency (RE) = $py_0 \Big/ py^*$

Where p is the price for output, y_0 is the actual output from production, and y^* is the possible output that can be attained from production (Cooper, Seiford & Tone, 2006). Revenue efficiency lies between zero and one, where one indicates that the respondent is producing at a revenue efficient

level. A value smaller than one, indicates that the respondent is producing at a revenue inefficient level, where the smaller ratio indicates lower revenue efficiency.

2.1.1.2.3 Cost Efficiency

Maudos *et al*. (1999) described cost efficiency as the ratio between the minimum cost to attain a given volume of production and the actual cost incurred to produce that volume. Cost efficiency can be improved if output is maintained with a less than proportionate increase in inputs given the price information (Badar Mohamad Ariff, & Hassan, 2008). Respondent A's cost efficiency can be calculated as follow:

Cost Efficiency (CE) = $cx^* \big/ cx_0 \leq 1$

Where c is the price of input x, x_0 is the actual input level used by respondent A to produce a given volume of output, and x^* is the minimum possible input level that can be used to produce a given volume of output (Cooper, Seiford & Tone, 2006). The measured cost efficiency lies between zero and one, where one indicates that the respondent is producing at a cost efficient level. Below one indicates the respondent is producing at a cost inefficient level. A smaller ratio indicates a lower level of cost efficiency.

2.1.1.2.4 Choice of allocative efficiency measure

According to Cooper, Seiford & Tone (2006) prices and cost of producers can either be constant or different from producer to producer, and when choosing an allocative efficiency measure, the decision should be guided by the price information available. Profit efficiency can be used as a measure of allocative efficiency when input prices and product prices for producers differ. For producers receiving different product prices, while facing the same input prices, revenue efficiency will be used as a measure of allocative efficiency. Cost efficiency should be used to determine allocative efficiency when the price producers pay for inputs differ, while product prices are the same across the sample.

2.1.1.3 Economic Efficiency

Farrell (1957) defined economic efficiency as the ability of a firm to produce a predetermined quantity of output at the minimum possible cost for a given level of technology, placing economically efficient input-output combinations both on the frontier function and the expansion path (Ogundari & Ojo, 2006). Any deviation from the frontier or expansion path indicates economic inefficiency. Since economic efficiency is made up out of technical efficiency and allocative efficiency, economic inefficiencies will arise from technical and/or allocative inefficiencies (Bravo-Ureta & Pinheiro, 1997).

Richetti & Reis (2003) indicated that measuring economic efficiency may direct decision makers to improve current performance and to identify differences between the production potential of a new technology and the actual level of production.

The discussion of economic efficiency as an indicator of overall efficiency concludes the discussion of the different types of efficiencies. Next the focus shifts to approaches to quantify efficiency.

2.1.2 MEASURING EFFICIENCY

Four major approaches to measure and estimate efficiency exists (Okoye, Onyenweaku & Asumgha, 2006). The parametric or statistical approach, non-parametric approach, the deterministic statistical approach and the stochastic frontier production function approach. The parametric approach relies on econometric techniques while the non-parametric approach uses mathematical programming techniques (Sarafidis, 2002). The most popular under the parametric and non-parametric approaches used in efficiency analysis is the Stochastic Frontier Analysis (SFA) production function approach and the Data Envelopment Analysis (DEA), respectively (Speelman *et al.,* 2008). The parametric approach uses mainly maximum likelihood estimation techniques to estimate the frontier function in a given sample (Sarafidis, 2002). DEA is focused on the resolution of a set of problems by making use of maximisation or minimisation of a given objective subject to some constraints. The non-parametric approach uses mathematical linear programming techniques to find the set of weights for each firm that maximises their efficiency score, subject to the constraint that none of the firms has an efficiency score greater than a 100% at those weights (Sarafidis, 2002).The main difference between these two approaches is that the parametric approach specifies a particular functional form for the production or cost function while the non-parametric approach does not.

SFA deals with stochastic noise and permits statistical test of hypotheses pertaining to production structure and the degree of inefficiency (Sharma, Leung & Zaleski, 1999). However the parametric approach's main weakness is that it has a need for imposing an explicit parametric form for the underlying technology and an explicit distributional assumption for the inefficiency term (Chavas & Aliber, 1993). Speelman *et al*. (2007) argued that in contrast to SFA, DEA requires no assumptions concerning the functional form for the frontier technology or the distribution of the inefficiency term. According to Sharma, Leung & Zaleski, (1999), this can be considered as the main advantage of the DEA's approach. Another advantage is that the comparison of one production method with others, in terms of performance index, is allowed since the approach permits the construction of a surface over the data. The disadvantage is that DEA is sensitive to measurement errors and noise in the data, since it is deterministic and attributes all deviations from the frontier to inefficiency (Sharma, Leung & Zaleski, 1999). Several studies that compared DEA and SFA showed that results from both these methodologies are highly correlated, which suggest that there is little to choose between them.

2.2.3 CONCLUSION

Efficiency improvements would assist farmers to be more cost effective and hence may have a possible impact on profitability. Allocative efficiency is a condition for cost minimisation and so profit maximisation can be measured in profit efficiency, revenue efficiency and cost efficiency. Cost efficiency is the chosen measure for this study because input cost will differ from farm to farm in Eksteenskuil, while output prices will stay constant across the sample. Allocative efficiency will be measured as a ratio of the current cost of production to the minimum cost of production. Cost efficiency can further be measured by SFA or DEA. DEA makes provision for a small sample size and was the chosen model.

Given the hypothesis that economic literacy will influence the efficiency with which respondents will allocate their resources; the next section will focus on the literature of economic literacy, the measurement of economic literacy and the factors that will influence economic literacy.

2.2 ECONOMIC LITERACY

2.2.1 BACKGROUND TO ECONOMIC LITERACY

Thinking in terms of economics, economic matters have become a vital part of individuals' lives and international relationships (Kotte & Witt, 1995). Economic transactions dominate life throughout the world. World trade, national budgets, and everybody's purses are affected by economics. Farrell (1999) stated that economics offers insight into the issues that affect us as workers, consumers, savers, investors and voters. Economic logic teaches us to look for the non-obvious cost and benefits of various policies (Stigler, 1983). Economics is about understanding and making choices, living with the consequences of those choices, and making tradeoffs among scarce resources in a world where we can't have everything we want (Koshal *et al.*, 2008). Decisions of various types and magnitude must be made by producers and consumers in relation with their wealth getting and wealth using activities (Pierce & Williams, 1954).

Lusardi (2008) suggested that a large portion of the adult population lack knowledge in finances and of even the most basic economic concepts, including inflation, risk diversification, interest composition and other debt instruments. Questions can be asked on the importance for individuals to familiarise themselves with these basic economics concepts. Jappelli (2009) stated that in light of the recent economic crises, people who lack the financial sophistication required to absorb financial shocks face implausible risks. These risks are particularly severe for individuals from a low income household with limited savings. Already in 1954 Pierce & Williams (1954) recognised that management decisions on farm level are becoming more complicated by innovations, change in prices, personalities of the producers and institutions. Today those management decisions have become even more complex due to the free market where farmers negotiate their own price without

government interference. Individuals are increasingly expected to prepare themselves for rapid change and tolerate much of the risk from the turmoil in our economy, making the need for economic literacy greater than before (Farrell, 1999).

Economic literacy can be described as the ability of individuals to recognise and use economic concepts and the economic way of thinking in order to improve their wellbeing (Mathews, 1999). It is a type of knowledge necessary to master certain tasks related to economic issues and having a reasonable grasp of the money, business, and economic issues being discussed (Kotte & Witt, 1995). According to The Organisation for Economic Literacy (2011) two facets exist for economic literacy. The first facet entails knowledge of the economic way of thinking by recognising the importance of incentives, understanding tradeoffs, and anticipating the full effects of public policy, including unintended consequences. The second facet entails being familiar with fundamental economic concepts like market forces or how the monetary system works. Personal financial literacy can be thought of as a division of economic literacy. Economic literacy can be used to measure whether people understand forces that significantly affect their quality of life, making economic literacy a crucial part of society (Farrell, 1999).

2.2.2 IMPORTANCE OF ECONOMIC LITERACY

Jappelli (2009) indicated that economic literacy can contribute to the stability of the overall economy. He included three different aspects that will be affected by economic literacy:

- **Assets**

Economic literacy is important on the asset side since financial products have become exceptionally complex. Several choices exist which make decisions more complex. As a consequence of greater stock market participation and policy shifts, households in many countries are more exposed to financial risk. Poor risk diversification, inefficient portfolio allocations and low levels of savings are related to a lack of economic literacy.

- **Debt**

In many countries ownership of credit cards, borrowing and consumer credit have increased. In light of the resent recession economic literacy proved not only to affect choices made by individual investors and borrowers, but also influence the whole economy of a country since household debt plays a central role in balance sheets of banks and other financial intermediaries. A debt build-up accompanied by an increased number of insolvencies and bankruptcy can be partially blamed on low levels of economic literacy.

- **Macro**

Deceitful financial practices and unfair competition in financial markets may be a result of financial illiteracy. Educated and well-informed financial consumers will improve financial markets by raising their confidence and forcing rogue products from the marketplace.

Economic literacy can affect financial development by more efficient allocation of savings, attracting more investment and growth in a country. Greater stock market participation and financial market depth can be induced by higher economic literacy. Economic literacy can also help in the building of confidence in the market economy, regulate financial mediators and create an improved policy environment for growth.

Jappelli (2009) also stated that economic literacy is increasingly important for households in making investment and borrowing decisions. Many adults lack the level of economic literacy that can help them to become better consumers, producers, savers, investors, and members of the workforce; making economic literacy an important tool for individuals (Mathews, 1999). Economic illiterate people are confused about economic forces. They do not know how decisions are going to affect them, what questions to ask, and where to seek answers (Koshal *et al.,* 2008). Jappelli (2009) indicated that evidence shows that economic literacy differs widely across households. Less educated and poorer demographic groups show limited levels of economic literacy; which in turn have obvious distributional consequences especially in market downturns. Low levels of economic literacy among individuals can be explained as either individuals that did not have exposure to economics, or they have been introduced to economics but were unable to retain the material (Mathews, 1999). Economic literacy may improve by raising the incentive to acquire financial knowledge (Jappelli, 2009). By improving individuals' economic literacy an increase in human capital resources can be expected in the long run (Kotte & Witt, 1995). The choices and decisions to be made at farm level can also not be removed from the economic implications of markets, labour supply, credit and the factor market.

Although farming is one of the world's oldest professions, modern farming is affected by modern economic factors. By improving the economic literacy of a farmer, and consequently farm management, farmers will be assisted to make rational production decisions (Pierce & Williams, 1954). Production decisions can include decisions on whether or not to engage in agriculture, choice of enterprises and quantity to produce, the level of practices employed and the correct allocation of resources. For managing personal and family economic matters efficiently, economic literacy is very important (Yunus, Ishak & Jalil, 2010). Raising economic literacy of farmers in general does not necessarily mean that their ability in the area of decision-making will be unquestionable (Pierce & Williams, 1954). If farmers are trained in what to look for, understand the basic analytical tools, and are trained to evaluate the economic cost of alternatives; fewer recommendations and more information to base rational producer decisions on will be needed. Economic literacy, whether it is for farmers, consumers, citizens, or environmentalists is an acquired characteristic, and not an inherited

one. The primary purpose of education in agricultural economics is to raise economic literacy of farmers, which will help them to succeed (Pierce & Williams, 1954).

In conclusion economic literacy can be interpreted as the ability of decision makers to improve their wellbeing by the use and understanding of economic concepts to make viable economic decisions. Today management decisions on farm level are becoming more complicated. Due to a free market and policy changes farmers can negotiate their own price. An increase in economic literacy can contribute to the improvement of farm management and rational production decision-making, which ultimately increase profitability of small-scale farmers.

2.2.3 MEASURING ECONOMIC LITERACY

Over the years, different test instruments to measure economic literacy have been developed. However, measuring economic literacy of individuals still proves to be difficult. In the United States the National Council on Economic Education (NCEE) developed four grade-level specific standardised tests to measure economic literacy, including the Test of Understanding College Economics (TUCE) (Saunders, Fels & Welsh, 1981), Basic Economics Test (BET) (Chizmar & Halinski, 1983), Test of Economic Knowledge (TEK) and Test of Economic Literacy (TEL) (Soper 1979).

The Test of Understanding College Economics (TUCE) consists of two separate exams which include microeconomics and macroeconomics. The exams consist of multiple choice questions (Walstad, & Rebeck, 2008). The cognitive specifications of the TUCE entail recognition, understanding, simple application, and complex application (Chrizmar & Halinski, 1983). The main purposes of the TUCE is: 1) to be used as a mechanism for measuring experiments in the teaching of introductory economics at college level and 2) to compare students' performance with that of other students from other universities or colleges (Walstad, & Rebeck, 2008).

The Basic Economics Test (BET) is an achievement test of basic principles of economics intended for use for individuals in grade four to six (Chizmar & Soper, 1981). The BET consist of three cognitive categories including knowledge, understanding and application. The Test of Economic Knowledge (TEK) is a standardised test containing multiple choice questions and is designed to measure economic knowledge of individuals in grade seven to nine (NCEE, 2007).

The Test of Economic Literacy (TEL) is a standardised test of basic economic understanding consisting out of a pre- and post-test, all multiple choice questions (Walstad & Soper, 1988). The TEL use cognitive content which covers seven categories including basic economic problems, economic systems, microeconomics, macroeconomics, world economy, economic institutions, and evaluation concepts (Soper, 1979). According to Chizmar & Soper (1981) the TEL uses a five level

taxonomic classification, which includes knowledge, comprehension, application, analysis and evaluation.

Although four standard tests were developed to measure economic literacy, no standard test was found, within the literature, to measure the economic literacy levels among small-scale producers. Economic literacy levels of small-scale producers are expected to be low since the formal education system has fallen short of achieving adequate literacy levels among poor communities because of earlier political dispensation. Keeping this in mind economic literacy questions, that measure small-scale producers' economic literacy levels, need to be developed to measure producers' knowledge, comprehension and application of economic concepts within their frame of reference.

2.2.4 FACTORS AFFECTING ECONOMIC LITERACY

Economic literacy of individuals can give an indication of the decision-making ability of individuals. More economic literate individuals will be able to make accurate and informed decisions within different situations. Having information on the factors affecting different individual's economic literacy, the information could contribute to improve economic literacy. Various researchers have identified different factors affecting economic literacy, though few studies have been done in South Africa. Among the factors identified education, economic education, training, age, experience, gender, race and income stood out the most. Education, skill and management ability can all be included in human capital, while training is employed to expand human capital.

2.2.4.1 Human Capital

Jappelli (2009) indicated that one of the indicators that are positively correlated with economic literacy is human capital. If the drivers of human capital improve so will economic literacy. Human capital represents the investment people make in themselves that enhance their economic productivity (Olaniyan, 2008). Han & Lin (2008) indicated the characteristics that can describe human capital include education, experience, skill and the qualities of management that put forth a positive effect on organisational performance. Marínez & Fernández (2010) stated that the human capital theory is based on the notion that education is an investment that produces income in the future and that an educated population is a productive population. Investment in human capital will not only have a positive impact on individuals but also on society as a whole. The positive impact on society includes an increase in employment, economic growth and social equity. Individuals with higher quality human capital can better recognise profitable opportunities presented in new economic activities (Davidsson & Honig, 2003). Individuals with higher quality human capital should also have superior ability in successfully utilising the presented opportunities. The human capital theory emphasises that by improving education, workers' level of cognitive stock of economically productive human capability will increase; increasing the productivity and efficiency of workers (Olaniyan, 2008). Providing formal education can be seen as a productive investment in human capital.

Education has become essential as a factor in the modernisation of production systems and economic behaviour of individuals (Marínez & Fernández, 2010). Education can be regarded as both a consumer good and a capital good (Olaniyan, 2008). It can be regarded as a consumer good because it offers utility to a consumer and as a capital good because it can be used as an input into the production of other goods and services. Education creates an improved society and helps to improve the general standard of living in society (Olaniyan, 2008). In order for growth of production to occur, accumulation of human capital must occur and the tipping point in this regard is determined by literacy (Marínez & Fernández, 2010). To attain a higher level of development in a country a certain threshold of human capital must be cleared, and this can only occur if a significant percentage of the population became adequately literate. Economic growth and development will occur if an investment will be made in formal education (Olaniyan, 2008).

In a study done by Caplan (2001) education showed to have a statistically significant influence on economic literacy. Jappelli (2009) also found that a correlation between education and economic literacy exists, and that the fraction of the adult population with a college education has an effect on economic literacy. A strong correlation between economic and mathematical abilities was found. While an advanced degree in education have a stronger effect on the economic literacy score, educational attainment beyond high school also raised the economic literacy score (Burke & Manz, 2010).

Outside the educational system, adults get economic information from a variety of sources including the media, co-workers, and friends. Students who frequently read a newspaper also scored higher in the test of economic understanding (Jackstadt & Grootaert, 1980). The economic literacy score was also raised significantly by economic education (Burke & Manz, 2010).

2.2.4.2 Economic Education

In the previous section overall education of individuals was discussed as part of the human capital factor that will influence economic literacy. Economic education will make out part of an individual's overall education. In this section the focus is specifically on education within economics that will influence the economic literacy levels of individuals. Yunus, Ishak & Jalil (2010) found a significant relationship between an individual's economic education and their economic literacy. Wood & Doyle (2002) explored the economic knowledge of a sample of individuals who have been removed from formal education for a number or years. Results indicated that individuals who had taken at least one economic course at college level showed higher economic literacy than those individuals with a college degree with no economic courses. The same applies to individuals who took more economic courses at college level. They showed higher economic literacy than those who had only one economic course at college level. Students with undergraduate majors in business have a higher level of economic literacy than students with other majors (Koshal *et al.,* 2008). Walstad & Larsen (1992) indicated that if a lack of economic education exists, the related cost to a nation will be

continuing economic illiteracy and great confusion among the public young and old, about how the economy works. Evidently more years of economic education improves economic literacy.
According to Banaszak (1987) the following basic concepts surrounding economic education should be covered:

- **Scarcity**

Scarcity refers to the limited resources available to fulfil our unlimited demand for products and services, requiring a choice between alternative uses of production resources. Choices should be made between the most desirable and second most desirable alternative use for a resource. The value of the lost opportunity, when the resource is allocated to an alternative used is called opportunity cost. The resource should be allocated to the production process with the highest opportunity cost.

- **Production Resources**

Production resources include everything used to create products or services, and can also be called factors of production. Three types of production resources can be distinguished including human resources, natural resources, and capital resources. Human resources include all the workers and their skills and to use human resources efficiently workers need to specialise in what they do best. An important type of a human resource is entrepreneurship. Entrepreneurs are people who take risks associated with starting a new business. Natural resources include everything that can be excavated from nature. Natural resources consist of renewable and non-renewable resources. Capital resources are those resources created by human efforts and savings for the production of products and services. Capital resources include factories, machines and tools.

- **Economic systems**

Economic systems are the organised way to determine how scarce production resources should be allocated. Each economic system should at least answer three questions. What to produce, how to produce, and how the output should be distributed. In the command system decision are made by decision makers, usually government employees. In the market system minimum government intervention is present and decisions are made by individuals and institutions endorsing their own self-interest in a free market. Competition among producers is also required by the market economy.

- **Exchange**

Exchange entails the trading of resources, products and services, where both sides believe that they gain when trade is voluntary. Exchange will result in more efficient use of resources since exchange allows for specialisation in production.

- **Economic Incentives**

Economic incentives influence human behaviour by rewarding individuals financially which in turn allow for larger demands for products and services. Consumers seek to maximise their satisfaction, workers their wages, producers their profits, and investors seek to maximise their return. A powerful way to influence the economy is by understanding and manipulating incentives.

- **The Market**

The market is not only a place where buyers and sellers meet, but also a process where the forces of supply and demand interact, seeking an equilibrium, and register the decision through the price. The market is the principle feature of a market economy.

- **Economic Management**

Managing the economy is an attempt to achieve socially determined goals. These goals can be to promote economic freedom, economic efficiency, full employment, economic growth, and price stability. Managing a modern complex economy is a difficult task because of the changing dynamics of the economy and measurement problems. The market economy is managed by fiscal and monetary policies.

Kotte & Witt (1995) stated that in addition to some of these basic economic concepts individuals should also develop the necessary perceptions and attitudes with respect to economic thinking. In order for economic literacy to be built up by economic education, both cognitive and emotional aspects need to be covered. Currently with the advantages of technologies, searching for information on economics is much easier (Yunus, Ishak & Jalil, 2010).

2.2.4.3 Training

According to Drexler, Fischer & Schoar (2011) training will have a positive effect on individuals' business practices and performance. The results suggested that management practices of small businesses in an emerging market will be positively influenced by improving knowledge on finance and financial accounting. Braunstein & Welch (2002) stated that evidence indicate that training and education can result in more informed consumers who make better financial decisions. Drexler, Fischer & Schoar (2011) also suggested that significant gains could be made in individuals' economic decision-making by simplifying training programs and rely more on easy-to-implement practical training. According to Braunstein & Welch (2002) a significant goal oriented education component should be included in training and success can be measured by achieving the specific outcome resulting from training. The format of training as well as human traits will play a role in whether training programs will effectively affect households' financial wellbeing.

2.2.4.4 Experience and Age

Gleason & van Scyoc (1995) found age and experience to have a significant effect on economic literacy of an individual and that each additional year added about a tenth of a point to an individual's TEL score. According to Koshal *et al.* (2008) age had a non-linear relationship with economic literacy. Economic literacy increases with age, but at a decreasing rate. Gleason & van Scyoc (1995) suggested that adults who had not taken an economics course had statistically the same test scores as those adults who had only a high school course in economics, implying that economics can be learned through years of experience. Gains in economic literacy are accelerated by experience and making experience a determinant of economic literacy (Koshal *et al.,* 2008).

2.2.4.5 Income and Investment

Other variables that showed to have a significant effect, other than variables such as education, age and gender, on individuals' economic literacy were income and investment (Wood & Doyle, 2002). Caplan (2001) found that current income growth and expected income growth made people think more like economists. Higher levels of resources for investment will create a higher incentive to acquire economic literacy (Jappelli, 2009).

In a study done by Yunus, Ishak & Jalil (2010) questions were asked on whether economic literacy is influenced by economic education, spending, savings, and investment and to what extent these factors will influence economic literacy. Results indicated that a significant relationship exists between economic knowledge and economic literacy. Savings also confirmed a significant relationship to economic literacy. However, savings and economic education have an inversely proportional relationship or no relationship at all with economic literacy. Meaning that even though some individuals have no basic economic education they can still make sound economic decisions, due to experience they have acquired. Furthermore savings is not a proxy for economic literacy since a number of individuals can save for various purposes and not be aware of the economic aspect surrounding that savings. Yunus, Ishak & Jalil (2010) further found that a significant relationship between economic literacy and spending and investment of individuals exists.

2.2.4.6 Gender and Race

Several studies done on the factors affecting economic literacy, found that males performs better in an economic environment or business than females. Burke & Manz (2010) measured the determinants of economic literacy and found that women displayed lower economic literacy scores than men as did Wood & Doyle (2002) on their study of economic literacy among corporate employees. Research done by Caplan (2001) also showed evidence that males are generally more economically literate than females, while Koshal *et al.* (2008) found that among MBA students, gender did not have a significant influence on the economic literacy.

Jackstadt & Grootaert (1980) looked at gender, gender stereotyping and socio-economic background as determinants of economic literacy and learning by using the test of economic understanding. The results of the study showed that students who do not gender-stereotype economics, and who had no preference regarding the gender of the economics teacher, performed better and learned more in economics. Students' level of economic understanding and learning were affected by intelligence, occupation of the parents and frequent newspaper reading. Male students whose father held a professional, business or managerial positions seemed to have scores higher in the test of economic understanding. For female students it was the other way around, suggesting that homo-gender parents may play an important role in encouraging children in the pursuit of economic knowledge.

According to Burke & Manz (2010) race also plays a part in economic literacy among individuals, where blacks scored lower on the economic literacy test than whites. Wendt, West & Parliament (2007) found that white students had a significantly higher economic literacy score and also a higher increase in economic literacy scores than Black, Native-American, Hispanic or other students.

2.2.4.7 Conclusion

Economics is part of everyday life and an important aspect in decision-making. In the literature it was found that human capital of individuals influenced economic literacy. By increasing education, especially economic education, individuals' economic literacy will also improve. Within economic education scarcity, economic incentives, economic management, production resources, exchange and economic systems are important. Another important determinant of economic literacy is training. Training is the tool used to extend human capital, thereby contributing to the economic literacy of individuals. Economic literacy will also improve with an increase in age and experience, implying that economics can be learned through years of experience. Other factors that were found to influence economic literacy are gender and race. All of the above mentioned factors show that socio-economic factors of individuals have a vast impact on economic literacy and these factors should be considered in the improvement of economic literacy of small-scale producers in order to better allocate their resources in order to increase profitability.

2.3 IMPLICATIONS FOR THE RESEARCH

From the literature some inferences can be drawn regarding the measuring procedures of allocative efficiency and economic literacy.

- Choice of the allocative efficiency measure depends on the characteristics of the market environment. The choice will be supported by the price information for outputs produced and cost information of inputs used, by the small-scale raisin producers of Eksteenskuil.

- In comparison, results obtained from DEA and SFA are highly correlated, which suggest that there is little to choose between them.

- No standard test was found in the literature measuring economic literacy of small-scale producers. Economic literacy levels of small-scale producers are expected to be low since the formal education system has fallen short of achieving adequate literacy levels among poor communities because of earlier political dispensation. Keeping this in mind economic literacy questions, to measure small-scale producers' economic literacy levels, need to be developed to measure producers' knowledge, comprehension, and application of economic concepts within their frame of reference.

- From the literature it is apparent that human capital and training have a noticeable impact on economic literacy levels of individuals and should be considered in the expansion of economic literacy of individuals.

CHAPTER 3

SURVEY & CHARACTERISTICS OF RESPONDENTS

The objective of this chapter is firstly to provide an overview of the research area in terms of geographic location, climate, history and production activities within the area. The next section provides the sampling procedures and the methods employed to collect the relevant data. The last part of the chapter provides an extensive discussion on the characteristics of the respondents in the study area, which include human capital characteristics, farm specific characteristics, and raisin production.

3.1 STUDY AREA

3.1.1 THE REGION

Eksteenskuil is situated about 10km from the town Keimoes, on the banks of the Orange River in the Northern Cape South Africa (as shown in Figure 3.1). The area experiences a hot climate and little rainfall. Eksteenskuil generally receives an average rainfall of 88mm per annum (SA Explorer, 2011). Most of the rainfall occurs during early autumn. The lowest rainfall occurs during June, while the highest rainfall occurs during March. Average midday temperatures for Eksteenskuil range from 19.7˚C in winter to 33˚C in summer.

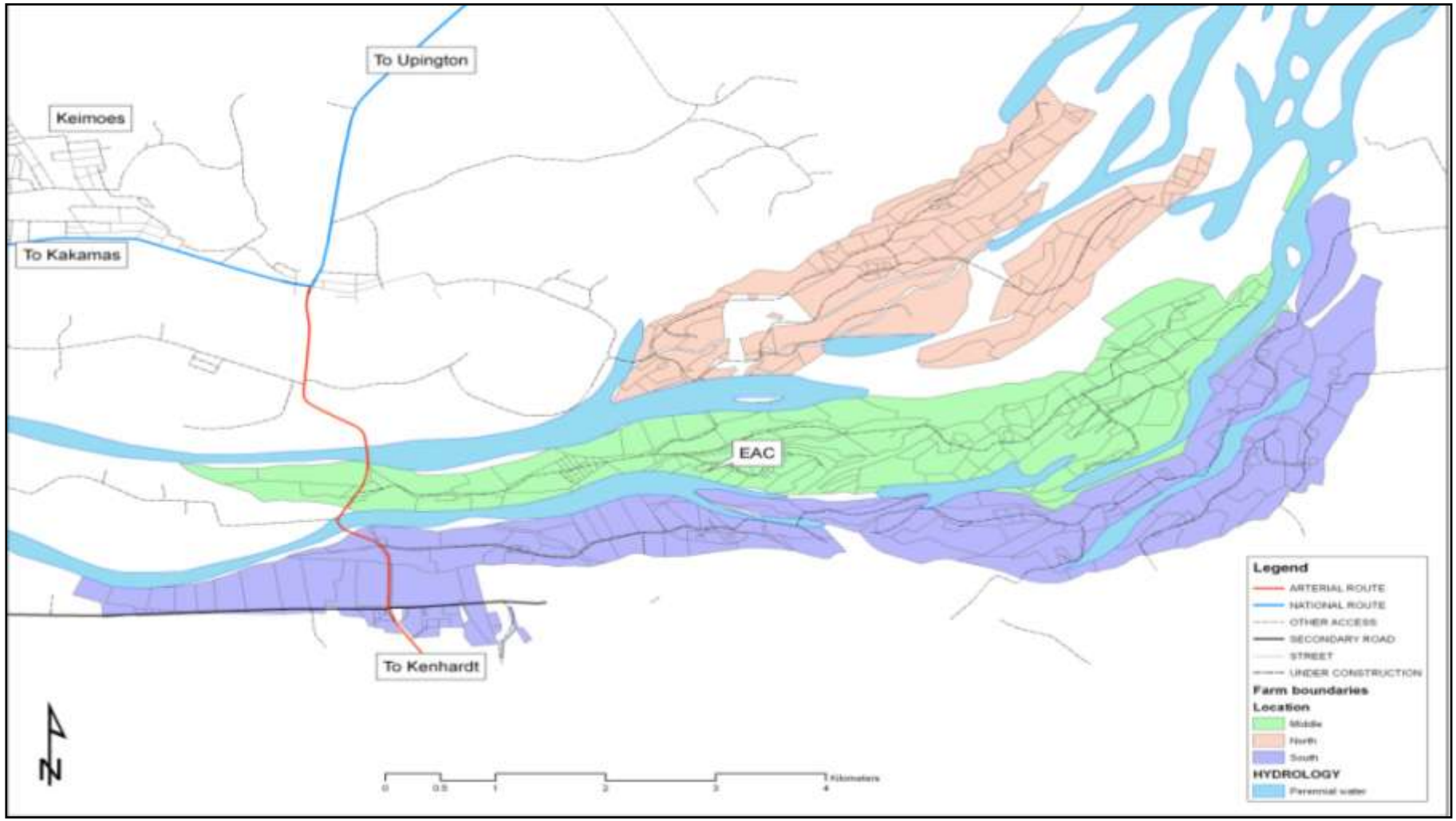

Figure 3.1: Map of Eksteenskuil near Keimoes in the Northern Cape Province of South Africa.

Eksteenskuil consist of 18 small islands due to the Orange River passing through the area. The islands are grouped into three main groupings of islands namely North-, Middle-, and South island, shown in Figure 3.1. A problem with regard to the different island groupings is that there are no roads connecting the three groupings of islands. To travel from the North island grouping to the South island grouping is only possible by travelling around the Middle island. Within the different island groupings a total area of about 367ha is farmed of which 240ha consist of grape vines (Fairtrade Foundation, 2010). Eksteenskuil consist of approximately a 100 small sized farms.

3.1.2 HISTORY OF EKSTEENSKUIL

The Eskteenskuil community is a previously disadvantaged community and is eligible for government support within the broad based Black Economic Empowerment legislation. In the 1970s the establishment of vines for raisin production was enabled by the provision of flood irrigation through a system of canals (Fairtrade Foundation, 2010).

In 1994 raisin producing farmers in Eksteenskuil formed the Eksteenskuil Farmers Association (EFA) with the purpose to assist small-scale farmers by getting access to training, encouraging other farmers to start vineyards and by supporting social development. During 1995 a relationship was formed with Traidcraft (Fairtrade Foundation, 2010). Traidcraft is a UK fairtrade company that fights poverty through trade in developing counties by continuing to influence the trade rules and business practices that have an impact on producers in these countries. Traidcraft purchased EFA raisins via the South African Dried Fruit Co-operative (SAD). However, fairtrade have certain standards that producer organisations and traders need to comply with. Due to farming association hinderers the EFA was dispersed and changed to a co-operative. In 2007 the Eksteenskuil Agricultural Co-operative (EAC) was established. The EAC has the legal status of a producer co-operative under South African law. The EAC was registered to export raisins through the fairtrade initiative as their own brand.

The fairtrade initiative allowed the Eksteenskuil farmers to export their choice grade raisins via SAD to the UK fairtrade market consequently allowing them to receive higher prices and resulting in long-term trading relationships (Fairtrade Foundation, 2010). Sales of raisins done through the fairtrade market allow them to generate better income. The EAC receives social premiums through the fairtrade initiative. The premiums have been used to finance the purchase of equipment and tools that members can hire on a daily basis at a nominal rate (Fairtrade Foundation, 2010). The premiums have also been used for the training of farmers.

3.1.3 PRODUCTION AND MARKETING ACTIVITIES

The main agricultural activities that are currently taking place in Eksteenskuil include the production of grapes, lucerne, maize, and raising livestock. Grape production currently makes out the main source of farmers' income. The grapes are used for the production of raisins, wine or grape juice.

Grapes are harvested during February and March. The grapes can be dried into three raisin varieties including Tompson Seedless raisins, Golden Sultanas and Orange River Sultanas (OR). The Eksteenskuil farmers mostly produce Tompson Seedless raisins. Only a few farmers produce Golden or OR Sultanas. Tompson Seedless raisins are produced by sun drying the grapes for a certain period of time on a cement slab. Goldens are produced by placing the sultanas on stacked drying racks that are covered with canvases, and then fumigated with sulphur dioxide smoke to produce light or dark golden coloured raisins. The different varieties are produced from the same grapes but different drying techniques are used to alter their colour and taste. After grapes have been dried they are delivered to the processor, who wash and grade the raisins into choice grade, standard grade and industrial grade. Farmers receive the highest price for choice grade raisins, an average price for standard grade raisins and a low price for industrial grade raisins. The grades are mainly determined by the sugar content present. To achieve choice grade, farmers manage their vineyard of which the most important is ensuring vines receive adequate sunlight for high sugar content, not irrigating before harvesting and testing the sugar content before harvest. Choice grade raisins are normally exported to the UK through the fairtrade initiative. Standard grade and industrial grade raisins are sold to SAD, who distributes it to bakers who uses the raisins as an ingredient in baked goods.

3.2 DATA COLLECTION

Analyses were mainly based on primary data which was obtained from raisin producing farmers using a structured questionnaire. In this section the design of the questionnaire, as well as the sampling procedure and the survey are discussed.

3.2.1 QUESTIONNAIRE DESIGN

In order to obtain relevant information from raisin producers a questionnaire (see Appendix A) was designed. A questionnaire developed by Khaile (2012) to measure Eksteenskuil farmers' technical efficiency and the determinants of technical efficiency, was used as a basis to design the questionnaire. Alterations were made to the questionnaire of Khaile (2012) to include price data of inputs as well as include sections on economic literacy. The questionnaire consists of three parts including: Socio-economic characteristics, production activities, economic decision-making.

The first part of the questionnaire includes the socio-economic characteristics of respondents. Data was collected on the socio-economic variables such as age of the respondent, gender, years of schooling, years farming experience, the total area of raisins harvested, level of specialisation, off farm income and participation in training sessions, among others. The data was collected to explore the influence socio-economic factors will have on the farmers' ability to make sound economic decisions.

The second part of the questionnaire was developed to attain information on production activities. Input data, output data, as well as the prices of inputs were needed to determine allocative efficiency of respondents. Questions were asked on inputs used, where the inputs were bought as well as the time period in which the inputs were bought. The input data included fertiliser used by farmers, chemicals used on vines, labour needed, fuel used for raisin production and transportation of raisins, and the number of irrigations throughout the production year. The various costs of the inputs used were also captured. The input distributer from who respondents bought inputs and the time of purchase were included in the questionnaire. The question on input purchase allowed the researcher to obtain input price data from the input distributer if the respondents were unsure or unable to provide price information. Most farmers deliver all their raisins to SAD. The cooperative receives a list of the volumes delivered by the farmers as well as the grades obtained from SAD. Therefore the output data needed for the study was obtained from the cooperative.

The third part of the questionnaire was developed to measure respondents' economic literacy levels. The questions were developed to explore the effect farmers' economic literacy have on the efficiency with which farmers allocate inputs when taking input prices into consideration. Questionnaires of Chizmar & Halinski (1981), Soper & Brenneke (1981) and Wood & Doyle (2002) were used as a guideline in the construction of the questions. To measure small-scale raisin producers' economic literacy a series of questions were developed on economic concepts faced within their farming practices. Economic concepts mentioned in the literature review were used as a base to compile the economic literacy questions. The economic concepts include the comprehension of the market and exchange. Analytical evaluation and simple applied economic questions were also included in the questionnaire. The simple applied economic concepts included scarcity, economic systems, and economic incentives. Considering that raisin producers export their produce and face a number of economic matters on a daily basis, questions were developed to measure respondents' ability to make important economic decisions. Understanding the exchange rate as well as current affairs surrounding the exchange rate is one of the economic matters raisin producers face. Another matter that became transparent through previous interviews was that for Eksteenskuil's farmers money is a scarce resource. Money is needed to buy timely inputs such as fertiliser, chemicals and labour. Money is also needed to invest in new grapevines before they become unproductive. Farmers should be able to make proper decisions on the allocation of their scarce resource. Eksteenskuil farmers need to be knowledgeable about credit, interest rates, least cost inputs that provide high

quality, prices for raisins from different processors, the exchange rate as well as the fairtraide premium that can be expected.

3.2.2 SAMPLING PROCEDURES AND CONDUCT

The EAC consists of approximately 60 raisin producers, located on three different islands. All of the farmers were invited to partake in the questionnaire and for their convenience farmers were requested to be present at one local interview area. The hall at the EAC offices was the selected area. Farmers came to partake in the interview at their own free will and at a convenient time. Farmers who were not able to come to the interview area, but also wanted to take part in the interviews, were interviewed at their homes at a time that was convenient for them. The duration of the interview was about 30 minutes to one hour, depending on the extra information farmers volunteered.

The data was collected during the period 20 to 22 June 2011, for the production period of 2010-2011. One senior researcher and four research assistants together with the author conducted personal interviews with the respondents. The interviewers were trained beforehand. Training was specifically focussed on the economic literacy part of the questionnaire in order to avoid misunderstanding in the interpretation of questions, as well as to avoid helping farmers with the answers to questions. Most of the respondents have previously taken part in surveys, which contributed to the smooth running of interviews. After the interviews, lunch was served at the hall at the EAC offices to everyone who participated in the survey. During lunch further networking was done with respondents to gain added knowledge about farmers and current farming practices.

3.3 CHARACTERISTICS OF RESPONDENTS

A total of 53 farmers were surveyed. Due to incomplete questionnaires and farmers not making use of important inputs, only 40 questionnaires were identified for use in this study. The following section provides information on the surveyed farmers' human capital characteristics, farm specific characteristics, and production activities.

3.3.1 HUMAN CAPITAL

An important fact that was revealed in the literature is that human capital is positively correlated with economic literacy (Jappelli, 2009). The characteristics that can describe human capital include education, experience, skill and the qualities of management that put forth a positive effect on organisational performance (Han & Lin, 2008). The first part of the questionnaire covers the human capital side of the respondents and was developed to observe the effect of the socio-economic factors on respondents' economic decision-making ability. This section is divided into two parts. Part

one shows the respondents current level of human capital while the second part shows how respondents extend their human capital level through training activities.

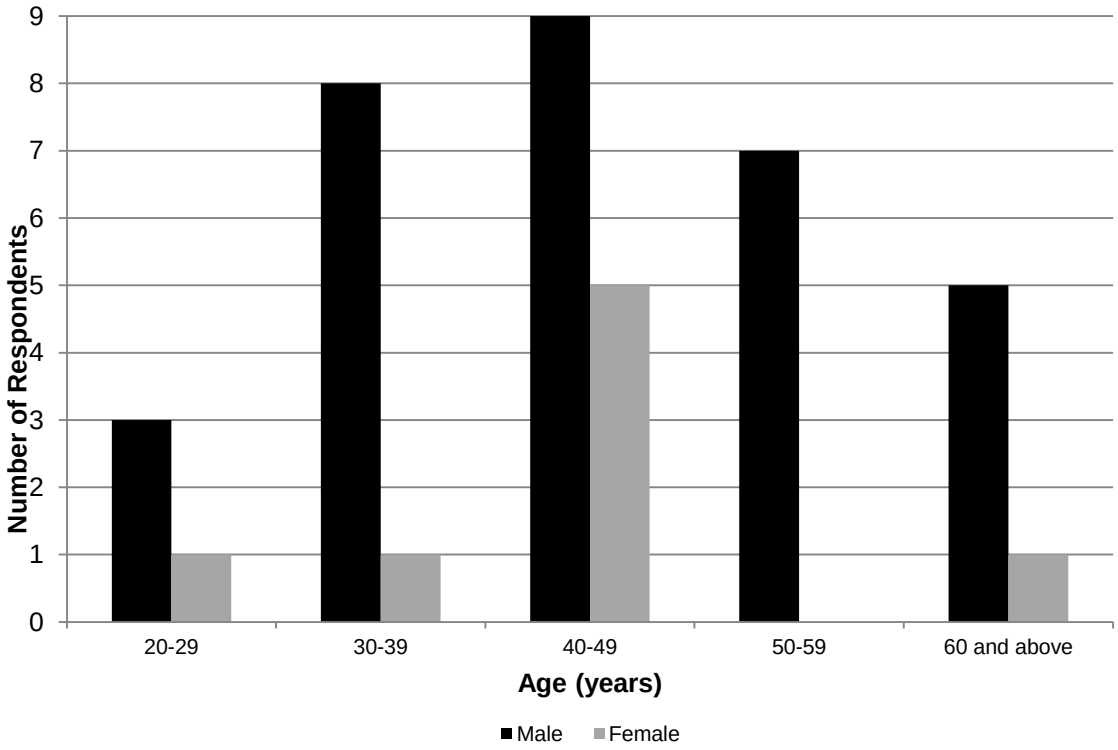

Figure 3.2: Age and Gender distribution of respondents

Figure 3.2 shows the division of age and gender of Eksteenskuil respondents. Most of the respondents are between the ages 40 and 49. Only four of the respondents were between the ages 20 and 29; indicating that the youth shows little interest in farming. The total number of raisin producing respondents consists out of eight females and 32 male respondents.

Table 3.1 show the education level of respondents. The education levels were divided into four levels including primary, secondary, high and tertiary education.

Table 3.1: Distribution of Education Levels of Respondents

Education level	Number of Respondents (n=40)	Percentage (%)
Primary	1	2.5
Secondary	9	22.5
High	29	72.5
Tertiary	1	2.5

The lowest level of education includes a three year primary education and the highest level of education is 15 years formal education. Nine respondents attained a secondary education representing the second highest percentage of respondents. Most of the respondents attended high school representing 72.5% of respondents. Out of the 29 respondents who attended high school 12 completed high school, of which one furthered his education to a three year diploma in agriculture.

Table 3.2 represents the farming experience level of respondents as well as summary statistics on farming experience.

Table 3.2: Distribution of farming experience of respondents

Faming experience in years	**Number of respondents (n=40)**	**Percentage (%)**
1-10	10	25
11-20	17	42.5
21-30	4	10
31-40	6	15
41-50	2	5
More than 50	1	2.5
Total number of respondents	40	
Average farming experience (years)	19	
Minimum farming experience (years)	3	
Maximum farming experience (years)	57	

Table 3.2 shows that most (42.5%) of the respondents has between 11 and 20 years' experience. The average farmer has about 19 years of farming experience, ranging from three years of farming experience to 57 years of farming experience. The table shows that only 25% of farmers have 10 years or less experience. Over all, the farmers show high levels of experience in farming since 75% of the sampled farmers have more than 10 years' experience.

Eksteenskuil farmers are readily exposed to various training sessions and farmer days to expand their knowledge and skills and consequently expand their human capital level. The fairtrade premium received through the fairtrade initiative is used to fund some of the training sessions. One of the important training sessions for Eksteenskuil farmers included training presented by Sandra Kruger and Associates. The training included a one year skills program on recordkeeping and communication, fund-raising for vineyard development and mentorship. Farmers who took part in the training session were requested to keep all receipts on all purchases for farming purposes. Training was presented on how to compile financial statements by making use of the kept receipts.

In the questionnaire farmers where questioned on their participation in the recordkeeping course, as well as the extent to which they applied what they have learned. Table 3.3 provides summary statistics on farmers' participation in training:

Table 3.3: Summary statistics on attendance and application of the recordkeeping course and farmer days.

	Mean	Standard Deviation
Recordkeeping course attendance (Yes=1/No=0)	0.55	0.50
Recordkeeping course application (1-5)	2.15	2.01
Farmer Days attended (1-6)	2.78	2.12

Out of all the respondents 22 attended the recordkeeping course, representing 55% of the respondents. The respondents were asked to rank how they applied what they have learned at the recordkeeping course on a scale of one to five. The average application gives an indication of how well the average respondent was able to apply what have been learned. According to the table the average respondent's ability to apply what they have learned was below 50%. On average, farmers attended almost three of the six farmer day training sessions held throughout the production season, showing that training sessions are being supported by the farmers.

3.3.2 FARM SPECIFIC

Eksteenskuil farmers manage small hectares of land. Almost 60% of farmers in the area farm on less than five hectares of arable land. The average farm is about six hectares in size ranging from half a hectare to 46 hectares. Most of the Eksteenskuil raisin producers farm on only two hectares of land. Various farming activities take place within Eksteenskuil. Most of the enterprises consists of production of raisins, grapes for wine, crop rotation and livestock. Other farming activities are also practiced by Eksteenskuil farmers, but only on a small-scale. Table 3.4 provides summary statistics on the income distribution among farming activities as well as specialisation in farming activities.

Table 3.4: Summary statistics on income distribution and specialisation in farming activities

Farming Activities	Mean Contribution (%)	Standard Deviation	Minimum	Maximum
Raisins	73.53	26.05	10	100
Wine	3	10.11	5	60
Crop rotation	7.95	10.21	5	40
Livestock	2.05	5.51	2	25
Other farming activities	2.5	12.40	25	75
Off farm income	10.98	23.09	1	80
Specialisation	72	18.00	35	100

According to Table 3.4 on average 73.53% of respondents' income comes from raisin production. The minimum income from raisin production is 10 percent, indicating that not all farmers' main source of income comes from raisin production. The table shows that raisin production is the most important source of income for Eksteenskuil farmers. On average off farm income includes about 11% of respondents' income. From the 40 respondents, 14 receive income from sources other than farming activities. Off farm income sources include income from being employed as a teacher, an officer of the law, a paramedic and ownership of another business, among other. Most of the respondents receive income from more than one farming activity. A calculation was made to determine the degree of specialisation on respondents' farms. The calculation was made whereby the proportional contribution of each enterprise to the total income was squared and then added together, giving a heavier weight to the more specialised respondent. Only raisin farmers were included in the study, so a specialisation index of 100% implies a farm that is fully specialised in raisin production. Six of the respondents were 100% specialised in raisin production. The average farm has a specialisation index of about 72%, and the least specialised farm among the respondent is 35%.

Grapevines have an economic lifespan of about 25 years (Kok, 2008). Grapevines older than 25 years of age shows a steady decrease in grape production while newly established grapevines must be at least four years of age before grapes can be harvested. Table 3.5 provides the age distribution of the harvested grapevines for the production season.

Table 3.5: Age distribution of the grapevines harvested during 2010/2011 season

Age	Total Hectares	Percentage of hectares
< 4 years	10.7	4.83
5 to 10 years	39.24	17.72
11 to 24 years	80.9	36.54
>25 years	99	44.72
Total area harvested	221.39	100

Table 3.5 shows that of the 221.39 ha harvested almost 45% of the vines are older than 25 years of age. Grapevines older than 25 years of age show the highest percentage of the total area harvested. The second highest percentage of vines is between the age of 11 and 24 years consisting of 80.9 ha of grapevines. Newly established vines consist of only 10.7 ha, while 99 ha of old vines need to be replaced. The age distribution of the vines shows that farmers need to acquire finances in order to replace old vines to ensure high volumes of raisin production in the future.

Taking the above mentioned characteristics into consideration it is apparent that farmers need to make important and rational decisions every day. Successful and sustainable farming depends on the management skills and rational decisions making of farmers.

3.3.3 RAISIN PRODUCTION

Raisin production features multiple outputs and inputs. The multiple outputs include different types of raisins like Tompson-, Golden- and OR raisins. Multiple inputs are needed to produce the different types of raisins; these are water, fertiliser, chemicals, labour and fuel. In order to calculate cost efficiency, raisin outputs were needed as well as inputs usage and their related cost. For the purpose of the study, outputs and inputs included consist of the most important inputs farmers purchase, as well as the most important output farmers sell.

3.3.3.1 Production Outputs

Raisin producing farmers need to make a decision on the type of raisins to produce. Farmers can either produce Tompson, Golden or both. Both of the raisin varieties were included in the efficiency analysis. The volume of raisins that was delivered for the production season was obtained from the processor, making output data reliable. In order for meaningful comparison among farmers with different land sizes, output was measured in kilogram per hectare (kg/ha). Table 3.6 represents descriptive statistics on raisins produced by the surveyed farmers.

Table 3.6: Summary Statistics on Tompson and Golden raisins produced during the 2010/2011 production season

	Unit	Mean	Standard Deviation	Minimum	Maximum
Tompson raisins	kg/ha	1419.47	965.03	210	4818
Golden raisins	kg/ha	283.84	744.05	0	3543.68

According to Table 3.6 not all farmers produce Golden raisins since the minimum value is zero, while the minimum value of Tompsons produced is 210kg/ha. Only nine of the 40 respondents produced Golden raisins. Respondent producing Goldens also produced Tompsons. All the respondents produced Tompsons. The average production of Golden raisins are 283.84kg/ha while the average production of Tompson raisins are 1419.47kg/ha. The maximum amount of Tompsons produced among the respondents were about 4800kg/ha while the minimum was 210kg/ha. The maximum amount of Goldens produced was about 3500kg/ha.

3.3.3.2 Production Inputs

Production inputs used by farmers include fertiliser, chemicals, labour, fuel as well as water. Both the quantities and the corresponding prices of inputs were needed to measure cost efficiency. Table 3.7 represents descriptive statistics on inputs used to produce raisins as well as the inputs used to estimate cost efficiency.

Table 3.7: Summary Statistics on production inputs used in raisin production during the 2010/2011 season

	Unit	Mean	Standard Deviation	Minimum	Maximum
Nitrogen	kg/ha	40.66	40.57	0.64	185
Phosphate	kg/ha	14.44	28.69	0.49	185
Potassium	kg/ha	22.21	31.94	0.79	185
Labour	Labour days/ha	220.07	254.07	20	1570
Fuel	l/ha	189.26	235.82	7	1000
Water	Nr of irrigations	18.95	6.22	9	33

- **Fertiliser**

Fertiliser can be purchased in many different forms. In order to ease cost efficiency calculation the most important elements critical to vine growth in fertiliser were identified. Eksteenskuil farmers use organic fertiliser, inorganic fertiliser or both organic- and inorganic fertiliser. Organic fertiliser used by the farmers consists of sheep- and/or cattle manure. Inorganic fertiliser consists out of fertiliser bought from local stores or fertiliser agents. The identified elements include nitrogen (N), phosphate (P) and potassium (K). Organic fertiliser contains N, P and K in small quantities. Inorganic fertiliser contains higher quantities of N, P and K depending on the N, P and K ratio within the fertiliser mixture. Nitrogen is the most generally required nutrient and consequently important for vine growth (Fertiliser Handbook, 2007). Phosphate is important for fruit quality and disease resistance. Potassium is important for quality of the grape and the sugar content of the grape. N, P and K, was measured in kg per ha given to the vines throughout the production period. Table 3.7 shows the average nitrogen, phosphate and potassium used by respondents throughout the production season are 40.66kg/ha, 14.44kg/ha and 22.21kg/ha respectively. The lowest level of nitrogen, phosphate and potassium used is 0.64kg/ha, 0.49kg/ha, and 0.79kg/ha respectively. The maximum nitrogen, phosphate and potassium usage is 185kg/ha for all three, pointing to the respondents using inorganic fertiliser.

Respective price per kg was calculated for nitrogen, phosphate and potassium. Cost of manure, for farmers using manure from their own livestock enterprise, was calculated on an opportunity cost basis. The cost of sheep manure is more expensive than cattle manure. The associated cost of N, P and K of sheep manure were calculated at a cost of R0.67/kg and that of cattle manure were calculated at a cost of R0.33/kg.

As previously mentioned respondents can use inorganic fertiliser, manure, or a combination of both. Table 3.8 gives an indication of fertiliser usage among the surveyed respondents.

Table 3.8: Summary Statistics on Fertiliser choice of respondents

	Mean (%)	Standard Deviation	Number of Respondents (n=40)
Manure	0.45	0.504	18
Inorganic fertiliser	0.3	0.464	12
Combination (manure and inorganic fertiliser)	0.25	0.439	10

Manure is the most popular among the respondents, with 18 out of the 40 respondents using manure, 12 respondents use inorganic fertiliser and ten of the respondents use a combination of manure and inorganic fertiliser nine respondents used cattle manure of which one respondent used only cattle manure, two used cattle manure in combination with inorganic fertiliser, and six used cattle manure in combination with sheep manure.

The rest of the manure using respondents used sheep manure. A premise was formed that specialisation will have an effect on fertiliser choice of farmers, because of the observed fertiliser usages among respondents. A Fischer Exact Test was conducted to explore the notion. Although a correlation existed between fertiliser use and specialisation no statistical differences was detected.

- **Chemicals**

Eksteenskuil farmers apply a number of chemicals in order to control pests, fungus and weeds. Chemicals can be bought from the cooperative, from local stores or from chemical agents. Popular chemicals used by farmers include Sulphur Phosguard, Roundup, Bladbuff, Dithane, Rubigan, and Mamba, to name a few. Chemicals were not included in the cost efficiency analysis since chemicals do not directly alter quality and quantity of raisins. An increase in chemical application appears to not increase raisin production.

- **Labour**

Raisin production is very labour intensive, making labour an important input for Eksteenskuil farmers. Labour includes both hired labour and family labour. Labour can further be divided into two categories, permanent labour and seasonal labour. Seasonal labour includes labourers used for pruning the vines and harvesting the grapes. For the purpose of the study labour was measured in labour days per hectare (labour days/ha) worked, as respondents could more easily recall the amount of days the employees worked rather than the hours worked. Summary statistics on labour usage are presented in Table 3.7. The average labour days per hectare are 220.07 days while the least used labour days per hectare is 20 days and the most used labour days per hectare is 1570 days. Most of the farmers do not pay for family labour, and when paid, family labourers are paid less than the required minimum wage. The reason farmers gave for not paying family labour is that all family members share in the farm income. The cost of labour were calculated, for each individual farm by making use of a weighted average wage paid, across all the different forms of hired labour,

for the production season. The going rate for hired labour for the production season was between R65 and R75 per day.

- **Fuel**

Raisin farmers use fuel in some of the production processes regarding raisin production. Farmers are responsible for transporting their raisins to the processor which increases fuel expenses. Fuel represents the litres per ha that is used by the farmer throughout the production season. Table 3.7 shows the average use of fuel by respondents is 189.26l/ha with a minimum of 7l/ha fuel used and a maximum of 1000l/ha fuel used. The fuel price per litre for the production season was used in the cost efficiency analysis. The fuel price can stay stable for a certain period of time and fuel was calculated at R8.85 per litre.

- **Water**

Water is a very important input for raisin production. The irrigation type used by the surveyed farmers is flood irrigation. Water was measured in number of irrigations throughout the entire season. Farmers irrigate less in the winter than during the summer. No irrigation takes place during the harvesting period. According to Table 3.7 the average number of irrigations is about 19 times throughout the production season. The least number of irrigations is nine times throughout the production season, representing farmers irrigating only once a month. The most number of irrigations is 33 times throughout the production season, representing farmers irrigating almost once a week. Water however where not included in the cost efficiency analysis, since farmers do not currently pay for water use.

3.4 SUMMARY

Identifying factors that could affect the profitability of small-scale farms is of great importance to provide farmers and policy makers with correct and relevant advice to support and expand farms. Production variables that were measured were selected from interactions with raisin producers and from given information of raisin production practices. Socio-economic factors were measured by making use of relevant literature and from interaction with knowledgeable individuals on raisin production. Dealing with small-scale farmers some data limitations were experienced. In general the farmers do not keep thorough records concerning their farming activities, so data gathered during interviews was based on the recollections of farmers. Another important constraint on the study was that Eksteenskuil was subjected to two floods within the specific production season of data measurement that can impact results obtained.

From the measured socio-economic factors of Eksteenskuil farmers, it was found that typically the respondents are older farmers with relative high levels of experience. Most of the farmers attended high school even though not all of them completed high school. The farmers of Eskteenskuil receive most of their farming income from raisin production.

The next chapter consists of methods used to measure cost efficiency and methods applied to measure economic literacy of respondents. Methods to measure the effect of economic literacy on the calculated cost efficiency as well as methods to measure socio-economic factors' influence on economic literacy are discussed.

CHAPTER 4

METHODOLOGY

The aim of this chapter is to describe all the working procedures used within the study. The chapter consist of four main sections. The first section provides support for the model chosen to measure cost efficiency as well as the specification of the model. The second part provides the measures developed and used to measure the economic literacy levels of respondents. The third section provides justification and specification of the model to determine whether or not economic literacy has an effect on cost efficiency. The fourth section provides rationalisation and specification of the models used to determine the socio-economic factors influencing economic literacy.

4.1 ESTIMATION PROCEDURES OF ALLOCATIVE EFFICIENCY

The first sub-objective was to quantify allocative efficiency of the respondents. The most widely used approaches to measure efficiency are Stochastic Frontier Analysis (SFA) and Data Envelopment Analysis (DEA). Studies that have compared DEA and SFA as measures of efficiency have found that these methodologies are highly correlated (Sharma, Leung & Zaleski, 1999). However, since the sample size of the Eksteenskuil raisin producers is small, the DEA approach was chosen to quantify allocative efficiency.

4.1.1 DATA ENVELOPMENT ANALYSIS

DEA is a non-parametric data-based methodology that was initially offered by Charnes, Cooper & Rhodes (1978) who extended past work done by Farrell (1957). Farrell (1957) developed a relative efficiency concept, where efficiency of a decision-making unit (DMU) can be evaluated by comparing it to other DMUs in a given group. Charnes, Cooper & Rhodes (1978) extended Farrell's (1957) model by incorporating many inputs and outputs simultaneously. The model is called the CCR (Charnes, Cooper and Rhodes) model and the non-parametric model provides measures of best practice efficiency (Omonoma, Egbetokun & Akanbi, 2010).

According to Frija, Speelman, Chebil, Buysse & van Huylenbroeck (2009) the DEA method defines efficiency as the ratio of weighted sum of outputs for a given decision-making unit (DMU), to its weighted sum of inputs. DEA allows the weights to vary for each farm in such a way that each individual farm's performance compares in the most favourable way with the remaining farms. DEA

methodology produces a distance function referring to the distance of inputs used and outputs attained to a benchmark input and output set (Ozkan, Ceylan & Kizilay, 2009). In doing so DEA provides a simple way of calculating the gap between a producers' practice and the best practice of the group. Speelman *et al.* (2008) stated that DEA is based on the notion that a DMU can be considered efficient when it can produce the same amount of output as another DMU while using less input. The efficiency frontier of a group of DMUs will be calculated where a DMU lying on the frontier will have an efficiency score of one. The inefficiencies of the other DMUs will be measured against the best performing DMU (Frija *et al.,* 2009).

DEA can be measured by either assuming constant returns to scale (CRS) or variable returns to scale (VRS). CRS assumes that there is no significant connection between efficiency and farm size (Frija *et al*., 2009). The first DEA model assumed CRS, which implies that if input is increased by a certain amount output will increase by a proportional amount (Frija *et al.,* 2009). However in practice this is not always the case and a VRS option should be considered when measuring efficiency. The first DEA model that assumed VRS was developed by Banker, Charnes & Cooper (1984) and was called BCC (Banker, Charnes and Cooper) model. Considering the data obtained for the study and the market respondents operate in, VRS was used.

4.1.2 SPECIFICATION OF THE DEA MODEL TO QUANTIFY ALLOCATIVE EFFICIENCY

Allocative efficiency was measured in terms of cost efficiency since the small-scale raisin producers of Eksteenskuil receive the same price for their raisins, while the input cost differ from producer to producer. Cost efficiency and allocative efficiency will be used interchangeably for the rest of this study as cost efficiency is the preferred measure of allocative efficiency. The input and output variables used to estimate cost efficiency, include N, P, and K, representing fertiliser (Organic and Inorganic) used by farmers, labour and fuel. N, P and K were measured in kilograms per hectares and the respective prices were measured Rand per kilogram used. Labour was measured in labour days per hectare for the entire season and the price includes the Rand per labour day, paid. Fuel was measured in litres per hectare used and the fuel cost was measured in Rand per litre.

In the present study cost efficiency was evaluated by using variable returns to scale as demonstrated by Cooper, Seiford & Tone (2006) and Coelli (1996). The GAMS (General Algebraic Modelling System) model, presented by Rosenthal (2011), used to estimate cost efficiency is specified in Equation one and two. Calculating cost efficiency entails two steps. The first step was to calculate minimum possible production cost represented in Equation one.

$$
\begin{aligned}
& cx^{*} = \min cx \\
& Subject\,to: \\
& x_{ijo} \geq \sum_{j=1}^{n} x_{ij}\lambda_j; \qquad (i = 1,\ldots\ldots,I) \\
& y_{pjo} \leq \sum_{j=1}^{n} y_{pj}\lambda_j; \qquad (p = 1,\ldots\ldots,P) \\
& \sum_{j=1}^{n} \lambda_j \leq 1 \qquad (j = 1\ldots\ldots,J) \\
& \lambda_j = 0;
\end{aligned}
\tag{1}
$$

where cx^{*} indicates the minimum possible cost of production and cx is the actual cost of production The cost of producing output y should be minimised. The group of DMUs is represented by $j = 1,\ldots\ldots,J$ and j_0 represents the current DMU. While x_{ij} (input vector) indicates the level of input i consumed by DMU j, c indicates the price of inputs used, y_{pj} (output vector) indicates output p produced by DMU j and λ_j indicates non-negative weights or intensity variable defining frontier points.

The second step in calculating cost efficiency entails the calculation of the actual cost of production for DMUs. Cost efficiency is determined by the ratio between the minimum possible production cost, calculated in equation one, and the actual cost of production. Equation two represents the calculation for cost efficiency, where θ is the ratio between the minimum possible cost of production and the actual cost of production. The value of the ratio θ of DMU j, lies between zero and one, where a fully efficient DMU receives a cost efficiency score of one. The efficient farm thus produces output at least cost.

$$
\theta = \frac{cx^{*}}{cx} \tag{2}
$$

Within the next section the focus shifts to the quantification of economic literacy levels of respondents given the hypothesis that economic literacy will influence allocative efficiency.

4.2 ESTIMATION PROCEDURES FOR ESTIMATING ECONOMIC LITERACY

Economic literacy of small-scale raisin producers was measured based on the responses to questions that are used as a proxy for economic literacy. Economic literacy questions and measuring methods were based on an economic literacy questionnaire developed by Soper (1979), Chizmar & Halinski (1981), Soper & Brenneke (1981) and Wood & Doyle (2002). The compiled questions

included some fundamental economic concepts discussed in the literature. The economic literacy questions included in the analysis comprise of the supply-, the demand-, the exchange rate-, the prime interest rate-, the transport cost- and the input choice-, questions (see part 3 of **Appendix A**). The economic literacy questions were compiled in order to measure respondents' general knowledge, understanding and simple application of economics. The economic concepts included within the questions are economic incentives, scarcity and economic systems. The economic literacy questions were divided into two groups.

The first group, the applied economic concepts group, includes economic literacy questions measuring the respondents' understanding and simple application of economic concepts within certain farming situations. The group consists of two economic literacy questions. The first economic question is the transport question. The economic concept included within the applied question is the economic incentive concept. Economic incentives influence human behaviour by rewarding individuals financially. The transportation question offers respondents' hypothesised higher prices for selling their raisins to another processor further away. A scenario was given to farmers with the option to sell to a processor other than the one they currently sell their raisins to. The option of selling to a processor 50km away offering a higher price was given. Farmers have to deliver the raisins to the new processor at their own expense. Four possible higher prices for choice grade raisins were given within the scenario. The transportation question was compiled to test whether or not respondents know the cost to transporting raisins, as well as if farmers would consider it if a higher price for choice grade raisins were offered by a processor further away. The cost to transport raisins for the 50km was calculated to be 24c per kg raisins. The first and second increase in choice grade raisin given was 10c and 20c respectively, which is below the cost of transport. If farmers would want to sell at the first and second increase in price they would be worse off. The third and fourth increase in choice grade raisin given was 30c and 40c per kg respectively, indicating that from the third higher price transport cost will be covered and farmers will improve profit by selling to the new buyer. Farmers would be acting rationally and in their own best interest by selling to the new processor if a 30c per kg increase in raisin price were offered.

The input choice question is the second question classified under the applied economic concepts group. The question included scarcity and economic systems. Scarcity refers to the limited resources available and economic systems are the organised way to determine how scarce production resource should be allocated. The scarce resource within the input choice question is funds. Respondents were asked which of the four important inputs: water, fertiliser, labour or chemicals they would buy if they only had enough money for one input. The input they would buy second if they had enough money for two inputs. The question was continued until all four inputs where purchased. This question ranks the importance of inputs form one to four, were four is the most important to the respondent and one is the least important to the respondent. The question was asked to determine how respondents will allocate their scarce funds among important inputs.

The second group included the question on the respondent's general economic perception and comprehension. Comprehension on the market is included in the supply- and demand questions. In the supply question respondents were asked what they expect would happen to the price received for raisins if a normal harvest occurs with few buyers for raisins. Four options were given and respondents had to choose the correct one. The demand question was handled in the same manner only the question was if the harvest was small with a lot of buyers in the market for raisins. The exchange rate question includes the comprehension of the exchange economic concept. The exchange rate question included both the R/Pound exchange rate and the R/Dollar exchange rate for the specific day of questionnaire completion. Respondents were asked what the current exchange rate was. Respondents were also asked if they knew what the prevailing prime interest rate is.

In order to get an indication on how farmers performed with the economic literacy questions, the answers were graded. The grading techniques of Soper (1979), Chizmar & Halinski (1981), Soper & Brenneke (1981) and Wood & Doyle (2002) were also adopted in order to grade respondents' economic literacy. The questions were graded by giving respondents a one for each question answered correctly and a zero for each question answered incorrectly. Four possible answers were given for both the supply and demand questions of which only one was the correct answer. The exchange rate question got a one if a respondent knew the current exchange rate or was not more than 30 cents out both ways. The prime interest rate question got a one if respondents knew the prevailing prime interest rate or was out with not more than two percent both ways.

Within the applied economic concept group, the transportation question was accepted as correct, and got a grade of one, if respondents were willing to sell to the new processor from the third increase in price. If they were not willing to sell, or if they chose to sell from price increase one or two, the question was graded with a zero. The second question within this group presented to respondents is different than the other economic literacy questions as there was no correct or incorrect answer and thus could not be graded.

The overall economic literacy index was determined by adding all economic literacy questions that was graded by either zero or one. The final score of economic literacy together with the input ranking question were used as the final economic literacy index. Next the procedures used to determine the relationship between economic literacy and allocative efficiency will be discussed.

4.3 PROCEDURES TO DETERMINE ECONOMIC LITERACY FACTORS AFFECTING COST EFFICIENCY

After the cost efficiency scores were calculated, the next step was to identify the economic literacy determinants of inefficiency. The cost efficiency scores were used as the dependent variable. The results for questions asked on economic literacy were regressed against the efficiency scores to identify if economic literacy significantly influences cost efficiency levels of producers.

4.3.1 ECONOMIC VARIABLES HYPOTHESISED TO INFLUENCE ALLOCATIVE EFFICIENCY

The economic literacy variables that were hypothesised to influence cost efficiency include the question on transport, the demand question, knowledge of the exchange rate, knowledge of the prime interest rate and the question on which farmers had to demonstrate how they will allocate their production capital. Table 4.1 shows the economic literacy variables used to determine the effect on cost efficiency, as well as the expected direction of the influence economic literacy variables will have on cost efficiency.

Table 4.1: Economic literacy variables hypothesised to influence allocative efficiency, measurement index and expected signs

Variable	Measurement Index	Expected sign
Overall Economic literacy index	Economic literacy questions added together	+
Transport	1 if answered correctly, 0 if answered incorrectly	+
Demand	1 if answered correctly, 0 if answered incorrectly	+
Exchange rate	1 if answered correctly, 0 if answered incorrectly	+
Prime interest rate	1 if answered correctly, 0 if answered incorrectly	+
Water	Scale of 1 to 4 with 4 being most important	-
Fertiliser	Scale of 1 to 4 with 4 being most important	+
Labour	Scale of 1 to 4 with 4 being most important	+

Table 4.1 shows that the overall economic literacy score, transport, demand, exchange rate and prime interest rate are hypothesised to have a positive effect on cost efficiency. Economic literacy was hypothesised to have an effect on how farmers make decisions on input usage and thus will influence the cost efficiency with which farmers produce. The higher the overall economic literacy index, the more allocative efficient the respondents will be. Transport, demand, exchange rate and prime interest rate represents farmers' economic literacy, indicating that farmers answering the questions correctly are more economic literate and will in turn positively influence their cost efficiency. Respondent were expected to rank fertiliser as an important input, because fertiliser plays an important role in quality and volume of raisin production. The importance of fertiliser as an input was hypothesised to have a positive effect on cost efficiency. How important farmers rated water was expected to have a negative effect on cost efficiency. Farmers do not pay for water and therefore it is expected that the more important farmers rated water the less cost efficient they would be. Labour is also considered to have a positive effect since farmers will not be able to sell a timely product if the labourers did not help with the harvesting. Chemicals were not included in the analysis since water-, fertiliser- labour- and chemical choice is perfectly correlated.

Next the specification of the regression model used in order to determine the relationship between economic literacy and allocative efficiency is discussed.

4.3.2 MODEL SPECIFICATION TO DETERMINE ECONOMIC LITERACY VARIABLES AFFECTING ALLOCATIVE EFFICIENCY

Allocative efficiency ranges for zero to one and is censored from above. The Tobit model is a censored regression model and for this reason was considered to analyse the effect economic literacy will have on cost efficiency. The hypothesised economic literacy questions used as a proxy for economic literacy were regressed against the efficiency scores obtained, making the cost efficiency score the dependent variable.

The Tobit model was first proposed by Tobin (1958) and originated in the context of linear regression analysis (cross-sectional data). Tobit Regression is used when the dependent variable is bounded from below or above or both (Hoff, 2007). Positive probability load exists at the interval ends, either by being censored or by being corner solutions. Censored observations that fall outside the limiting interval are recorded as the border value, while corner solutions are by nature limited from below or above or both with a positive probability at the interval ends.

Greene (2008) and Lu (2006) specify the Tobit as:

$$\theta_i^* = z_i^{'}\beta + \varepsilon_i \tag{3}$$

Subject to:

$$\begin{aligned} \theta_i &= \theta_i^* if\ 0 < \theta_i^* < 1 \\ &= 0 if\ \theta_i^* < 0 \\ &= 1 if\ \theta_i^* > 1 \end{aligned} \tag{4}$$

Where for farm i, we represent the original scores of cost efficiency as θ_i^*, the censored scores of cost efficiency by DEA as θ_i, β the parameter of interest, and economic literacy scores as z.

Given the importance of economic literacy on allocative efficiency, the next section provides procedures to explore the characteristics that will contribute to higher levels of economic literacy.

4.4 PROCEDURES TO ESTIMATE SOCIO-ECONOMIC FACTORS INFLUENCING ECONOMIC LITERACY

The literature shows that various socio-economic factors influence the economic literacy of individuals. The next step in the analysis was to identify the socio-economic determinants of farmers

that influence economic literacy. All the economic literacy questions found to significantly affect cost efficiency were each used as the dependent variable of their own regression analysis. Specified socio-economic factor of respondents are regressed against each economic literacy variable to determine the socio-economic effect on each proxy for economic literacy. The same socio-economic variables were used in all the regression models.

4.4.1 SOCIO-ECONOMIC VARIABLES HYPOTHESISED TO INFLUENCE ECONOMIC LITERACY

The socio-economic factor hypothesised to affect farmers' economic literacy include years of schooling, farming experience, income from another source other than farming, participation in the recordkeeping course, application of recordkeeping on the farm, farmer days attended, specialisation in raisin production and the area of raisins harvested. The objective of this particular part of the study is to quantify the relationship between the farmer's characteristics and the probability of responding in the correct manner to the economic literacy questions and thus determining the socio-economic factors that will influence the farmers' ability to be cost efficient. Table 4.2 gives an indication to the expected effect of socio-economic variables on economic literacy.

Table 4.2: Socio-Economic variables, measurement index and expected signs

Variable	Measurement Index	Expected sign
Education	Number of years	+
Farming experience	Number of years	+
Off farm income	1 if yes, 0 if no	+
Recordkeeping course attendance	1 if yes, 0 if no	+
Recordkeeping course application	Scale of 1 to 5	+
Farmer days	Number of sessions attended	+
Specialisation	Specialisation index	+
Area harvested	Hectares of land	+

Table 4.2 shows that all of the hypothesised characteristics of the farmers are expected to have a positive effect on farmers' economic decision-making ability. The table shows that education, farming experience, attending the recordkeeping course, application of the recordkeeping course and attending farmer days are expected to positively affect economic literacy. The reason for these hypotheses is because, according to the literature education, experience and training were found to positively influence an individuals' economic literacy ability. Income from a source other than farming is expected to positively influence economic literacy of individuals. The reason for this is because income from a source other than farming generally is associated with training in order to execute the occupation. Specialisation is expected to positively influence economic literacy since farmers specialising in a product are expected to contain the best knowledge of the product as well as make better economic decisions. The more specialised a respondent is the bigger the loss if wrong production decisions are made, since the biggest part of the respondents income will come from the

specific enterprise. The area harvested is expected to positively affect economic literacy because the bigger the area, the more farmers will lose if poor decisions are made.

4.4.2 SPECIFICATION OF REGRESSION MODELS TO IDENTIFY FACTORS AFFECTING ECONOMIC LITERACY

Most of the economic literacy questions are measured as a binary variable, where a one is given for the correct answer and zero for the incorrect answer. However the question on the allocation of money as a scarce resource between inputs is measured on a scale from one to four, where four is most important and one is least important. In order to measure the effect socio-economic factors have on the different economic literacy questions different regression models were needed.

- **Probit model**

The economic literacy question consist of only two possible outcomes, zero or one, the Binary Probit Statistical Model was chosen to regress the socio-economic factors on economic literacy. The Probit model is an econometric model where the dependent variable is discrete (e.g., 0 or 1) and the independent variable can be discrete or continues (Aramyan, Oude Lansink & Verstegen, 2007). A simple linear regression will be inappropriate, since the implied model of the conditional means places inappropriate restrictions on the residuals of the model.

Equation five represents the Probit statistical model. The Probit model expresses the probability P_i, that the dependent variable takes the value one as a function of your independent variables.

$$P_i(z_i = 1 \int p_i \beta = 1 - \Phi(-p_i' \beta) \quad (5)$$

Where $z_i = {}^{1}_{0}$-depending if individual i answered correctly or not, p_i is a vector of personal and farm characteristics for farmer i, β is a vector of coefficients, and Φ is the cumulative normal probability distribution.

- **Ordinary Least Squares**

Ordinary Least Squares (OLS) was used to analyse farmers' characteristics that will affect the outcome of ranked economic literacy questions. OLS is a statistical technique that uses sample data to estimate the true population relationship between two variables (Gujarati, 2003).

The linear models estimated using OLS are of the form:

$$Z_i = t_i \beta + u \quad (6)$$

Where Z_i is the ranked economic literacy variable of respondent i, t_i is the socio-economic characteristic of the farmers i, β is the corresponding vector of coefficients and u is the normally distributed error term with mean zero and variance σ^2 ($\sim N(0, \sigma^2)$).

The presentation of the regression models to identify the socio-economic characteristics that influence economic literacy concludes the procedures that were followed to meet all of the sub-objectives. The results of the relevant analyses are presented and discussed in Chapter five.

CHAPTER 5

RESULTS AND DISCUSSION

This chapter presents the results of the analyses as well as a discussion of the results. The chapter is divided into four sections. In the first section the cost efficiency results are presented. The second section presents the findings on the economic literacy levels of small-scale raisin producers. Within the third section the relationship between cost efficiency and economic literacy are presented to determine the extent to which economic literacy will influence the ability of small-scale producers to produce at a cost minimising input combination. Finally the socio-economic factors affecting economic literacy are presented and discussed in the last section as such information may contribute to the improvement of economic literacy levels of small-scale producers.

5.1 COST EFFICIENCY OF RAISIN PRODUCERS IN EKSTEENSKUIL

The aim of this section is to present and discuss the distribution of the cost efficiency scores of the sample of Eksteenskuil raisin producers. Cost efficiency was calculated by comparing the minimum possible cost of production with the actual cost of production. The cost efficiency scores are restricted to an interval between zero and one, where one is efficient and zero is inefficient. Summary statistics on the cost efficiency results are presented in Table 5.1.

Table 5.1: Summary statistics of cost efficiency estimates of the raisin producers in Eksteenskuil

Summary Statistics	
Mean	0.347
Standard deviation	0.308
Minimum	0.042
Maximum	1

Table 5.1 shows that respondents in Eksteenskuil exhibit a wide range of cost efficiency scores, ranging from 0.042 to one. The distribution of the sample skews toward the left with a very low average cost efficiency of 0.347. The average cost efficiency indicates that the average respondent can produce the same product at almost 35% of the cost and hence increase profits by 65%. Thus most of the farmers can drastically reduce their cost of production, and in turn increase their profitability. Only a few farmers had an efficiency score of one, which indicated that they produce at

minimum cost given their respective input prices. The cumulative probability distribution of cost efficiency scores across the sample are presented in Figure 5.1.

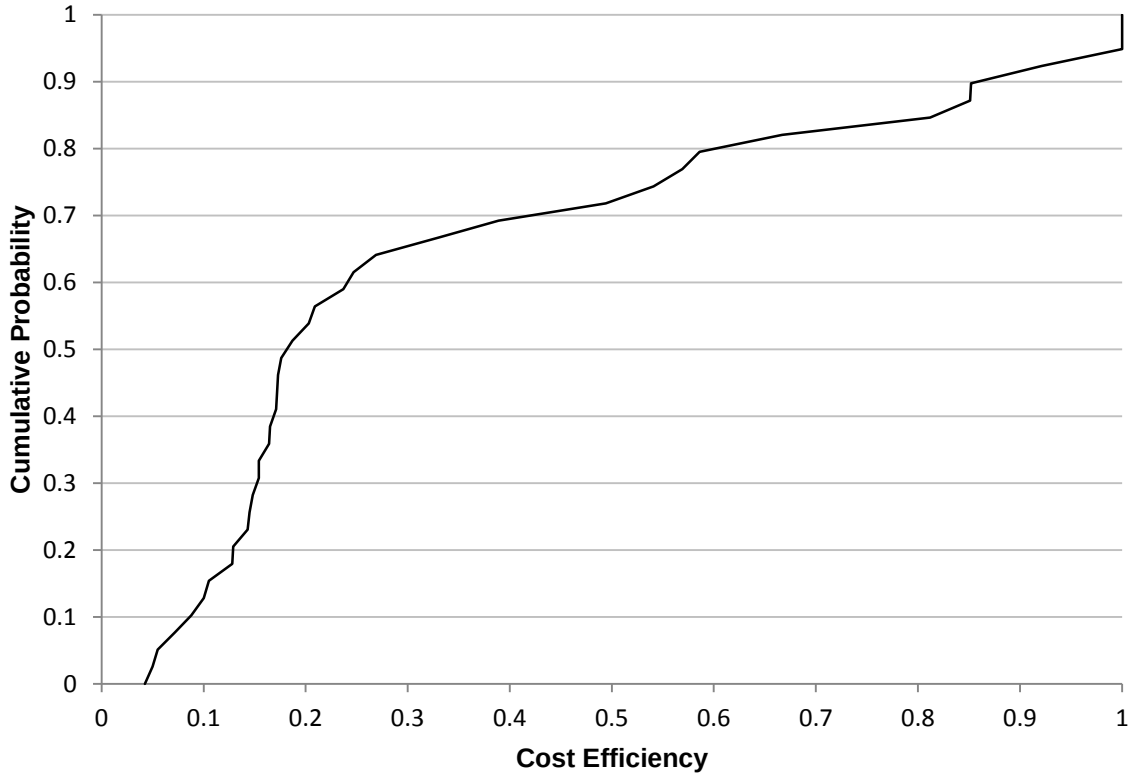

Figure 5.1: Cumulative probability distribution of cost efficiencies scores of small-scale raisin producers in Eksteenskuil.

Figure 5.1 shows that 40% of the sample has an efficiency score between 0.11 and 0.2, which is below the sample average. About 72.5% of respondents were less than 50% efficient. Thus most of the respondents can reduce their cost of production by half, and hence increase their profitability by 50% by choosing a better combination of inputs. Only 27.5% of farmers had an efficiency score above 0.5, of which only 7.5% are producing at an optimal efficiency level.

The results from the cost efficiency analysis reveal substantial inefficiencies which confirm the finding of Speelman, Frija, Farolfi, Buysse, D'Haese & D'Haese (2008) and Piesse, Von Bach, Thirtle & van Zyl (1996). There is significant capacity for cost efficiency improvement among the small-scale raisin producers of Eksteenskuil. Cost efficiency improvements will lead to profit increases. In order for farmers to become more cost efficient they need to have the ability to make economic decisions to identify the combination of inputs that will allow for the production of raisins at minimum cost. Within the following section the economic literacy of the respondents is assessed to get an understanding of the ability of the farmer to make economic decisions.

5.2 QUANTIFYING ECONOMIC LITERACY OF SMALL-SCALE RAISIN PRODUCERS IN EKSTEENSKUIL

The aim of this section is to present the results found on economic literacy of small-scale raisin producers in Eksteenskuil. The economic literacy of individuals was measured by making use of questions asked on economic concepts as proxies for economic literacy. The five questions were scored using one if answered correct and zero if answered incorrectly, and was then added together in order to get a total score for economic literacy. Table 5.2 presents the summary statistics of the overall economic literacy score of respondents.

Table 5.2: Summary statistics of overall economic literacy scores of the raisin producers in Eksteenskuil

	Total score out of 5
Mean	2.15
Standard deviation	1.12
Minimum	0
Maximum	5

Table 5.2 shows that the average respondent was only able to answer 2.15 out of the five questions correctly which means that on average respondents scored below 50%. The economic literacy of respondents ranges from zero to five. The minimum score of zero show that there were respondents who were not able to answer any of the questions correctly. The maximum score of five shows that some respondents were able to answer all of the economic literacy questions correctly. The distribution of economic literacy scores across the sample are presented in Figure 5.2 to get more insight into the distribution of economic literacy levels among the small-scale producers of Eksteenskuil.

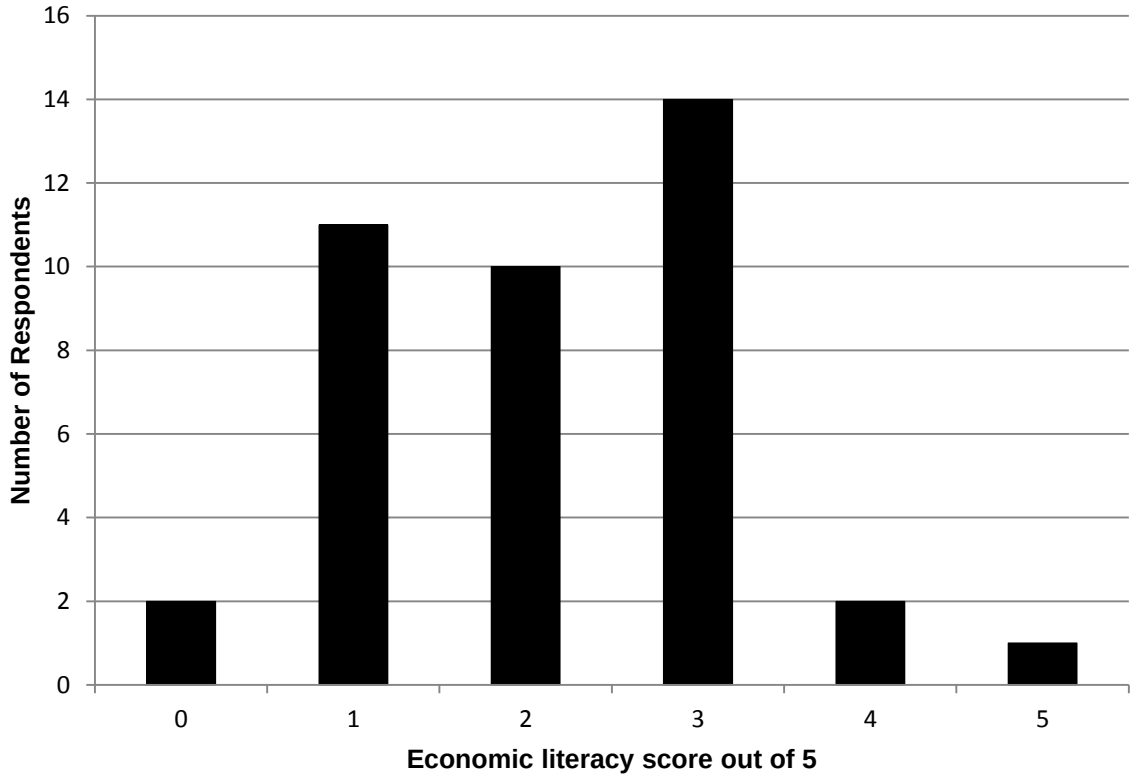

Figure 5.2: Distribution of overall economic literacy scores of small-scale raisin producers in Eksteenskuil.

Figure 5.2 shows that two of the respondents were not able to answer any of the economic literacy questions correctly, while one answered all five questions correctly. The figure also shows that more than 50% of respondents were not able to answer more than two economic literacy questions correctly, while only three respondents answered more than three correctly. In terms of the overall score the levels of economic literacy prove to be low.

Table 5.3 presents the results on the individual economic literacy questions that were asked to the respondents to gain insight into the dimensions of economic literacy where farmers performed better.

Table 5.3: Results on individual questions used as proxies for economic literacy

	Correctly Answered (n=40)	Percentage Correctly Answered (%)
Applied economic concepts		
Transport question	15	37.50
Comprehension of economic concepts		
Demand question	20	50.00
Supply question	35	87.50
Knowing the exchange rate	11	27.50
Knowing the prime interest rate	5	12.50

Table 5.3 shows that 15 out of the 40 farmers answered the transportation question correctly, while half of the farmers were able to answer the demand question correctly. Most of the respondents were able to answer the supply question correctly, making the contribution of the question to the economic literacy results insignificant. Due to the weak distribution of the supply question, the question was not included in the regression model. As for knowing what the current exchange rate and prime interest rate is for the period when the questionnaires were completed; about 11 respondents knew the exchange rate, while only five of the respondents knew what the current prime interest rate was. This shows that most of the small-scale producers in Eksteenskuil display very little knowledge on economic concepts surrounding the export of their produce. A possible reason for this may be because farmers do not export raisins themselves, but rather collectively as EAC. Small-scale raisin producers appeared to be more knowledgeable when it came to market behaviour. However, within the applied economic concepts questions more than half of the respondents were not able to make a rational decision in the marketing of their produce.

The last part on economic literacy question is concerned with the way respondents rank the importance of inputs. Respondents were asked to allocate their scarce funds between important production inputs. The inputs included in the question are water, fertiliser, labour and chemicals. Table 5.4 represents how farmers will allocate their scare resource among inputs.

Table 5.4: Summary statistics on ranked importance of inputs on a scale of 1 to 4

	Mean	Mode
Water	3.075	4
Fertiliser	2.825	3
Labour	2.3	1
Chemicals	1.8	2

Note: 4 is the most important and 1 the least important.

Table 5.4 shows that on average farmers found water to be the most important input. The mode also shows that most of the farmers ranked water as the most important input to allocate funds to. Water was expected to rank the lowest as farmers do not currently pay for water. A possible reason for respondents ranking water as the most important input may be because vines will not be able to

survive without water. Fertiliser was expected to rank the highest as it is an important source of nutrition to the grape vines. The mean and the mode shows that fertiliser was the second most important input to Eksteenskuil farmers, followed by chemicals and lastly farmers would purchase labour if funds were limited. The following section evaluates economic literacy as a possible reason for the low efficiency levels.

5.3 ECONOMIC LITERACY FACTORS INFLUENCING COST EFFICIENCY

The main purpose of this section is to determine whether economic literacy affects the cost efficiency of respondents presented in the previous section. A Tobit Regression Model was employed to relate economic literacy to the efficiency scores. The Tobit model was used because efficiency scores vary between zero and one and the Tobit model could censor the efficiency scores from above. The literature indicated that economic literacy is usually measured by scoring the answers like a test and expressing economic literacy as one value. Against all expectations the economic literacy of Eksteenskuil respondents was found to not significantly affect cost efficiency measured as a single score (see **Appendix B**). Thus all aspects of economic literacy combined do not have an effect on decision-making in terms of input use.

The proxies for economic literacy were also regressed separately on allocative efficiency scores to see whether some proxies on their own do influence allocative efficiency levels. Table 5.5 shows the results for the Tobit regression analysis of the economic literacy determinants and include the coefficients and probabilities for the hypothesised economic literacy variables. The probability represents the relative significance level of each variable while the sign of the coefficient indicates the direction of the influence of the independent variable on the level of allocative efficiency.

Table 5.5: Tobit results of economic literacy effecting cost efficiency

Variable	Coefficient	Standard Error	z-Statistic	Probability
Intercept	1.3121	0.5614	2.3374	0.0194**
Applied Economic Concepts				
Transport	0.2658	0.1006	2.6412	0.0083***
Fertiliser	-0.1638	0.0959	-1.7073	0.0878*
Water	-0.1471	0.0681	-2.1622	0.0306**
Labour	-0.0301	0.0641	-0.4686	0.6394
Comprehension of Economic Concepts				
Demand	-0.1018	0.0978	-1.0408	0.2980
Exchange rate	-0.1033	0.1200	-0.8612	0.3891
Prime interest rate	0.0627	0.1604	0.3906	0.6961
Goodness of Fit				
R^2_{ANOVA}	0.4425			
R^2_{DECOMP}	0.3885			

Note: ******* indicate significance at a 1% level; ****** indicate significance at a 5% level; * indicate significance at a 10% level.

Green (2002) suggested two measures that can be used to determine the goodness of fit for the Tobit model an: "ANOVA-based" fit measure (R^2_{ANOVA} **)** and a "decomposition based" fit measure (R^2_{DECOMP} **)**. The R^2_{ANOVA} takes the variance of the estimated conditional mean divided by the variance of the observed variable. The R^2_{DECOMP} takes the variance of the conditional mean function around the overall mean of the data in the numerator. Higher values for both measures indicate a better fit. The R^2_{ANOVA} for the Tobit model was 0.44, while the R^2_{DECOMP} was 0.39. Hartwick, Pérez, Ramos, & Soto (2007) found a R^2_{ANOVA} measure of 0.370 and a R^2_{DECOMP} measure of 0.379 in their study on knowledge management for agricultural innovation. Hartwick *et al.* (2007) concluded that the measures in their study constitute a very comfortable level of overall fit. Since R^2_{ANOVA} and R^2_{DECOMP} presented in Table 5.5 are higher than found by Hartwick *et al*. (2007) it is concluded that the overall fit of the Tobit model is satisfactory. Next, the significance of the individual variables is judged.

Interestingly Table 5.5 shows that the economic literacy questions within the comprehension economic concepts group did not have a statistically significant effect on cost efficiency. The economic literacy factors that did significantly affect cost efficiency are all questions within the applied economic concepts group. Applying transport cost estimates correctly to decide whether or not to sell to the new processor had an effect on cost efficiency. The transportation question was constructed to determine the farmer's knowledge on the cost of delivering raisins, as well as the

ability to make a rational decision to potentially increase income. As expected the coefficient of the transport question showed a positive correlation with cost efficiency. Knowledge on transportation cost and rational decisions to sell to a different processor in order to achieve higher profits, had a statistically significant effect **(p<0.01)** on cost efficiency. Respondents, who were able to make an informed rational decision to deliver and sell raisins to the processor offering a higher price, consequently raising profits, were the more cost efficient respondents.

The other question within the applied economic concept group is the question on ranking important production inputs when money to buy the specific inputs is limited. The question includes four important inputs: fertiliser, water, labour and chemicals. Respondents were asked to rank inputs in order of importance when funds to buy the inputs are limited. Inputs included in the regression model are fertiliser, water and labour. Chemicals were not included in the regression model because together these four variables are perfectly correlated. The results show that the rank order of fertiliser and water were statistically significant in explaining cost efficiency. Labour was not statistically significant as a factor influencing cost efficiency. Fertiliser was estimated to be statistical significantly at a five percent **(p<0.05)** level. The negative sign of the coefficient shows that the farmers who consider fertiliser as an important input to buy when money is limited, will be less cost efficient. The negative relationship between the fertiliser ranking and cost efficiency is unexpected. Reasons for this result are explained by making use of Figure 5.3. Figure 5.3 shows the cumulative probability distribution of cost efficiency across different types of fertiliser usages (manure, inorganic fertiliser or a combination of both) among respondents. The probability distribution leaning towards the right of the graph are considered to be more cost efficient.

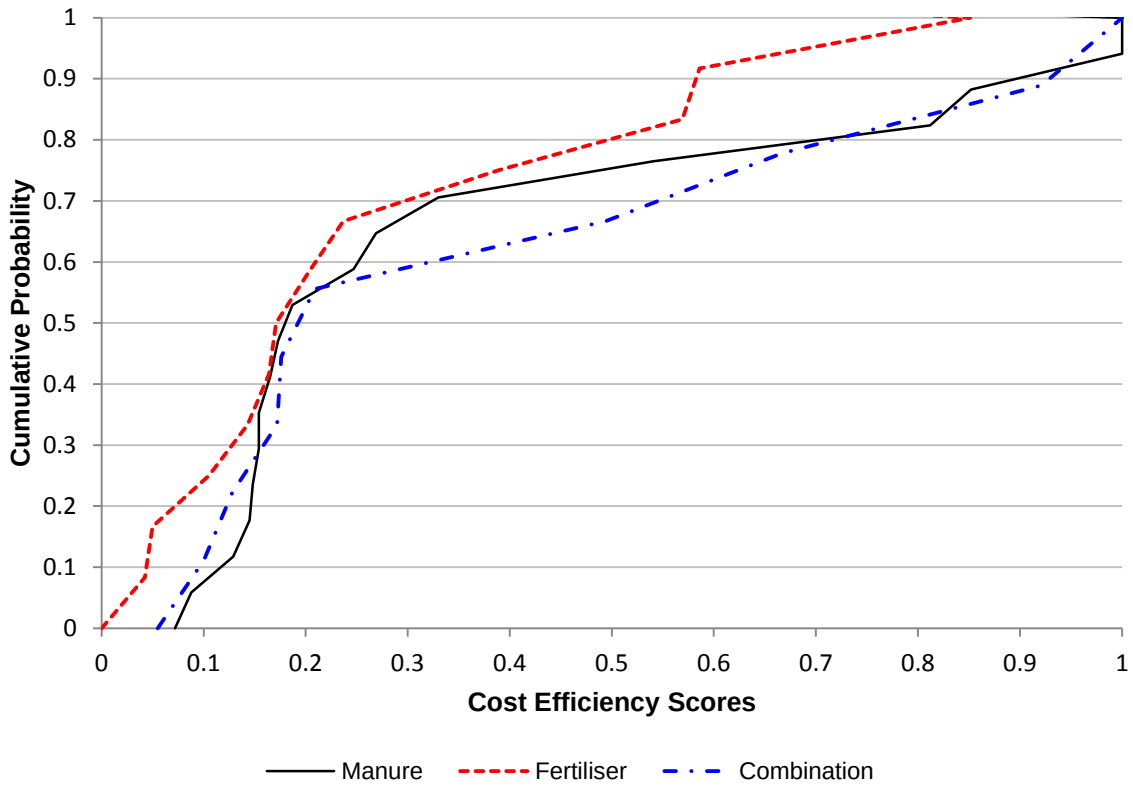

Figure 5.3: Cumulative Probability Distribution of Cost Efficiency in relation to different fertiliser usages of small-scale farmers in Eksteenskuil

Figure 5.3 show that farmers using a combination of fertiliser types will have the highest probability of being cost efficient. Farmers using only inorganic fertiliser have the lowest probability of being cost efficient. Respondents using only manure have a higher probability to be cost efficient than respondents using only inorganic fertiliser. In fact all three most cost efficient respondents used only manure. Most of the Eksteenskuil farmers do not have to pay for manure, since a lot of these farmers also have livestock enterprises. The few farmers that did buy manure received the manure at a very low price. However, manure has lower levels of N, P and K leading to low productivity of grapevines at a low price. Inorganic fertiliser has higher levels of N, P and K leading to high productivity of grapevines, but inorganic fertiliser can also be very expensive. A combination of manure and inorganic fertiliser will increases the productivity, while lowering the cost of fertiliser. Respondent using only manure might not have an output as good as farmers using inorganic fertiliser or a combination, but their fertiliser cost will be much lower. Taking all of this into consideration, farmers showing higher levels of economic literacy will make a rational decision to allocate their limited recourse to an input other than fertiliser, because they have access to manure that is free or at least much cheaper than inorganic fertiliser. This result shows that the ability to make the correct economic decisions will improve cost efficiency scores.

Another input from the input ranking question to significantly influence cost efficiency was ranking water as an important input. Respondent were asked to rank water as a choice-input to buy if they

only had enough money for only one input. Table 5.5 shows that ranking water as an important input had a statistically significant effect on cost efficiency at a five percent **(p<0.05)** level. Allocating the limited funds to buy water had a negative effect on cost efficiency, which is in accordance to the hypothesis. Results indicate that the more important farmers consider water as an input to be bought when funds are limited, the lower their cost efficiency. Most of the farmers farming in Eksteenskuil do not currently pay for water use, making a money allocation to buy water before other important inputs irrational. Farmers who take into consideration that they do not currently pay for water, and for this reason do not allocate their limited resource to water, show a higher level of economic literacy. This result again shows that being able to make the correct economic decisions will have an effect on how cost efficient respondents will produce output.

Note that economic literacy factors that were found not to significantly influence cost efficiency does not necessarily imply that the factor have no effect on the cost efficiency of raisin production, it only implies that comparatively the influence was not significant to cost efficiency. The results show that farmers who are aware of the economic surrounding of their farming practices and are able to apply rational thinking within certain economic situations are able to select the combination of inputs that minimise cost to produce the raisins. These farmers are considered as more economic literate. Thus, although the combined index was found not to be significant, individual proxies actually were found to have a significant impact on the levels of allocative efficiency of the farmers. Economic literacy thus proves to have a role to play in improving profit levels of smallholder raisin producers at Eksteenskuil. Given the importance of economic literacy, the next section explores the socio-economic characteristics of farmers that are associated with the levels of economic literacy.

5.4 SOCIO-ECONOMIC FACTORS INFLUENCING ECONOMIC LITERACY

The literature review indicated that individuals' levels of economic literacy are influenced by socio-economic factors. The purpose of this section is to determine the socio-economic factors of the Eksteenskuil respondents that may influence their economic literacy level. The economic literacy questions found to be significant in the previous section were used as the dependent variables in the regression models, used to determine the socio-economic factors that affect economic literacy. A Probit Regression Model was used to determine the socio-economic factors affecting the ability of respondents to answer the transportation question correctly. The Probit model was used because the transport question is discrete and only has two possible outcomes (yes=1/no=0).

Table 5.6 represents the results for the Probit Regression Model analysing the socio-economic factors influencing the correct answering of the transportation question. A probability level of up to 15% (**p<0.15)** was accepted since the aim of the result was not to predict economic literacy, but merely to determine the influence of specific variables.

Table 5.6: Probit results for the socio-economic factors affecting answering the transport question correctly

Variables	Coefficient	Standard Error	z-Statistic	Probability
Intercept	-3.2466	2.5349	-1.2808	0.2003
Education	-0.4552	0.3306	-1.3767	0.1686
Experience	-0.0460	0.0430	-1.0696	0.2848
Recordkeeping course attendance	-4.8968	2.7603	-1.7740	0.0761**
Recordkeeping course application	1.1546	0.7286	1.5847	0.1130*
Farmer days attended	0.5487	0.2712	2.0233	0.043***
Off farm income	0.3346	0.7971	0.4197	0.6747
Specialisation	5.8942	2.6309	2.2404	0.0251***
Area harvested	0.5303	0.3105	1.7081	0.0876**
Goodness of Fit				
McFadden R-squared	0.5575			
LR statistic	29.5058			
Prob(LR statistic)	0.0003			

Note: ******* indicate significance at a 5% level, ** indicate significance at a10% level; * indicates significance at a 15% level

The goodness of fit of the Probit model is determined by the McFadden R-squared and the LR statistic. The McFadden R-squared is an analogue to the R-squared in a conventional regression (Gujarati, 2003). A McFadden R-squared value of 0.2 to 0.4 is considered highly satisfactory, but the higher the McFadden R-squared the better the fit of the model. The McFadden R-squared value is 0.56, which indicates that the overall model is a good fit. The predictors will assert the transport question results. The equivalent of the F test in the Linear Regression Model is the Likelihood Ratio (LR) statistic (Gujarati, 2003). According to the LR statistic (29.5058), whose p value is 0.0003, (**p<0.01**) indicates that the overall model has a significant impact on answering the transport question correctly. Overall the estimated model proves to be significant to explain the factors that affect the ability of the respondents to answer the transport question correctly.

The socio-economic variables included in the regression model can be divided into three groups. The first group relate to human capital and, include education and experience of the respondents. Education was measured by the years of formal education while experience is the total years farming experience. The second group consist of the factors expanding human capital. Recordkeeping course attendance, recordkeeping course application, and farmer days attended are included in the second group. The last group consist of farm specific factors like off farm income, specialisation and area harvested. According to the literature human capital like education and training will positively affect economic literacy. However, the results from the Probit model show that socio-economic variables within the human capital group did not significantly influence the transport question. This does not imply that human capital has no influence on economic literacy, it only implies that comparatively their influence was not significant to the respondents interpreting the transport question correctly.

The socio-economic factors expanding human capital however were all found to be statistically significant. This is in accordance with the literature's finding on training having a positive influence on individuals' business practices and performance. The socio-economic factors within the training group were all expected to expand the individual economic literacy level. Braunstein & Welch (2002) stated that training, especially on the financial side, is positively correlated with respondents' economic literacy. Unexpectedly, the estimated coefficient for recordkeeping course attendance is negative and statistically significant at ten percent (**p<0.1**). The finding indicates that respondents who attended the recordkeeping course will not be able to answer the economic literacy question on transport correctly. A possible reason for this finding is farmers who attended the recordkeeping course mostly included weaker performing farmers. Most of the farmers who attended the recordkeeping course are most likely farmers feeling the need for improving their farming practices and need guidance to better their farming ability. However, this finding only shows the attendance of the recordkeeping course and not the capacity of farmers to understand and apply what they have been taught at the recordkeeping course.

Being able to apply what have been learned at the recordkeeping course will set apart the more economic literate farmers from the lesser economic literate farmers. Drexler, Fischer & Schoar (2011) stated that training will improve business practices and performance of individuals. Improving knowledge on finance and financial accounting will improve management practices of small businesses in an emerging market. Application of the recordkeeping course is statistically significant at a 15% (**p<0.15**) level. As predicted being able to apply what have been learned in the recordkeeping course has a positive effect on interpreting the transport question. The result shows that individuals who were able to understand and apply what they have learned at the recordkeeping course will be more able to answer questions relating to applied economics.

The last factor within the training group was Farmer Days attended. The results show that the more regularly farmers attended the training sessions presented by the EAC the better they were able to answer the transport question. Farmer Days attended had a positive statistically significant relationship (**p<0.05**) with answering the transport question correctly.

The third and final group of socio-economic factors included the farm specific socio-economic factors. Among the factors within the third group specialisation and area harvested have a positive correlation with the transport question. Specialisation is statistically significant at a ten percent (**p<0.1**) level, showing that farmers who are more specialised in production were more able to answer the transport question. Farmers more specialised tend to familiarise themselves more thoroughly with their main enterprise. More specialised farmers will shop around for the best output prices as well as account for the possible extra cost associated with delivering their produce. The reason for this is that the profits they make from the specific produce are their main source of income. Table 5.6 furthermore show that the area of raisins harvested was statistically significant at a ten percent (**p<0.1**) level. The result shows that respondents harvesting a bigger area of raisins are

more likely to answer the transport question correctly. Farmers harvesting a bigger area of raisins will have more raisins to sell than farmers harvesting a smaller area of raisins, making transportation of raisins to the processor more expensive. For this reason farmers harvesting a bigger area will be more attentive to cost associated with their produce. Another possible reason for the result is that farms in Eksteenskuil are fairly small, indicating that the bigger the area of raisins harvested, the more specialised some of the farmers would be in raisin production. Farmers using the biggest part of their farms to produce raisins should know where to buy the cheapest most valuable inputs, where the best prices for raisins can be attained and what the cost associated with transporting those raisins is. Respondents more specialised in raisin production or harvesting a bigger area of raisins are more dependent on raisin production and should be more informed when it comes to selling raisins as well as the associated cost. The farm specific factor, off farm income, did not have a statistically significant effect on answering the transport question correctly.

A simple linear regression model was used to analyse socio-economic factors on the remaining significant economic literacy factors. These factors include ranking fertiliser and water as important inputs. The reason for using an OLS is because fertiliser- and water choice are a continuous depended variable ranging from one to four. Only specialisation had an effect on the fertiliser choice, and none of the socio-economic variables had an effect on the water choice. The results show that, of the explanatory variables included in the model few explain the variation in the probability of respondents choosing water or fertiliser as an important input. The regression models also showed very little overall significance. The regression results for socio-economic factors affecting fertiliser choice and water choice are presented in **Appendix B**.

CHAPTER 6

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

6.1.1 BACKGROUND AND MOTIVATION

The South African, government has aimed to create a new integrated agricultural economy where both large and small scale farmers can compete on local and international commodity markets (National Department of Agriculture, 2001). The challenge, however for South African smallholder development policy is to create the necessary conditions and motivation to enable smallholders to grow from subsistence farming to commercial producers, competing in local and international markets. This is a challenge because of the small-scale producers' operations on small-scale and poor access to markets leading to small profit or no profit at all. Profit can be raised by improving efficiency of production and by reducing cost by allocating inputs efficiently given their respective prices (Reddy, 2003). Coelli, Rahman & Thirtle (2002) stated that small-scale farmers may be assisted in the improvement of utilizing inputs in optimal proportions by examining the level and determinants of allocative efficiency. By improving allocative efficiency small-scale producers would be assisted to produce at minimum possible cost and hence increase profit.

To improve efficiency producers require knowledge and the ability to apply economic concepts. Thus, a certain level of economic literacy is required. Economic literacy of individuals gives an indication of the level of understanding and ability to apply important economic concepts such as scarcity, tradeoffs, market forces and recognising the importance of incentives. Economic literacy should be accompanied by financial literacy. Economic education without financial literacy can result in individuals understanding the theory but not the application of the theory. However, by improving financial literacy without individuals understanding the bigger economic depiction managerial ability of decision-makers could be complicated. Schilling (2007) stated that economic-and financial literacy should not by a matter of one or the other. By improving financial literacy, improvement in economic literacy will follow. A lack of financial literacy exists in poor households and communities in South Africa (Piprek, Dlamini, & Coetzee, 2004). This is particularly true in cases where the formal education system fell short of achieving adequate financial literacy levels among communities who

were marginalised by earlier political dispensation. For this reason small-scale producers' economic literacy levels are expected to be low.

6.1.2 PROBLEM STATEMENT AND OBJECTIVES

Although the profitability of small-scale farming in South Africa is widely recognised to be low, the extent to which inefficient allocation of resources contributes to the problem of low profitability remains uncertain. Furthermore uncertainty exists whether economic literacy levels of the decision makers will improve the ability of the farmers to allocate their inputs efficiently in order to increase their profit.

Ample research abroad has focussed on the measurement of technical and allocative efficiency within agriculture, as well as the factors that will affect technical and allocative efficiency. Attempts to quantify the extent and determinants of allocative efficiency among small scale producers are relatively less, especially in South Africa. Speelman, Frija, Farolfi, Buysse, D'Haese & D'Haese (2008) and Piesse, Von Bach, Thirtle & van Zyl (1996) investigated technical and allocative efficiency in smallholder agriculture within South Africa. Substantial technical and allocative inefficiencies were found to exist. These authors however did not explore the factors that will influence allocative efficiency. Khaile (2012) measured the technical efficiency of small-scale raisin producers of Eksteenskuil and the factors that will influence technical efficiency of the producers. The efficiency with which the small-scale raisin producers allocate their resources, however have not been measured, and limited knowledge still exists on economic literacy as a factor affecting allocative efficiency of small-scale producers.

The main objective of this study is to explore the relationship between economic literacy and allocative efficiency of small-scale raisin producers in Eksteenskuil. The main objective will be reached through the completion of four sub objectives. Firstly the allocative efficiency at production level was quantified in order to determine the extent to which allocative efficiency contributes to low levels of profitability. Allocative efficiency was measured by making use of a cost minimising approach, where the ratio of the minimum possible cost of production to the actual cost of production was calculated. Secondly, the economic literacy levels of the small-scale raisin producers were measured. Thirdly, the relationship between the economic literacy of respondents and their allocative efficiency was explored to see whether or not economic literacy does affect the ability of small-scale producers to produce at a cost minimising input combination and hence have an effect on their profitability. Lastly, the socio-economic characteristics that influence the economic literacy of small-scale producers in Eksteenskuil was explored in order to understand the characteristics associated with higher economic literacy levels.

6.2 LITERATURE REVIEW

6.2.1 EFFICIENCY

In essences efficiency is concerned with input-output relationships. Efficiency within farming activities and how it is measured has become an important subject in developing countries as it is a success indicator and it can be used as a control mechanism to monitor production performance (Ajibefun & Daramola, 2003). The analysis of efficiency measures started with Farrell (1957) who divided efficiency into three components: technical efficiency, allocative efficiency and economic efficiency. Technical efficiency is the ability to produce a given amount of output by using the minimum possible amount of inputs. A number of studies have been done on the quantification of technical efficiency and the factor influencing technical efficiency. Allocative efficiency is the ability of a farm to use inputs in optimal proportions, given their respective prices and available technology. Compared to technical efficiency, allocative efficiency is much less researched. Allocative efficiency can be measured through cost efficiency, revenue efficiency and profit efficiency, which is a combination of the two (Wu, 1979). Cost efficiency is the ratio of respondents minimum possible production cost to actual production cost. Revenue efficiency is the ratio of the maximum possible income a respondent can receive to the actual income a respondent received. Profit efficiency is a combination of cost efficiency and revenue efficiency. Maximising profits not only requires that goods and services produced at minimum cost but also demand maximum revenue. Choice of the allocative efficiency measure depends on the characteristics of the market environment. Cost efficiency should be used to determine allocative efficiency when the price producers pay for inputs differ, while product prices are the same across the sample. For producers receiving different product prices, while facing the same input prices, revenue efficiency will be used as a measure of allocative efficiency. Profit efficiency can be used as a measure of allocative efficiency when input prices and product prices for producers differ. The choice will be supported by the price information for outputs produced- and cost information of inputs used, by the small-scale raisin producers of Eksteenskuil.

Four major approaches to measure and estimate efficiency exists (Okoye, Onyenweaku & Asumgha, 2006). The two most popular measures used in efficiency analysis is the parametric Stochastic frontier analysis (SFA) approach and the non-parametric Data Envelopment Analysis (DEA), respectively (Speelman *et al.,* 2008). The parametric approach uses mainly maximum likelihood estimation techniques to estimate the frontier function in a given sample (Sarafidis, 2002). DEA is focussed on the resolution of a set of problems by making use of maximisation or minimisation of a given objective subject to some constraints. In comparison results obtained from DEA and SFA are highly correlated, which suggest that there is little to choose between them (Sharma, Leung & Zaleski, 1999).

6.2.2 ECONOMIC LITERACY

Economics is about understanding and making choices, living with the consequences of those choices, and making tradeoffs among scarce resources in a world where we can't have everything we want (Koshal, Gupta, Goyal & Choudhary, 2008). Economic literacy can be described as the ability of individuals to recognise and use economic concepts and the economic way of thinking in order to improve their wellbeing (Mathews, 1999). By improving economic literacy of farmer and consequently farm management, farmers will be assisted to make rational production decisions (Pierce & Williams, 1954). Economic literacy levels thus may provide farmers with the required skills to be able to select input combinations that will minimise cost and hence maximise profit of the producers of Eksteenskuil.

Four standard tests were found in the literature to measure individuals' economic literacy. However, no standard test was found in the literature measuring economic literacy of small-scale producers. Economic literacy levels of small-scale producers are expected to be low since the formal education system has fallen short of achieving adequate literacy levels among poor communities because of earlier political dispensation. Keeping this in mind economic literacy questions, to measure small-scale producers' economic literacy levels, needed to be developed to measure producers' knowledge, comprehension, and application of economic concepts within their frame of reference.

From the literature the economic literacy of individuals is affected by factors, including human capital, economic education, training, experience, age, income and investment, gender, and race. Education, experience, skill and qualities of management describe human capital. By improving the drivers of human capital, the improvement in economic literacy will follow. Drexler, Fischer & Schoar (2011) indicated that management practices of small businesses in an emerging market will be positively influenced by improving knowledge on finance and financial accounting. Economic literacy can increases with years of experience. Economic literacy is also influenced by savings, expenditure and investment. Lastly gender and race was identified in the literature to influence economic literacy. Males were found to perform better in economics or business than females and whites were found to outperform blacks when it came to economic literacy tests.

Training serves as the expansion of human capital. Within economic education knowledge and understanding of scarcity, production resources, economic systems, exchange, economic incentives, the market, and economic management should be considered. In order for economic literacy to be built up by economic education, both cognitive and emotional aspects should also be covered. From the literature it is apparent that human capital and training have a noticeable impact on economic literacy levels of individuals and should be considered in the expansion of economic literacy of individuals.

6.3 SURVEY AND CHARACTERISTICS OF RESPONDENTS

Analysis was mainly based on primary data which was obtained from the small-scale raisin producers in Eksteenskuil by means of a structured questionnaire. A questionnaire developed by Khaile (2012) to measure Eksteenskuil farmers' technical efficiency and the determinants of technical efficiency, was used as a basis to design the questionnaire. Alterations were made to the questionnaire of Khaile (2012) to include price data of inputs as well as include sections on economic literacy. The questionnaire consists of three parts including: Socio-economic characteristics, production activities, economic decision-making.

From the measured socio-economic factors of Eksteenskuil raisin producers it was found that the respondents are older farmers with relative high levels of experience. Most of the respondents are between the ages of 40 and 49 years of age. Only four of the respondents were younger than 30 years of age. Most of the respondents were male. From the 40 respondents most of them attended high school of which only 12 completed high school. One of the respondents furthered his education with a three year tertiary diploma in agriculture. Furthermore, respondents consist of high levels of farming experience. Only 10 respondents had farming experience less than 10 years. Eksteenskuil farmers are readily exposed to various training sessions and farmer days to expand their knowledge and skills and consequently expand their human capital. On average more than 50% of the respondents supported the training sessions and farmer days.

The raisin producers of Eskteenskuil receive the most of their farming income from raisin production. Grapevines have an economic lifespan of about 25 years (Kok, 2008). Grapevines older than 25 years of age show a steadily decrease in grape production while new established grapevines must be at least four years of age before grapes can be harvested. The data showed that almost 45% of the vines from which respondents produce raisins are older than 25 years of age. This shows that raisin producers need to acquire funds in order to replace old vines to ensure high volumes of raisin production in the future. The farmers mostly produce Tompson, Golden or a combination of both. However, only a few farmers produce Golden. The production inputs that are used in the production of grapes, for raisins include among others, fertiliser, labour, fuel and water.

6.4 PROCEDURES

Cost efficiency was used to determine the degree of allocative efficiency if the Eksteenskuil raisin producers because the produce prices for the raisin producers will be the same while input cost will differ from farmer to farmer. Cost efficiency was measured (sub-objective 1) by making use of Data Envelopment Analysis (DEA). DEA was chosen because the sample size of the study was small. The input variables used to measure cost efficiency was N, P, and K, representing fertiliser (Organic and Inorganic) used by farmers, labour and fuel. The amounts used as well as the prices paid were used within the DEA model. Cost efficiency was evaluated using variable returns to scale as

demonstrated by Cooper, Seiford & Tone (2006) and Coelli (1996). Calculating cost efficiency entail two steps. The first step was to calculate minimum possible production cost. In the second step the actual cost of production are calculated. Cost efficiency is determined by the ratio between the minimum possible production cost and the actual cost of production.

After the cost efficiency scores have been calculated, the next step is to determine the economic literacy levels of respondents (sub-objective 2). The economic literacy proxies used to measure economic literacy can be divided into two groups. The first group includes the transport question and the input ranking question. The group is called the “applied economic concept” group and consists of economic literacy questions measuring the decisions farmers will make in certain hypothesised economic situations. The group entail economic literacy questions measuring understanding and simple practical application of economics. The second group includes the questions on demand, exchange rate and prime interest rate. The group is called the “comprehension economic concept” group. The questions within the group test if farmers know something about the economics surrounding them. Economic literacy questions were presented to respondents to answer, and was then graded by either a one if answered correctly or a zero if answered incorrectly. An economic literacy score was calculated by adding all the scores together.

The economic literacy questions were used to determine the relationship between the cost efficiency scores and the economic literacy of respondents (sub-objective 3). The calculated cost efficiency scores were used as the dependent variable. The results for the individual questions asked on economic literacy were regressed against the efficiency scores to identify whether individual proxies for economic literacy will influence cost efficiency. Due to the nature of the dependent variable a Tobit Regression Model was used to determine the effect the economic literacy proxies will have on cost efficiency.

In order to meet the last sub-objective each of the economic literacy questions found to be significant was used as a dependent variable in their own regression model to determine the socio-economic factors that will influence answering the economic literacy questions correctly. Most of the economic literacy questions are measured as a binary variable and a Probit Regression Model was used to determine the socio-economic factors affecting the dummy variable economic literacy questions. The other economic literacy proxy was measured in a ranked order of one to four and an Ordinary Least Squares (OLS) regression model was used to determine the socio-economic factors affecting the ranked economic literacy question.

6.5 RESULTS AND CONCLUSIONS

6.5.1 COST EFFICIENCY OF SMALL-SCALE RAISIN PRODUCERS IN EKSTEENSKUIL

The results from the cost efficiency measures exhibit a wide range of cost efficiency scores, ranging from 0.042 to 1. The distribution skews toward the left with a very low average cost efficiency across the sample of 0.347. Efficiency scores ranging between 0.11 and 0.2 make out 40% of the sampled respondents. About 72.5% of respondents were less than 50% efficient. Most of the respondents can reduce their cost of producing the same amount of output by half and in turn increase their profits by half. Only 27.5% of farmers had an efficiency score above 0.5, of which only 7.5% are producing at an optimal efficiency level. Most of the farmers thus can drastically reduce their cost of production, and hence improve their profits. A few farmers had an efficiency score of one, indicating that they utilise their inputs optimally given the respective input costs. In order for farmers to become more cost efficient they need the ability to make economic decisions when allocating production inputs.

The small-scale raisin producers of Eksteenskuil exhibit very low levels of allocative efficiency, indicating that a substantial reduction in production cost can be achieved by adjusting the combination of inputs given their input prices. By adjusting the combination of inputs to a cost minimising combination an increase in profitability will be realised.

6.5.2 ECONOMIC LITERACY OF SMALL-SCALE RAISIN PRODUCERS IN EKSTEENSKUIL

On average raisin producers in Eksteenskuil scored 43% for overall economic literacy. Half of the respondents were able to answer the demand question correctly, while 15 out of 40 respondents were able to answer the transportation question correctly. About 11 respondents knew the exchange rate, while only five of the respondents knew what the current prime interest rate was. This shows that most of the small-scale producers in Eksteenskuil display little knowledge on economic concepts surrounding the export of their produce. A possible reason for this may be because farmers do not export raisins themselves, but collectively as EAC. Small-scale raisin producers appear to be more knowledgeable when it came to market behaviour.

Within the applied economic concepts more than half of the respondents were not able to make a rational decision in the marketing of their produce. Another test of applied economics respondents were asked to allocate their scarce funds, between important production inputs (water, fertiliser, labour and chemicals). On average farmers found water to be the most important input Water was expected to rank the lowest as farmers do not currently pay for water. Fertiliser was expected to rank the highest as it is an important source of nutrition to the grape vines. Respondents ranked chemicals the third most important input while labour was ranked as the last input they would buy if funds were limited.

In conclusion the overall economic literacy levels of producers in Eksteesnkuil proved to be low. Considering the economic literacy questions separately, within the applied economic concept group, more than half of the respondents were not able to adjust their marketing decision, based on new information, to realise a higher income. Within the other applied economic concept question most of the respondents were not able to allocate their scarce funds between inputs in the most optimal way since they allocate funds toward inputs that they can receive for free.

6.5.2 ECONOMIC LITERACY FACTORS INFLUENCING COST EFFICIENCY

The economic literacy questions affecting cost efficiency was measured by making use of a Tobit Regression Model. The proxies for economic literacy hypothesised to influence cost efficiency include the knowledge and understanding of demand, the exchange rate, the prime interest rate, transport and fertiliser, water and labour of the input ranking question.

Against all expectations the economic literacy of Eksteenskuil respondents was found not significantly affect cost efficiency measured as a single score and for this reason the proxies for economic literacy were regressed separately on allocative efficiency scores to see whether some proxies on their own do influence allocative efficiency levels. The results showed that none of the economic literacy questions within the second group were statistically significant in affecting allocative efficiency. Within the applied economic concept group only labour was not statistically significant.

Answering the transport question correctly was found to be statistically significant. As expected respondents answered the transport question correctly had a higher cost efficiency score. Within the input ranking question fertiliser and water were found to be statistically significant. However, a negative relationship between the ranked inputs and cost efficiency was found. The results show that respondents, who consider fertiliser as an important input to buy when money is limited, will be less cost efficient. The negative relationship between fertiliser and cost efficiency was unexpected. Reasons for the unexpected result are put forward to be because farmers make use of manure to fertilise vines. Manure is freely available to farmers since most of them have a livestock enterprise on their farm. The farmers who do not have a livestock enterprise are able to obtain manure at a very cheap rate. Farmers who take into consideration that manure is free or very inexpensive and for this reason do not allocate their limited resources to fertiliser, shows higher levels of economic literacy. Results further shows that respondents considering water as an important input to buy when money is limited will be less cost inefficient. The negative relationship between water and cost efficiency was expected. Eksteenskuil farmers do not currently pay for water, making a money allocation to buy water before other important inputs irrational. Farmers taking this into consideration when ranking inputs, and thus rank water lower as an important input, can be considered as more economic literate.

It can thus be concluded that certain economic aspects of economic literacy will influence the decisions small-scale raisin producers will make in terms of input allocation, more than others and are the aspects of economic literacy that should be focussed on in the improvement of decision-making regarding profit increases.

6.5.3 SOCIO-ECONOMIC FACTORS INFLUENCING ECONOMIC LITERACY

In order to determine the socio-economic factors affecting economic literacy, each economic literacy question found to have a significant effect on cost efficiency were each used as a dependent variable in their own regression model. A Probit Regression Model was used for the transport question and an OLS Regression Model was used for the fertiliser and water questions.

The socio-economic factors hypothesised to influence economic literacy include education, experience, recordkeeping course attendance, recordkeeping course application, farmer days attended, off-farm income, specialisation and area harvested. The socio-economic factors can be divided into three groups. The first group included human capital factors like education and experience. The second group included factors expanding human capital like recordkeeping course attendance, recordkeeping course application, and farmer days attended. The third and last group include farm specific factors like off-farm income, specialisation and area harvested.

The results for the Probit Regression Model regressing socio-economic factors on the transport question show that all the socio-economic factors within the human capital group were found to not be statistically significant. The socio-economic factors expanding human capital were, however, all found to be statistically significant. The findings indicated that respondents who attended the recordkeeping course where not able to answer the transport question correctly. The reason for this is weaker performing farmers would more readily attend training sessions like the recordkeeping course. Most of the farmers who attended the recordkeeping course are most likely farmers feeling the need for improving their farming practices. This finding only shows the attendance of the recordkeeping course and not the capacity of farmers to understand and apply what have been learned. Being able to apply what have been learned at the recordkeeping course was found to have a positive statistically significant effect. The results showed that respondents who were able to understand and apply what they have learned at the recordkeeping course will be able to answer the transport question correctly. Results further showed that farmers who attended more farmer days were more able to answer the transport question correctly.

The farm specific socio-economic factors found to significantly influence answering the transport question correctly was specialization and area harvested. The more specialised respondents are the more able they are to answer the transport question correctly. Furthermore the results indicated that the bigger the area harvested the more able respondents were able to answer the transport question correctly. Of the explanatory variables included in the OLS model, to determine the socio-economic

variable influencing fertiliser and water choice, very few explained the variation in the probability of respondent choosing water or fertiliser as an important input. Only specialisation had a statistically significant effect on fertiliser. The regression models also showed very little overall significance.

From the analysis of socio-economic characteristics that contribute to higher levels of economic literacy it was interesting that only factors associated with expanding human capital were significant and not human capital variables themselves. Producers who more readily attend training sessions, applied what they have learned on their farms, and actively invest in their human capital are the producers who are more economic literate and were able to answer the applied economic questions correctly. These are also the producers who are able to produce at a lower cost and in turn earn more profits.

The overall conclusion is thus that allocative efficiency contributes to low profits, while economic literacy contributes to small-scale producers' ability to make decisions in terms of input allocation and hence increase profits. Given that the farmers who actively invest in improving human capital levels are considered to be more economic literate, ways should be found to incentivise farmers to participate in training sessions that contribute to developing human capital.

6.7 RECOMMENDATIONS

In light of the results from this study the following policy implications could be drawn:

- An investment in the human capital of small-scale producers should be made by means of training. Existing training services can be expanded, or new training services can be implemented focussing on expanding human capital of small-scale producers. Training can include courses on expanding producers' economic and financial literacy in order to improve producers' ability to obtain information and implement the information to make informed decision and improve profitability.

- Training should be targeted at individuals not performing satisfactorily in production, or individuals who wish to improve on their current production activities.

- Training should be goal-orientated, practical training, focussing on the producers' specific farming practices. Both cognitive and emotional aspects need to be covered in the goal orientated training. The training should be understandable, implementable, and executable.

From this study the following recommendations for further research can be made:

- Since very few economic literacy studies exist in South Africa, especially on small-scale farmers, research on economic literacy can be expanded to address this knowledge gap.

- The results showed that of the three cost efficient respondents all of them used only manure to fertilise their vines. Research can be done on the cost efficiency levels of respondents using different types of fertiliser.

- Research can also be extended to determine the effect that credit availability will have on cost efficiency, in order to buy timely inputs.

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APPENDIX A: QUESTIONNAIRE

DEPARTEMENT OF AGRICULTURAL ECONOMICS
UNIVERSITY OFTHE FREE STATE

QUESTIONARE: 2011

THIS QUESTIONARE MUST BE COMPLETED BY THE INTEVIEWER ON BEHALFE OF THE MAIN DECISION MAKER OF THE FARM.

Respondent number _____ **Date** _____

Interviewer _____

1 Socio-economic characteristics

1.1 Age _____ (years)

1.2 Formal Education in years (Grade 12=12, 3 year tertiary =15) _____ (years)

1.3 Gender

Male	**Female**

1.4 Years farming experience _____ (years)

1.5 Do you receive income from a source other than farming?

Yes	**No**
1	**0**

1.6 If yes in 1.5, did your employer send you for training?

Yes	**No**
1	**0**

1.7 Did you partake in the financial recordkeeping course presented by Sandra Kruger?

Yes	**No**
1	**0**

1.8 if yes in question 1.7, indicate on a scale from 1 to 5 how you applied, the past year, what you learned in terms of financial statements, where 1 is not at all applied and 5 is applied a lot.

No Application	**1**	**2**	**3**	**4**	**5**	**Applied a lot**

1.9 Are you able to provide financial statements, if the answer in question 1.8 is more than 3.

Yes	**No**
1	**0**

1.10 How many farmer days did you attend this year? _____

1.11 Have you previously served, or are you currently serving on the managing-board of Eksteenskuil?

No	**Previously**	**Currently**
0	**1**	**2**

1.12 On a scale from 1 to 5 indicate how important you consider tertiary education is for your kids, where 1 in not important and 5 is very important.

Not important	**1**	**2**	**3**	**4**	**5**	**Very important**

1.13 If question 1.12 is important, how do you make financial provision to ensure your children receive tertiary education, currently of in the future?

Currently		**Future**	
Savings		Savings	
Policy		Policy	
Loan		Loan	
Other (specify)		Other (specify)	

1.14 If you are able to receive the same amount of income you receive from farming, from a job other than farming, would you rather do the other job?

Not at all	**Maybe**	**Defiantly**
2	**1**	**0**

2 Production Activities

2.1 Please complete the following table regarding the size of your farming land (own and rented) as well as the scale of raisin production activities for the production season.

	Total farm size (ha)	**Total area under grapes for raisin production (ha)**		**Area harvested (ha)**	
		Sultana	**Merbein**	**Sultana**	**Merbein**
Own					
Rented					

2.2 Please complete the following table regarding raisin production for the production season

	Volume delivered(ton)	**Choice grade**		**Standard grade**		**Industrial grade**	
		%	**Price/kg**	**%**	**Price/kg**	**%**	**Price/kg**
Tompson							
Golden							
OR							

2.3 What size of the farm is under the vines specified in species and age in the table?

	Sultana (ha)	**Merbein (ha)**
Between 0 and 4 years old		
Between 5 and 10 years old		
Between 11 and 24 years old		
25 years and older		

2.4 Give an indication on input (specified in the table below) amounts used for raisin production as well as the corresponding input prices paid, where inputs were bought and when inputs were bought

		Sultana						Merbein					
Item		Type	Amount per ha	Amount (total)	Amount spent (R)	Bought when	Bought where	Type	Amount per ha	Amount (total)	Amount spent (R)	Bought when	Bought where
Fertiliser (Specify NPK concentration)													
Fertiliser (Liquid) (Specify NPK concentration)													
Manure (type)													
Chemicals													
Water (number of irrigations)													
Labour (Not family)	Permanent												
	Seasonal												
Amount of family members involved in raisin production													
Fuel (only for raisin production)													

2.5 Please give an indication of the percentage of your total income from the following activities.

Activities	**%**
Non farming activities	
Raisin production	
Wine/juice	
Rotation crops	
Livestock	
Other (Specify)	
	100%

2.6 How many different input suppliers did you contact for prices this production season?

1	**2**	**3**	**4**	**>5**

2.7 How many different processors did you contact for prices before selling raisins this production season?

1	**2**	**3**	**4**	**>5**

2.8 Do you receive price information by cellphone?

Yes	**No**
1	**0**

2.9 Do you receive price information from other farmers?

Yes	**No**
1	**0**

2.10 Did you make use of contractors for raisin production this season?

Yes	**No**
1	**0**

2.11 If yes at question 2.10, give an indication if it was contractors from the cooperative or private contractors as well as the cost of the contractor.

Activity	**Private Contractor**		**Cooperative**	
	0	**Price/ha**	**0**	**Price/ha**

2.12 Did you take soil/leaf samples in the previous 3 years?

Yes	**No**
1	**0**

2.13 If yes in question 2.10, did you take soil/leaf samples this year.

Yes	**No**
1	**0**

2.14 Which of the following 2 strategies is the most important to you when making farming decisions?

Cost minimizing	Income maximization

3 Economic Literacy

If a normal harvest for raisins occur and the amount of raisin buyers in the market is low.

3.1 What do you expect will happen to the price of raisins?

The price will fall	**A**
The price will stay the same	**B**
The price will increase	**C**
Not sure	**D**

3.2 Which one of the following define R/Pound exchange rate?

The amount of Pound you would pay for an ounce of gold	**A**
The amount of dollar you would pay for a pound	**B**
The amount of rand you would pay for a pound	**C**
Not sure	**D**

3.3 Rate how important is the exchange rate for your farming activities on a scale from 1 to 5 where 1 is not important and 5 is very important.

Not important	**1**	**2**	**3**	**4**	**5**	**Very important**

3.4 Do you know the current exchange rate, R/dollar of R/pound?

Yes	No
1	**0**

3.5 What is the current exchange rate R/pound or R/dollar? _____

3.6 Which one of the following defines the interest rate the best?

The cost associated with a loan	**A**
The extra cost you have to pay on a product you bought	**B**
The cost you pay to withdraw money from your bank account	**C**
Not sure	**D**

3.7 How important do you consider the interest rate for your farming activities on a scale from 1 to 5 where 1 is not important and 5 is very important?

1	2	3	4	5

3.8 Do you know what the current prime interest rate is?

Yes	No
1	**0**

3.9 What is the current prime interest-rate? _____ %

3.10 Do you know the current Fairtrade price received for raisins?

Yes	No
1	**0**

3.11 What is the current Fairtrade price received? _____ R/kg

3.12 You are currently delivering choice grade Tompson raisins at a price of R13.50/kg, the Fairtrade price included. Suppose a new processor opened in Upington, but you have to deliver the raisins at your own cost. Given the following prices, would you rather deliver to the new processor?

Price Offered	**Would you sell?**	
	Yes	**No**
R 13.60	**1**	**0**
R 13.70	**1**	**0**
R 13.80	**1**	**0**
R 13.90	**1**	**0**

3.13 If the raisin harvest for the year is small because of floods, but there are a lot of buyers for raisins in the market, what do you expect would happen to the price of raisins?

The Price would stay the same	**A**
The Price would increase	**B**
The Price will decrease	**C**
Not sure	**D**

3.14 If you only had enough money to by one input indicate which of the following 4 inputs you would buy first, second, third and fourth.

Water	
Chemicals	
Fertiliser	
Labour	

APPENDIX B: REGRESSION RESULTS

Table B.1: Tobit regression results for the total economic literacy score affecting cost efficiency.

Variable	Coefficient	Standard Error	z-Statistic	Probability
Intercept	0.8236	0.5487	1.5011	0.1333
Total Economic Literacy	0.0412	0.0451	0.9148	0.3603
Fertiliser	-0.1214	0.0892	-1.3612	0.1735
Water	-0.0905	0.0684	-1.3217	0.1863
Labour	0.0286	0.0636	0.4498	0.6529
Goodness of Fit				
ANOVA based fit measure	0.2669			
DECOMP based fit measure	0.2477			

Note: ****** indicate significance at a 10% level, ***** indicate significance at a 15% level.

Table B.2: OLS regression results for socio-economic factors affecting the fertiliser choice

Variables	Coefficient	Standard Error	t-Statistic	Probability
Intercept	2.5950	1.0022	2.5892	0.0145
Education	-0.0792	0.0676	-1.1723	0.2500
Experience	-0.0048	0.0129	-0.3689	0.7147
Recordkeeping course attendance	0.1991	0.6550	0.3040	0.7632
Recordkeeping course application	0.0884	0.1695	0.5214	0.6058
Farmer Days attended	-0.1063	0.0786	-1.3519	0.1862
Off farm income	-0.3967	0.3223	-1.2307	0.2277
Specialisation	1.4991	0.8139	1.8418	0.0751**
Area harvested	0.0199	0.0176	1.1335	0.2657
Goodness of Fit				
R-Squared	0.2044			
Adjusted R-Squared	-0.0009			
Prob(F-statistic)	0.4588			

Note: ****** indicate significance at a 10% level, ***** indicate significance at a 15% level.

Table B.3: OLS regression results for socio-economic factors affecting the water choice

Variables	Coefficient	Standard Error	t-Statistic	Probability
Intercept	3.3460	1.4824	2.2571	0.0312
Education	0.0586	0.0999	0.5860	0.5621
Experience	0.0030	0.0191	0.1569	0.8763
Recordkeeping course attendance	-0.1528	0.9688	-0.1577	0.8757
Recordkeeping course application	-0.1693	0.2507	-0.6753	0.5045
Farmer Days	0.1170	0.1163	1.0059	0.3222
Off farm income	0.4323	0.4768	0.9067	0.3716
Specialisation	-1.2123	1.2039	-1.0070	0.3217
Area harvested	-0.0048	0.0260	-0.1830	0.8560
Goodness of Fit				
R-Squared	0.1174			
Adjusted R-Squared	-0.1104			
Prob(F-statistic)	0.8356			

Note: ****** indicate significance at a 10% level, ***** indicate significance at a 15% level.