

ECONOMIC EFFICIENCY OF TABLE GRAPE PRODUCTION IN WATERBERG AND  
SEKHUKHUNE DISTRICTS, LIMPOPO PROVINCE, SOUTH AFRICA

BY

NAUME MAPASEKA MAPONYA

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SUPERVISOR: PROF. IB OLUWATAYO

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## **Abstract**

Table grape production plays an important role in the economy of many countries in Africa. It serves as a source of income for people who are engaged in its production and being one of the fields that is labour-intensive, thereby providing employment for many people.

The aim of this study was to analyse economic efficiency of table grape production in Waterberg and Sekhukhune districts of Limpopo Province, South Africa. The study used primary data collected from semi-structured questionnaires. A sampling technique called snowball, was used in the study as this method assisted in getting those farmers that were not easily accessible. The analytical tools employed to analyse data included descriptive statistics and Stochastic Frontier Model.

Findings from the study revealed that the average age of table grape farmers was 47 years. On average, household size for table grape farmers was found to be 5 members. Also, findings revealed that table grape farmers on average had a farming experience of 16 years. Average household income was found to be R47 600, 00. Furthermore, the study revealed that the average years of schooling for the table grape farmers was 15 years and only 67% of these farmers have acquired a tertiary educational level, while 33% have acquired secondary educational level.

In terms of efficiency, farming experience ( $P<0,00$ ), educational level ( $P<0,05$ ) household size ( $P<0,10$ ) and age of farmer ( $P<0,10$ ) were associated with increased efficiency as they were found to be significant at 1%, 5% and 10% confidence level. The findings also revealed that quantity of grapes produced was positively influenced by Farm size ( $P<0,00$ ), labour ( $P<0,00$ ), pesticides used ( $P<0,05$ ), extension services ( $P<0,05$ ) and fertilisers ( $P<0,05$ ).

Technical efficiency among farmers was found to range from 0.8 to 1, with a mean of 0.89, thus this indicated possibility of improvement in production. However, the allocative efficiency was found to range from 0.47 to 1, with a mean of 0.68, this clearly indicated that some farmers were finding it difficult to allocate their resources efficiently. On the other hand, it was found that economic efficiency ranged from 0.56 to 1, with a mean of 0.73, this indicated that most of the farmers were economically efficient.

Meanwhile, some of the constraints faced by the table grape farmers included high electricity bills and labour costs, as such the introduction of prepaid electricity in the farms could reduce the strain they go through.

Based on the findings from the study, it was recommended that, since the production of grapes is a male-dominated enterprise, women and youth should also participate. Participation could be encouraged through provision of learnership skills on the farms.

## **Dedication**

I sincerely dedicate this mini-dissertation to my late parents, wish that you guys were here.

## Declaration

I declare that the mini-dissertation hereby submitted to the University of Limpopo for the degree of Master of Science in Agriculture in Agricultural Economics has not previously been submitted by me for a degree at this or any other university; that it is my work in design and in execution, and that all material contained herein has been duly acknowledged.

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Surname, Initials (title)

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Date

## **Acknowledgement**

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## **Abbreviations**

EE – Economic efficiency

TE – Technical efficiency

AE- Allocative Efficiency

SFM – Stochastic Frontier Model

DEA – Data Envelopment Analysis

FAOSTAT – Food Agriculture Organisation Statistics

GDP – Gross Domestic Product

LED- Local Economic Development

DAFF – Department of Agriculture Forestry and Fisheries

FAO – Food and Agriculture Organisation

OECD – Organisation for Economic Co-Operation and Development

DFA- Deterministic Frontier Analysis

ETB – Ethiopian Birr

PC – Productivity Commission

IDP- Integrated Development Plan

TZS – Tanzanian Shilling

## CHAPTER ONE

### INTRODUCTION

#### 1. 1 Background

In agriculture, resources needed for agricultural production are scarce and therefore one needs to know how to deal with this issue and increase the level of output regardless of the circumstances. The scarcity of resources lead to the concept of economic efficiency to deal with the problem. For a farmer to be economically efficient, he or she needs to produce maximum output at the lowest possible costs and not waste resources(Quattara, 2012).

Eco-nomic efficiency comprises of technical efficiency and allocative efficiency. According to Aung (2012), technical efficiency refers to the ability of a farm to increase output for a given set of inputs and also at the lowest cost. On the other hand, allocative efficiency is the extent to which farmers make efficient decisions on how to use inputs to the level to which their marginal contribution to production value equal the cost. It is a good analysis of production as it outlines whether a farmer is operating at a good level of output or not.

In the same vein, Mburu *et al.* (2014), indicate that technical efficiency increases with farm size. This clearly indicates that farm size is vital for a farmer to be economically efficient. In contrast, Aung (2012), states that farms may be technically and allocatively efficient without being economically efficient, even if these two concepts are the properties of economic efficiency.

The measures required for the evaluation of efficiency analysis are classified into two groups, namely; non-parametric models which are exemplified by Data Envelopment Analysis (DEA) and parametric models such as Deterministic Frontier Analysis and Stochastic Frontier Analysis (Jarzebowski, 2013). On the other hand, methods used to measure the inefficiency level of production can be derived by the inefficiency model (Conradie *et al.*, 2006).

The degree of inefficiency is obtained by most farmers or producers during their production processes (Makombe *et al.*, 2011). This shows that this concept of inefficiency is a part and parcel of production whether producers like it or not. Crudely defined, according to Reiff *et al.* (2002), inefficiency refers to a situation whereby the same level of output is produced, however, with less of one input. This is similarly supported by a study that was done by Kumar

and Managi (2009), as it stated that inefficiency is due to the state of operating in the range of constant returns to scale, therefore, inefficiency level should be higher than zero.

Measurements of technical inefficiency are quite helpful as they provide information on the minimum quantity of inputs required for a farmer to produce maximum output (Neupane and Moss, 2015). Furthermore, technical and allocative inefficiency measures the size of consequent loss in production (Mendes et al., 2013). Hence, the inefficiency aspect is vital in ensuring that all the inefficiency variables are outlined and minimised effectively to enable producers to improve production. Moreover, farm performance can be potentially influenced by production assortment and quality interventions (Tasevska, 2012).

From the foregoing, the study therefore examined allocative and technical efficiency of table grape production in Waterberg and Sekhukhune districts to get a clear understanding of the production level and know what needs to be done to improve it.

## **1.2 Problem statement**

In South Africa, more than 80% of table grapes are produced in the Western Cape Province, and other production areas include Northern Cape, Eastern Cape, Limpopo, Free State and Mpumalanga (DAFF, 2012). The Limpopo Economic Development (LED) (2010) indicates that the Northern Cape Province is the dominant producer for table grapes. Even though Limpopo Province is recognised among the table grape producers, it depends on only two districts (Waterberg and Sekhukhune Districts) out of the five districts. This shows that Limpopo Province has limited farmers who are producing table grapes. It has approximately 90 farms that are supplying grapes to the international market. The market for table grapes has shown growth.

Economic efficiency in production plays an essential role and farmers are faced with the difficulties of not achieving it in their production since resource allocation is required (Quattara, 2012; Tasevska, 2012). The production of table grapes in Limpopo area is gradually decreasing as such, this shows that efficient measures need be taken to improve productivity of table grapes.

Limited studies have been done on table grape farming in Limpopo Province and majority of the studies done in the province only concentrated on vegetables, maize and livestock production etc. The greatest concerns of this study rest upon the following questions; What are the socioeconomic characteristics of farmers producing table grapes? Are the table grape

farmers economically efficient in their production? What are the constraints to efficient production of table grapes? These and many more underscores the need for the study.

### **1.3 Rationale for the study**

Table grape production is one of the forms of income generating activities in Limpopo Province (DAFF, 2015). Until recently, little attention has been placed on the production of table grapes in the province as only two districts are involved in it. This study aimed to analyse the economic efficiency of table grape production as a way of encouraging more farmers to engage in this type of farming and be more profitable in the business.

In South Africa, on average, grapes production top the list by value, which accounts for about 25%, compared to the value of maize at 17%, and followed by sugarcane, wheat and potatoes (Dube *et al.*, 2013). Hence, there is a huge potential for viable table grapes business if the number of farmers is increased as they can export their produce and improve their standard of living. Table grape farmers can therefore, supply wholesalers with their products for them to get better access to markets (Vilpoux and Constatino, 2016). This clearly indicates that table grapes play a vital role in the supply chain, as 90% of the total production is being exported, hence, adding a significant value towards the gross domestic product (GDP) of the country (DGIS, 2016a).

On the other hand, since table grape production is labour- intensive, it always requires more labourers, as the production of table grapes cannot be mechanised easily (Dahmardeh and Shahraki, 2014). Thus, as a result, this promotes job opportunities which leads to the growth of the economy.

According to DAFF (2015), South Africa's total export of table grapes in 2014 amounted to R6.2 billion. A large fraction of the amount which is R5 billion was made by the Western Cape Province, in comparison with other provinces. This shows that more needs to be done to improve the productivity and income generation of table grape production in Limpopo Province and enhancing employment.

Furthermore, through this study, lessons were learned from the farmers' ways on how they adapt to harsh climatic conditions taking its toll on the productivity of farmers in the Province. In addition, the table grape production has an ideal value for farmers as it enhances the

potential to venture into value adding practices through networking with export markets, to improve their standard of living by increasing profitability levels.

#### **1.4 Aim and objectives**

##### **Aim**

The aim of the study was to analyse economic efficiency of table grape production in Waterberg and Sekhukhune Districts, Limpopo Province, South Africa.

##### **Objectives**

The specific objectives of the study were to:

1. Identify and describe the socioeconomic characteristics of table grape farmers in Waterberg and Sekhukhune Districts, Limpopo Province, South Africa.
2. Examine the allocative and technical efficiency of table grape farmers in the study area.
3. Analyse the constraints to efficient production of table grapes in the study area.

#### **1.5 Research hypothesis**

Table grape farmers in Waterberg and Sekhukhune Districts are not economically efficient in terms of their production.

#### **1.6 Outline of the study**

Chapter 1: Discusses the concept of economic efficiency and its components. The production of table grapes and its importance in the study area and also across the country.

Chapter 2: Discusses the studies that were previously done around the concept of economic efficiency and the overview of production of table grapes in local and international contexts.

Chapter 3: Explains in detail the methodology used to undertake the study, and explains the analytical techniques employed.

Chapter 4: Presents the discussions from the results obtained from the stochastic production frontier model and from the descriptive statistics.

Chapter 5: Presents the summary, recommendations and conclusions of the study as well as the references.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Introduction

This chapter provides an overview, the state of table grape production and its importance. The concept of technical efficiency and allocative efficiency is outlined based on farmers' production and the effect it has on their production. Thus, according to Lwelamira (2015), there are approaches to measure efficiency of which are specified into parametric and non-parametric parametric approaches.

The empirical literature on the international perspective of farmers and constraints that they are faced with is detailed. Furthermore, empirical literature is still an emerging process in the developing countries, especially in the African context, thus, the market performance of table grapes is outlined. The review is basically aimed at getting a clear understanding of the grape market and the approaches that are available to analyse its efficiency.

#### **Table Grape Production Status and its Climatic Conditions in South Africa and Globally**

Worldwide, the production of grapes is dominated by few countries and amongst those countries, South Africa produces 9.2% with an export market share of 6.7% (Fernandez-Stark, 2016; Seccia *et al.*, 2015). In the Limpopo province, table grapes are mostly produced in the valleys of the Orange, Olifants, Berg and Hex Rivers (Macaskill, 2010). There are various types of grapes that are being produced and each have their own varieties namely; red grapes, white grapes, table grapes and raisin grapes.

On the other hand, the growth level of vines in South Africa is larger as compared to the European prototypes as they are more exposed to the intense sunshine, hence, this results in the production of a grape that is of high sugar and with lower acid content than the European grapes (Wellington, 1960). In the Western Cape Province, table grape production contributes more than 50% to the gross domestic product (GDP) which is mostly generated by the wine industry (Araujo *et al.*, 2014). In addition, the South African grape industry genuinely contributes an estimated amount of over R3 billion towards (GDP) gross domestic product (FAO, 2016).

The production of table grapes globally is in a surplus of 21 million tons and has shown tremendous growth over the years as more than 50 countries are engaged in this type of production. China accounts for 12% of global production, followed by Italy (9.1%), the USA

(8.7%), France (7.6%), Spain (7.4%), Turkey (5.5%) and Chile (4%) (Seccia *et al.*, 2015). Meanwhile, in India the production of table grapes is ranked ninth, which is regarded as the largest producing country and also accounts for more than 90% of its tropical production (FAO, 2015; Chandha, 2008). Furthermore, Nepal's demand for table grapes is largely met by India (Dahal *et al.*, 2017). Countries such as Serbia, they produce grapes on a 25 000 ha and on average the annual production amounts to 285, 71 tonnes of grapes, although it varies over the years (Milic *et al.*, 2016).

However, despite the quantity of table grapes produced in South Africa, farmers still have to deal with climatic conditions that arises such as temperature, rainfall and drought wherein farmers make use of irrigation systems to minimize the negative impact that it has on grapevines (Araujo *et al.*, 2014). According to DAFF (2016), grapevines require a unique climate and biodiversity of which South Africa acquires for a wide range of diversity and flavour. Hence, globally, low summer rainfall declines productivity of grapevines as this constitutes a continuous decline in the availability of water during growing seasons of grapes (Schultz, 2016).

In addition, according to Hunter and Bonnardot (2011), temperature plays a role in the physiological behaviour of grapevines and in order to improve grape quality, key grapevine physiological processes need to be carefully considered. According to Kok (2014), in wet humid tropics, the climate is favourable in the sense that grapevines are evergreen and continuously grow which allows farmers to have one cropping cycle per year. However, low temperatures are common in dry climate tropical areas causing dew or watery developments on grapes (Bois *et al.*, 2017).

### **Uses and Consumption Patterns of Table Grapes in SA and Globally**

Table Grapes are mostly used in the processing industries, wherein dried fruits are produced which are further used in cakes, sweets and salads, jam and juice. They also are the key players in the wine making industry and grape seeds are used in pharmaceutical industries as antioxidants, (DAFF, 2012). In addition, according to Macaskill (2010), table grapes can be freshly eaten and or be used for making jam, juices, jelly, vinegar, wine, grape seed extracts, raisins and grape seed oils. As such, the uses in South Africa are similar across the globe.

In the developing countries, labour is abundant, making table grapes to be well suited as they are more labour intensive. Thus, this stimulates rural employment and the workers can improve their standard of living (Mencarelli and Bellincontro, 2005). In a way when farmers



can engage in trade activities they can create job opportunities for their communities. According to Zhang *et al.* (2016), the most important factors that influence the consumption of table grapes is its taste and rich nutrition. In contrast to a study that was done by Feng *et al.* (2012), it was found that quality and safety are the two most important factors that influence consumers' consumption and purchasing power for grapes.

The consumption percentage change since 1994-2009, in South Africa as assessed by FAOSTAT food balance sheet has gradually decreased over the years, as it accounts to -70.5%, during that period (Ronquest-Ross *et al.*, 2015). Similarly, the Spanish market has experienced a decline in the consumption of table grapes as consumers' do not prefer the green grapes which are more acidic (Piva *et al.*, 2006). However, in countries such as China (Feng *et al.*, 2012); and Bulgaria (Desislava, 2017), it was found that there is a gradual increase in consumption of table grapes because consumers have recognized its nutritional value and in Bulgaria, grapes ripening period is when there is a surplus of other fruits in the domestic market.

### **International Perspectives on Table Grapes Production**

According to Kakade *et al.* (2011), the estimated age of grape wine producer was 46, 34 years along with an education standard that is more than undergraduate, meaning that these farmers are well educated and majority of them are youth in the grape wine production business. On the contrary, majority of grape farmers were between 35-64 years of age, whereas the adoption of technology was independent of the education level (i.e. mostly primary education level) (Lwelamira *et al.*, 2015). However, in a study that was done by Lwelamira *et al.* (2015), it argued that the farmers who are engaged in the production of grapes are the ones that have retired from the non-farm employment sector, and on average are over 50 years of age and continue to operate on small farms.

Furthermore, Odoemenen and Obinne (2010) & Saka *et al.* (2005), however, revealed that an increased education level, enhances the adoption of agricultural technology as grape farmers are more informative and are capitalists in the grape farming business. In contrast, Kalimang *et al.* (2012), stated that majority of the farmers that were engaged in the production of grapes, were individuals with low education level.

Majority of the individuals whom are engaged in the production of table grapes are males than females. However, even if females are a minority, they manage to produce more than their male counterparts, because females are more effective and efficient in doing things compared to the males (Kalimang *et al.*, 2014). In the Western Cape Province, men dominate the

workforce on wine farms, while female workforce is 20% larger than the male workforce on table grape farms (Conradie, 2005).

Household sizes for majority of the wine grape producers on average was 9.06 in number and it clearly indicated that these producers had large family size which may be due to joint family (Kakade *et al.*, 2011). Similarly, according to Lwelamira *et al.* (2015), argued that grape farmers were characterised by large household size which comprises of 6 members and above, and also stated that large composition of household members is associated with increased adoption of new interventions. Lastly, stated that these farmers, majority of them who are engaged in grape farming business are married. However, according to Kalimang *et al.* (2014), mostly those farmers who are engaged in the production of grapes were young, single or unmarried and devoted most of their time to this type of farming business compared to the old and married individuals.

The average farm size for table grapes is about 1 hectare, which implies that vine growers cannot meet the great demand of wholesalers' due to their small planting scale (Deng *et al.*, 2016). In a study that was done by Lwelamira *et al.* (2015), it was found that about seven in ten grape farmers (74.6%) had less than two acres of land under grape production with average acreage of 2.1. This clearly shows that farm size is vital in achieving the optimum level of grape production.

According to Conradie (2005), table grape farmers in the Western Cape puts the average wage for farm labour at R928 per month in 2003 and R1123 per month in 2004. On the other hand, in a study that was done by Lwelamira *et al.* (2015), it was found that 73% of grape farmers earned less than 1 million TZS per year, while 21.4% and 5.6% earned 1-2 million TZS and less than 2 million TZS per year respectively. On average grape farming was 823.151 TZS which is equivalent to 35.6% of the total income. Similarly, this was observed in a study that was done by Kalimang *et al.* (2014), which found that 34% of the farmers' level of income per year per acre is less than 5 million Tsh.; 23% earned between 5million and 10 million Tsh, between 10 million and 15 million Tsh. (31.4%) and above 15 million Tsh. In a nutshell, this shows that grape farming plays a vital role in contributing to their household income.

Majority of the farms around the world operate and depend on credit facilities to fully function well. According to Ezihe *et al.* (2016), it was found that age, gender, farm size and collateral value have a significant relationship on the level of farmer's access to formal loans and it promotes room for farm expansion. However, since majority of the farmers do not have collateral and there is poor loan recovery on the supply-side, while on the demand-side the

provision of insufficient capital prevents farmers to have access to credits (Amadhila and Ikhide, 2016). In addition, farmers may not seek loans due to the high risks implied by the available credit contracts and it was found that short term credits have no impact on the productivity of the farms (Reyes *et al.*, 2012). In contrast, farm productivity may be affected if there is no access to credit as farmers would be forced to constrain themselves and only use few agricultural inputs (Petrick, 2004).

In a study that was done by Haq (2013), it was found that extension services have a positive significant effect on improving farm income. Similarly, this is validated by a study that was done by Gulati *et al.* (2018), as it was found that extension services empower farmers to be able to realize higher net income from their respective farm enterprises to achieve sustainability. Furthermore, according to Mamun-ur-Rashid and Qijie (2016), all farmers need extension services to be at their best performance level, however, more concentration is put on larger and medium farms that possess a major proportion of cultivable land. In addition, the efficiency of extension services is hampered by shortages of skilled extension workers. On the other hand, one of the constraining factors is that extension services are not intensified to improve fruit quality and safety (Tellioglu and Konandreas, 2017).

### **Constraints to Efficient Production of Table Grapes**

Majority of the export takes place in the port of Cape Town and one may find that one must incur high transportation costs and post-harvest temperature control measures should be taken into consideration. In contrast, it is said that the challenges in the Limpopo province to produce table grapes is the farm size that smallholder farmers own which amounts to 1.5 ha and their supply level to the market is very low (Dludla, 2014). This means that smallholder farmers are unable to meet market demand since they are constraint.

On the other hand, factors such as irrigation, pest and diseases can affect table grape yield and quality as it affects the grapes' sugar levels, acidity and juice colour (Myburg and Howell, 2006; Lwelamira *et al.*, 2015). Furthermore, distance to the harbours poses a serious constraint for the export market if any existing cultivars are planted (DAFF, 2012). The major concern for table grape farmers is the irrigation systems that are put in place and are powered by electricity as the expenditures are hitting hard on their pockets (Conradie *et al.*, 2006).

A study that was done by Kalimang *et al.* (2014), stated that the major challenges specifically faced by smallholder grape producers were diseases, unreliable number of extension officers, number of processing firms, enforcements of written contracts, establishment of grape boards and cooperative unions that organise farmers to form strong farming entity, and lastly delayed

payments that causes a decline in grape quality and this can be supported by a study done by Patil (2008) which stated that it was very difficult for farmers to meet export standard and maintain grape and the lengthy procedures for export are so unbearable.

Grape producers experienced challenges such as high labour costs, fertiliser and transportation costs, fluctuation of market prices, severe pest and diseases which reduces grape quality, irregular supply of electricity, lack of mechanisation, high initial investments, high investment for getting various certification, inadequate credit, non-suitability of improved technologies to small and fragmented land holdings, inefficiency of labour, lack of knowledge about improved varieties (Patil, 2008). Moreover, in a study that was done by Lwelamira *et al.* (2015), grape farmers face challenges such as low price of grapes, high costs of inputs, limited access to market, prevalence of pests and diseases, inadequate storage facilities and limited access to quality seedlings. In addition, lack of information on markets, poses a serious threat for emerging and smallholder farmers when they have to participate in agricultural input and output, especially in the developing countries (Chandra, 2010).

### **Marketing of Table Grapes**

According to DAFF (2016), table grapes are one of the most important deciduous fruits grown in South Africa, taking into consideration their foreign exchange earnings, employment creation and linkage with support institutions. In 2015, table and dry grapes contributed 33% (26 391 ha) of the total area planted to deciduous fruits (80 740 ha)<sup>2</sup>, however, according to DAFF, in 2017, the contribution decreased by 1% which amounted to 32% (25 331ha) of the total area planted to deciduous fruits (79 748 ha)<sup>2</sup>.

South Africa is the second largest exporting country in the southern hemisphere and fifth globally (market share 6.7%) and also the main competitors from the southern hemisphere are Argentina, Brazil and Peru (Seccia, 2015). In contrast, FAO (2016), stated that South Africa is the sixth largest exporter and it shares the same objective with Chile which is primarily aimed at the export market. Chile has the leading grape market share of exports with more than 20%, followed by the United States of America and Italy (12%), the Netherlands (7,5%), South Africa (6.7%), Turkey (5,7%) and China (5,4%) (Seccia, 2015; OECD, 2004).

In a study that was done by Beluhora-Uzunova and Roycheva (2017), it was found that there are issues and problems associated with the competitiveness in Bulgarian viticulture such as reduction of harvested area, production, export and gross value addition of grapes and lastly low investment in the sector poses as a threat to the growth of the sector. On the other hand,

the European market has been eroded by new competitors, this is of a result of the competitiveness of emerging countries (Seccia *et al.*, 2015).

Likewise, it was discovered that countries such as Egypt have the potential to obtain opportunities through the table grape industry as its market share in the world is largely influenced by the time of export, export prices of competitors, and the quality being exported (Diab *et al.*, 2009). According to Dimitrova *et al.* (2014), the driver of productivity and competitiveness of table grapes viticulture is the investment activities that should be taken into consideration. Thus, countries that are engaged in the production of table grapes must consider their investment activities to enhance growth of the sector.

Consumers' taste and preference play a vital role in the supply of table grapes, in the sense that this forces suppliers to conform, especially in well established markets such as Northern Europe (FAO, 2016). In addition, suppliers are supposed to ensure that the product is more attractive to consumers based on the following attributes such as its intense perfume and plump, juicy, sweet and sour flesh as in this way they can attract consumers and make sales (Zhang *et al.*, 2016).

A working paper that was done by Lubinga *et al.* (2017), argued that on average, an increase in exports of selected products such as citrus, deciduous fruits, table grapes and wine is led by a unit increase in levy expenditure on export promotion and market developments. According to Kalimang *et al.* (2014), on an annual basis, the market shares of each smallholder grape farmer accounted for 91.4% (i.e. on average 1530kg) and they also used credit methods to sell their produce and it took them more than 6 months to be paid.

Consequently, South Africa imported grapes in 2016, the market share value was 7.5% with a growth rate of 15.6%. The exported grape fruits experienced a negative growth rate of 12.2% between 2015 and 2016, with an export share value of 14.7% (NAMC and DAFF, 2017).

### **Allocative and Technical Efficiency of Table Grape Farmers and its Impact on Production**

The concept of economic efficiency is commonly used in the production of agricultural produce. According to Ogundari and Ojo (2006), it is a measure that provides inputs and or outputs in quantities such that all users have the same marginal benefit and all producers operate at the same marginal cost. Thus, marginal benefit should be equal to marginal cost. In contrast (PC, 2013), states that it is a measure of the increase in net benefits; encompassing; productive, allocative and dynamic efficiency. It is attained when individuals in

a society maximize their utility, given the resources available in the economy. In simple terms, economic efficiency refers to the use of resources in a manner that the cost of production is low, and the resources are not wasted to utilize them in future.

Therefore, economic efficiency can only be achieved, if the highest possible level of satisfaction is obtained from given resources used (Azeez *et al.*, 2013). According to Edet *et al.* (2018), technical efficiency is one component of overall economic efficiency, however, to be economically efficient, a firm must first be technically efficient.

In addition, technical and allocative efficiency are the tools that are required in the concept of economic efficiency. Technical efficiency is the ability to transform resources in order to produce the possible maximum outputs (Tipi *et al.*, 2009). Similarly, according to the Productivity Commission (2013), technical efficiency refers to the transformation of inputs into outputs and it is measured as the ratio of physical outputs into inputs (Aung, 2012). This means that for a farmer to be technically efficient, an increase in outputs should result into a decrease in some other output during the transformation of inputs into outputs. It has grown over the last years.

Meanwhile, allocative efficiency refers to the relation of inputs utilization by a firm or smallholder farmer according to the current prices on the market (Quattara, 2012). On the other hand, according to Ogundari and Ojo (2006), it is the utilisation of resources in such a way that they are not wasted and is evenly distributed and also the benefits of using those resources are high. This type of efficiency ensures that scarce resources are well distributed and can be conserved for future use. In actual fact, allocative efficiency looks at the effective management of scarce resources.

There is an expectation that farms that are heavily involved in the establishment phase may appear to be less efficient as compared to those farms that have long been established (Conradie *et al.*, 2006). Similarly, in a study that was done by Lwelamira *et al.* (2015), it was found that farms that have just been on their implementation stages are more prone to be less efficient. According to Tasevska, (2012), argued that more efficient farms are characterised by the following factors namely; the use of a smaller area, irrigation of a smaller proportion of total area, use of less hired labour, used and paid less for inputs, but produced a larger quantity with higher value per hectare. Likewise, according to Oluwatayo and Adedeji (2019), profitability of any agricultural enterprise is enhanced by the efficient use of inputs. In contrast,

efficiency is determined by socioeconomic and demographic factors (White and Wadud, 2002).

In terms of productivity, female smallholder farmers were more efficient than their male counterparts (Kalimang *et al*, 2014). On the contrary, more technically efficient farmers were found to be young, had profit-orientated goals, viewed farming as a hobby and had less expectations, performing bookkeeping duties, monitoring and evaluation farm processes, those attending seminars, farmers making choices with other family members, and those interested in competence-based knowledge such as plant protection, credit/investments (Tasevska, 2012).

The other aspect that needs to be taken into consideration are the tools required to measure efficiency, namely, non-parametric model (Data Envelopment Analysis- DEA) and parametric models (Deterministic Frontier Analysis - DFA and Stochastic Frontier Model- SFM) (Garcia del Hoyo *et al.*, 2004). According to Kumbhakar and Heshmati (1996), DEA generates a large scale of optimal levels, while DFA yields a constant level of optimal scale and the most preferred SFM model shows constant returns to scale.

Stochastic Frontier Production (SFM) function Model allows for measurement error as well as random factors that are not under a farmers' control such as weather and disease. The other advantage is that it makes it possible to test hypotheses about a farm's production technology and impose corresponding restrictions (Saldias and Cramon-Taubadel, 2014). This model involves unobserved random variables that are associated with technical inefficiency in production of individual firms while the DEA only involves the concept of efficiency, which was decomposed by Farrell (1957) into technical and allocative efficiency. However, the major limitations of DEA are that it is complex conceptually, to operate the effects of uncontrollable environmental variables and measurement errors, from the effect of differences in farm management and the presence of outliers (Mendes *et al.*, 2013).

According to Garcia del Hoyo *et al.* (2004), deterministic frontier analysis (DFA) does not consider random effects like the SFM does, and it deviates from the frontier output of a decision-making unit. Inefficiency is assumed to be caused. Hence, SFM is a critical production measure of efficiency since it can easily measure the uncertainty of efficiency estimates (Cornwell and Schmidt, 2008).

## 2.2 Summary of literature review

From the review of literature, it is clear that the production of table grapes is dominated by few countries, countries such as South Africa produces 9,2%. In addition, the growth levels of vines in South Africa are well established as its export market share accounts for 6,7%. Production of table grapes in terms of its economic contribution towards the GDP is more than 50% with an estimate of over R3 billion. The climatic conditions for table grape production differs according to the regions and conditions such as temperature, rainfall and drought have a major impact on the growth and development of grapevines.

In South Africa and across the globe table grapes are used in processing (i.e. wine) and pharmaceutical industries (i.e. as antioxidants). The consumption patterns over the years in the South African and Spanish market have gradually decreased, meanwhile, in countries such as China and Bulgaria there is a gradual increase in consumption due to the nutritional value it contains. According to literature, majority of these farmers are middle-aged and old aged groups (i.e. retired) and mostly are males than females, both with a low educational level, however, females in the production of table grapes are more productive than males. For instance, in South Africa, women dominate the grape farm work force. Majority of the grape farmers have large household sizes which range from 6 household members and above. In addition, a low educational level attained from majority of the grape farmers, which results in low adoption of technology.

Extension services were found to be essential as they empower farmers to perform at their best, however, these services are not intensified to improve the quality and safety of fruit (Tellioglu and Konandreas, 2017). On the other hand, the major constraints to efficient production of table grapes mostly include high electricity bills, labour costs and transportation costs. According to NAMC (2017), when it comes to the grape market, South Africa and Chile have the same objective which is to engage in the export market. Between 2015 and 2016, South Africa, experienced a negative export growth rate of 12,2% while the imported grapes in that particular period and experienced a growth rate of 15,6%. Investment activities are the main drivers of productivity and competitiveness for table grape viticulture.

According to literature, female farmers were found to be more efficient in the production of table grapes than males. Farms that are still in the establishment phase were found to be less efficient than farms that have been in existence for a long period of time. Efficient farms were found to be using less production inputs, however, produced larger quantities per hectare.



There are various tools that are used to measure efficiency of a farm, however, it was found that the SFM can easily measure variables that make the farmer to be inefficient.

## CHAPTER THREE

### RESEARCH METHODOLOGY

#### 3.1 Introduction

This chapter entails the description of the study area, data sources and collection method that were used to achieve the objectives of the study. Lastly, it describes in detail the models and the data sets utilised.

#### 3.2 Study area

The study was conducted in Waterberg and Sekhukhune Districts. In Waterberg District, Modimolle Local Municipality was selected and on the other hand, in Sekhukhune District, Marble-hall and Groblersdal Local Municipality were selected.

##### 3.2.1. Overview of Waterberg District Municipality

It is located in the western section of Limpopo Province, sharing provincial border with Botswana. In addition, Waterberg shares its borders with Capricorn and Sekhukhune District Municipalities with a total area of approximately 4951882 sq.km (Du Toit, 2002). According to Census 2011, population growth rate was 1.2% over a ten-year period. The district area in nature is both semi-arid and hot. Furthermore, average rainfall is 600-650 mm and it occur from November to February. Major economic activities include agriculture, mining and tourism.

##### Demographics of farmers in Waterberg District

Farmers in this area are aged between 46 and 64 years, and also their level of education is very low wherein they engage in agriculture which enables food security. Its population constitutes of 91.8% black people, 7.5% White, 0.2% Coloured and 0.4% Asian (DGIS, 2016c). On the other hand, Modimolle Local Municipality is located under Waterberg District with a total area of 13521.8 sq.km and has a population size of approximately about 106621 people (Census, 2011). Agricultural activities are both commercial and subsistence farming. Commercial farming mainly focuses on grapes, watermelons, citrus, seed maize, vegetables, strawberries and vegetable production (IDP, 2009/10 a).

**Table 3.1: Distribution of residents by gender**

Local Municipalities	Male	Female	Total
Thabazimbi	42773	29072	71845
Lephalale	56704	48259	104964
Mookgophong	15748	14760	30509

Modimolle	30614	29760	60373
Bela - Bela	28799	27603	56401
Mogalakwena	137512	158285	295796
Waterberg	312150	307739	619889

Source: Census 2011

### 3.2.2 Overview of Sekhukhune District Municipality

It is one of the 5 district of Limpopo province, it is located in the northern part of South Africa and covers an area of approximately 13 527.72 sq.km. It has a population size of approximately 1, 076 840 people and the population growth rate, on an annual basis is 1.9%. And 53.8% of the population constitute of females while males constitute about 46.2%. Major economic activities include mining, agriculture and tourism (Census, 2011).

#### Demographics of farmers in Sekhukhune District

In this district, 40% of agricultural household heads are between 46-64 years of age (IDP, 2017b). Majority of the farmers in this district have low level of education with approximately 86% of household heads with no schooling which enables them to focus more on agriculture (DGIS, 2016b).

On the other hand, Groblersdal Local Municipality is located under the Sekhukhune District with a total area of 10.88 sq. km, and has a population size of approximately 8440 people, while Marble-hall Local Municipality is located in the same area with a total area of 3708,3 sq.km with a population size of approximately 34904 individuals. According to Steyn (2008), Marble-hall is a major producer of citrus and table grapes, amongst others they are also engaged in vegetable production. Groblersdal Municipality is characterized by agricultural production of grapes, wheat, tobacco, maize, soya beans, citrus fruits, vegetable production and cotton (IDP, 2017b).

### 3.3 Data sources and sampling method

#### Data sources

Data was collected using semi-structured questionnaires. The questionnaire was tested with the extension officers in the district areas to test the reliability of the questionnaires. The primary source of this study were the table grape farmers in Waterberg and Sekhukhune Districts, Limpopo province. Face to face interviews were used as a method of data collection. A sample of 12 farmers was interviewed for the study. Since the table grape farmers were few,

a sampling technique called snowball was used to locate the table grape farmers that were in the two districts namely; Sekhukhune and Waterberg Districts. This technique revealed all the relevant participants that are off the radar.

Snowball technique is a sampling method that is applied when samples with the targets characteristics are not easily accessible (Naderifar *et al.*, 2017). In addition, this is a way of obtaining information among individuals who are having informal social relations (Rajamanickam, 2001). This sampling method was adopted because table grape farmers are few in the study area and also not easily accessible, thus this method becomes ideal for such events.

### **3.4 Analytical methods**

Descriptive statistics and Stochastic Frontier Model (SFM) were used to analyse the objectives of the study. Descriptive statistics methods such as tables and frequencies were used to analyse the socioeconomic characteristics of table grape farmers and the constraints that they are faced in producing table grapes.

On the other hand, Stochastic Frontier Model (SFM) was used to analyse the second objective. The SFM is an econometric model which presents a method assuming two error elements. In this approach, inefficiency is assumed to have asymmetrical distribution, usually half normal distribution and random error is expected to have symmetrical distribution (Vincova, 2005). According to Belete *et al.* (2016), its main advantage is that it captures random variables which are beyond the producer's control, in order to ensure that there is more consistency with the potential output under "normal" working conditions. It is a good measure of economic efficiency as it analyses, both the technical and allocative efficiency simultaneously. Hence, the rational for using Stochastic Frontier and Technical inefficiency Model in this study were used to examine the economic efficiency and determinants of table grape production and also the sources of inefficiency. Thus, this is in line with the study done by Mburu *et al.* (2014).

According to Bushara and Abuagala (2016), this model entails the measure of technical inefficiency by using the technical inefficiency effect model which is captured by the normal distribution means  $U_i$  and it is assumed to be independently distributed such that  $U_i$ , will be obtained by truncating (at zero) of the normal distribution with mean  $U_i$  and variance  $\delta^2$ .

On the other hand, technical inefficiency refers to when a higher level of output is technically obtained by a given set of inputs or the level that can be obtained by using few inputs in the

production process (Kumbhakar *et al.*, 2015). In addition, it is likely caused by inadequate information, insufficient technical skills and lastly untimely input supply (Wassie, 2012).

### 3.4.1 Model specification and estimation of parameters

#### Stochastic Production Frontier Function Model Specifications;

$$Q_i = \alpha U_i + (Z_i - X_i), \text{ cu } i=1, n$$

Where:  $Q_i$  =table grape production of farmer i

$\alpha$ = vector of unknown parameters

$U_i$  = number of inputs for table grape farmers from  $X_i$

$Z_i$  = stochastic variables considered  $N(0, \delta^2 z)$  and independent

$X_i$  = non-negative stochastic variables relating to production technical inefficiency and considered  $|N(0, \delta^2 z)|$

### 3.4.2 Estimation of economic efficiency

$$EE = \text{Price (Quantity of table grapes)} / \text{Price (Quantity of inputs)}$$

### 3.4.3 Model for technical inefficiency

$$U_i = \sigma_0 + \sigma_i Z_i + \varepsilon_i$$

Where:  $U_i$  =table grape production of farmer i

$\sigma_i$  = Vector of coefficients to be estimated

$Z_i$  = Vector of independent variables such as access to support services and social-demographic variables.

The Maximum Likelihood Method was used to estimate the stochastic frontier and the inefficiency model (Bettese *et al.*, 1996)

**Table 3.2: Description of Variable**

Type of Variable	Description	Unit of measurement	Expected Sign
Dependent Variable			
Table grape production	Table grapes	Kilograms per hectare	+/-
Independent Variables			+/-
Stochastic Frontier Model			
Farm size	Area under table grape production	Hectares	
Labour used in production	Amount of labourers used in production	Numbers	+
Fertiliser	Amount of fertiliser used	Kg/ ha	+
Pesticides	Amount of pesticides used	ml	+
Capital	Amount for the establishment of table grape production	Rand	+
Equipment	Equipment operating cost	Rand	-
Seedlings	Amount of seedlings planted	Kilogram per hectare	-
Irrigation	Cost of water	Rand	-
<b>Model for technical inefficiency</b>			
Gender	1- Female 0- Male	Dummy Variable	+
Marital status	1- Married 0- Otherwise	Dummy Variable	+
Educational level	Years of schooling	Years	+
Household size	Household size of farmer	Numbers	+
Farmer's Age	Table grape farmers age	Years	+
Household income	Household income of the farmer	Rand	+
Farming experience	Number of years in the production of farmer	Years	-
Fertiliser costs	Cost of fertiliser used in the production of table grapes	Rand	-
Access to credit	1- Yes 0- Otherwise	Dummy Variable	-
Extension services	1- Yes 0- Otherwise	Dummy Variable	+
Membership of association	1- Yes 0- Otherwise	Dummy Variable	+/-

### **3.5. Limitations of the study**

There were few farms that were available at the study area because most of the farms had been bought out by commercial farmers that were very well established in the area. The table grapes farms that were provided through the land restitution pillar, they were not that functional and or they had collapsed. Just to mention a few, this was due to lack of capacitation, conflicts amongst members of the project, political instabilities in the area. Hence, the number of table grapes farms in Waterberg and Sekhukhune Districts had decreased gradually and most had shifted to the production of strawberries amongst other things as it is on high demand by the export market. Thus, this could be seen in Waterberg District.

The measures that were undertaken to overcome the limitations of the study were to engage with the extension officers to assist in locating table grape farmers. In cases, where the farms were given through the land redistribution and had failed, the beneficiaries were interviewed.

## **CHAPTER FOUR**

### **RESULTS AND DISCUSSION**

#### **4.1 Introduction**

This chapter represents the empirical results of data collected for the study on the economic efficiency of table grape production in Waterberg and Sekhukhune Districts. The study entailed the socioeconomic characteristics of table grape farmers, the technical and allocative efficiency of table grape farmers in the study area. Lastly, the reasons and challenges that the table grape farmers are faced with in their production activities is also outlined.

#### **Socioeconomic Characteristics of Table Grape Farmers in Waterberg and Sekhukhune District**

##### **Age of the farmers**

This study found that average age of the table grape farmer is 47 years of age, while the minimum age was 31 years old and the maximum was 61 years of age during data collection. Hence, the production of table grapes is engaged by people who are middle aged, and youth were not major players in the production. The findings of this study are similar to a study that was conducted by Kakade *et al.* (2011); Lwelamira *et al.* (2015), where they found that majority of the grape farmers were mostly middle aged and also well educated. Furthermore, a study that was done by IDP(2017a), found that majority of the farmers were aged between 46 and 64 years of age, however, they had low levels of education and vast of them with no schooling.

##### **Household size of table grape farmers**

On average, each household of the table grape farmers consisted of 5 members. The minimum household of the farmer consisted of 3 members while the maximum number of household members was found to be 11. On the contrary, a study that was done by Lwelamira *et al.* (2015a); Kakade *et al.* (2015), found that table grape farmers on average had large number of household members.



## Household income

This study found that on average, household income for the table grape farmers amounted to R47 600, it clearly indicated that their grape farming enterprises were well established as they were able to feed their loved ones and also manage to pay off their expenses. In contrast, on average, table grape farmers may earn between 5million Tsh. (R31 345, 90) and 10 million Tsh. (R62 691,80).

## Farming experience of table grape farmers

The average number of years in the production of grapes by the table grape farmers was found to be 16 years. The minimum number of years was 8 while the maximum number of years was 30. This simply implies that these farmers were more experienced in the production of grapes and as well as educated. On the contrary, in a study that was done by Lwelamira *et al.* (2015a), it was found that grape farmers had a minimum of five years' experience and with an average of 10 years.

## Farm size

Minimum farm size for the production of table grapes in this study was found to be 10 hectares while the maximum farm size is 116 hectares. On average, the farm size was 44, 25 hectares. Hence, this clearly indicated that these grape farmers were able to meet the supply and demand of grapes in the market. However, in a study that was done by Deng *et al.* (2016), stated that farm size is less than 1 hectare which does not enable them to meet the target demand of wholesalers. .

**Table 4.1: Summary statistics of farmers' socioeconomic characteristics**

Description	Minimum	Maximum	Mean
Age of household head	31	61	46.67
Household size	3	11	4.92
Household income	R24 500	R85 000	R47 600
Farming experience (years)	8	30	15.83
Farm size (ha)	10	116	44.25
Costs of establishment	R60 000	R821 000	R181 925
Maintenance of the farm	R8000	R400 000	R502 458

Source: Author's computation from data

Majority of the farmers were male at 75%, while 25% were female. This clearly indicated that production of table grapes is a male dominated type of agriculture. This was supported by a study that was done by Kalimang *et al.* (2014); Conradie (2005), which stated that males dominated the table grape production.

**Table 4.2: Gender of table grape farmers**

	Frequency	Percentage
Male	9	75
Female	3	25
Total	12	100

Source: Author's computation from data

About 33% of table grape farmers in this study were found to be single, while only 67% were married. This was similar to a study that was done by Lwelamira *et al.* (2015b), it was found that majority of table grape farmers were married. Hence, table grape production is a family-oriented business wherein farmers took pride in what they were engaged in regardless of the challenges they may had encountered.

**Table 4.3: Marital status of table grape farmers**

	Frequency	Percentage
Single	4	33
Married	8	67
Divorced	0	0
Widowed	0	0
Total	12	100

Source: Author's computation from data

Majority (67%) of the farmers had a Tertiary education level while only 33% had secondary education. This clearly showed that majority of these farmers were well educated and as such they were capable of building and improving their businesses. On the other hand, the average years of schooling in this study was found to be 15 years. This was supported by a study that was done by Odoemenen and Obinne (2010); Saka *et al.* (2005), which stated that majority of the grape farmers were more educated.

**Table 4.4: Educational level of table grape farmers**

	Frequency	Percentages	Average years of schooling
No formal education	0	0	0
Primary education	0	0	0
Secondary education	4	33	15

Tertiary education	8	67	
Total	12	100	

Source: Author's computation from data

This study found that 58% of the farmers had access to an agricultural extensionist, while 42% did not have an extension officer and relied only on their own knowledge to improve production of table grapes. This clearly indicated that table grape farmers really took the services provided for by the extension officers into careful consideration. This concurred with a study that was done by Haq (2013); Gulati *et al.* (2018), which stated that extension services had a positive significant role as farmers were able to achieve higher farm income and also be empowered. Thus, these services do improve farmers level of production.

**Table 4.5: Extension services provided to table grape farmers**

	Frequency	Percentage
No	5	42
Yes	7	58
Total	12	100

Source: Author's computation from data

About 50% of table grape farmers had access to credit facilities, while 50% did not have access to credit as some were financially stable and others did not have collateral to take up loans from the bank. The issue of having no collateral, poses a serious threat in terms of their potential to grow, it was outlined in a study that was done by Amadhila and Ikhide (2016).

**Table 4.6: Credit details of table grape farmers**

Access to credit facilities	Names or types of credit facilities	Frequency	Percentage
No	Not applicable	6	50
Yes	Bank	6	50
Total		12	100

Source: Author's computation from data

This study found that the average costs of establishing a vineyard amounted to R1 819 250, 00. On the other hand, it was stated in a study done by Lwelamira *et al.* (2015a), that the cost of establishing a vineyard was R250 000. This clearly showed that there was great variance in terms of the costs involved in establishing a vineyard. The minimum maintenance costs of the farm were R80000, while the maximum amount was R400 000. In addition, the production quantity on average amounted to 70045 kg/ha, while the minimum amount was found to be 14000 kg/ha and lastly the maximum amount was R180 000 kg/ha.

Price per box for the grapes, on average was found to be R100, 83, this sale was for the local sales. The minimum price was R70, 00, whereas the maximum amount was R150, 00. The average cost for pesticides was R794 365,17. The minimum earnings for a labourer was R1200, depending on the size of the farm it is, and the maximum amount that a labourer could earn per month was R3500, 00. On average, the amount that a labourer can get was R3116, 42. Therefore, this was in contrast with a study that was done by Conradie (2005), which stated that on average the labour wage was R1123,00 in 2004. On the other hand, the average amount of labourers that are engaged in the production of table grapes were only 291 individuals.

**Table 4.7: Production costs for table grape production**

	Minimum	Maximum	Mean
Cost of establishment	R60 000	R8 210 000	R1 819 250,00
Maintenance costs of the farm	R80 000	R400 000	R502458,33
Production quantity per season (kg/ha)	14 000	180 000	70045
Price per box or crate	R70	R150	R100.83
Cost of pesticides	R6000	R2 720 000	R7 94365.17
Litres of water used to produce table grapes	10950	1 000000	1625697.50
Earnings for labourers	R1200	R3500	R3116.42
Total number of labourers employed per season	96	600	291

Source: Author's computation from data

## 4. 2 Stochastic Frontier Model Analysis Results

The technical, allocative and economic efficiency scores of table grape farmers were determined by using the Stochastic Frontier Model(SFM). An overall summary of the results obtained from the use of inputs (seedlings, farm size, equipment, pesticide, fertiliser)

### Summary Statistics of Inputs, Output and Input Prices used in SFM

#### 4.2.1 Quantity of inputs

Table 4.8, illustrates that on average table grape seedlings amounted to 7135, thus, this was the amount used in the production of table grapes. The minimum hectare that was utilised by table grape farmers was found to be 10 hectares, while on maximum it

amounted to 116 ha. This indicated that these farmers were operating on a large scale, as on average their production amounted to 70045 kg of table grapes.

On average, the man-hours taken by the labourers was approximately 6 hours per day and per season. On the other hand, farmers in this study applied pesticides and fertilisers to their farms to make it productive, and on average they applied 55.78 ml of pesticides and 442.5 kg of fertiliser.

#### 4.2.2 Inputs costs

The table below indicates that table grapes require a lot of investment capital, thus, on average seedlings costs R48652, 25. On the other hand, labour costs were straining these farmers as they keep them during off season of the production of grapes. Farmers on average paid labourers R3116, 42 during the production season. The minimum cost of pesticides was R6000, while fertiliser costs were R2500. Water played a vital role in the production of table grapes and on average farmers had to pay R520931.90, annually.

The cost of equipment in this study was found to be quite expensive as on average it amounted to R686781, 50, while costs of pesticides equaled R793436,52 on average. In addition, according to a study that was done by Kebede and Redae (2017), the equipment costs for the production of grapes amounted to 120 000 ETB (R59 009, 00), which is far from the findings of this study which was that on average equipment costs amounted to R68 6781.50, and clearly indicated that they are quite expensive in South Africa. In contrast, to a study that was done by Carpio *et al.* (2008), it was found that grape equipment costs amount to \$1795, 35 (R25 265, 24) for a 4ha grape vineyard. This clearly indicated that farmers needed a good investment plan to cover cost of production.

**Table 4.8: Summary statistics of inputs, output and input prices used in SFM**

Variable	Mean	Std. Dev	Min.	Max.
Grapes production (kg)	70045	51896.09	14000	180000
Inputs				
Quantity of seedlings (amount)	7135	75631	1500	232000
Farm size (ha)	44.25	35.012	10	116
Man-hours (per season)	5.5	4.58	5	8
Pesticides (ml)	55.78	35.67	49	568.4
Fertiliser (kg)	442.5	354.7	100	1160
Input Prices				
Cost of seedlings	48652.25	32705.91	6500	980532

Cost of labour	3116.42	665.67	1200	3500
Cost of pesticide	793436.52	91935.86	6000	272000
Cost of fertiliser	3027.50	433.78	2500	3600
Equipment costs	686781.50	1116396	45500	3400000
Cost of water	520931.90	1427541	350000	5032000

Source: Author's computation from data

### 4.3 Technical and Allocative Efficiency on Table Grape Production

#### Farm size used for production of table grapes

Total number of hectares were found to be significant at 1% level and were positively related to the yield of table grapes. Expected sign for farm size had a positive relation to output, thus, it concurred with findings from this study. This implied that as more land is cultivated, there will be an increase in production output. This concurred with a study that was done by Belete *et al.*, (2016). This was furthermore, supported by a study that was done by Conradie *et al.* (2007), which stated that efficiency is dependent on farm size.

#### Cost of establishment

This variable was found to have a negative relationship to the production of grapes. However, it was significant at 10% level. Findings from this study showed that there was a negative relationship between cost of establishment and output, which was in contrast with the expected sign. This suggested that, as there was a decrease in the cost of establishment, there would be an increase in production. This concurred with a study that was done by Lwelamira *et al.* (2015b), which stated that small farm areas tend to produce more output as their cost of establishments were small.

#### Equipment costs

The expected sign for equipment costs was negative and this was validated by the findings from this study. Costs for the equipment used in the production of table grapes were positively related to the production of table grapes. However, it was not significant, this meant, for every additional equipment, there would be an increase in equipment costs of 0.03%. This concurred, with a study that was done by Kopeva and Noev (2001), which found that table grape equipments had a negative significant impact for

producers, however, for cereal and vegetable producers, it had a positive significant impact on farm efficiency.

### **Pesticide used**

For every output increase, the use of pesticides increased by an additional 0.65%. Pesticides were significant at 5% confidence level. The expected sign of pesticide costs was positive, likewise, this was validated by the findings from this study. This implied that when productivity of table grapes increased, cost of pesticides also increased being expensive for the farmers to purchase. According to a study that was done by Koçtürk and Engindeniz (2016), it was concluded that a decrease in the cost of pesticides resulted in an increase in table grape production. Therefore, this enabled an increase in exportation of table grapes.

### **Cost of water**

The cost of water was found to be negatively related to the production of table grapes and it was significant at 1 % level. Expected sign for the cost of water was negative and as such this concurred with the findings of this study. This implies that when yield increases, cost of water decreases by 0,80%. Similarly, in a study that was done by Deng *et al.* (2016), it was found that water and electricity were the lowest input cost for farmers at 7%, while labour costs were found to be the second important input cost (38%).

### **Grape Prices**

This study found that prices for table grapes were statistically significant at 5% level. Grapes prices were found to be negatively related to the production of table grapes. This simply implied that the cost of producing additional units of table grapes increases as more was produced. Thus, in a study that was conducted by Conradie *et al.* (2007), showed that table grape farmers produced more and showed more variance on their farm productions due to higher prices of table grapes.

### **Number of labourers**

The work force was found to be negatively related to the production of table grapes and was significant at 1% level. The expected sign of the quantity of labourers at the grape

farms was negative and concurred with the findings from this study. This implied that increased labour, results in a decrease in production of table grapes. This concurred with a study that was done by Townsend *et al.* (1998); Tasevska (2012), which found that grape production in South Africa had a negative influence on labour use with regards to efficiency and as variable cost of labour increases it decreases efficiency of the farm.

### Household income

Farmers' household income was found to be positively related to the production of table grapes; however, it is not statistically significant. The expected sign of the household income was to be positively related to efficiency. Thus, the findings from the study validated the expectations. Consequently, this was validated by a study that was done by Lwelamira *et al.* (2015a), which found that if productivity of table grapes were to be improved this could potentially reduce poverty as household income would be increased. Furthermore, it was stated that grape production highly contributes to household income despite its low productivity and low grape pricing.

**Table 4.9: Efficiency factors**

Production quantity	Coefficient	Std. Err.	Z	P>z
Farm size	8719.79	1314.80	6.62	0.000***
Cost of establishment	-.0433	.006759	-5.38	0.1*
Equipment costs	.03	.0259063	1.18	0.241
Pesticides used	.65801	.1122	4.98	0.05**
Cost of water	-.8005408	.1393405	-5.75	0.000***
Grape prices	-6742.50	186.111	4.58	-0.15**
Quantity of labourers	2328.493	-371.5989	-6.28	0.000***
Household income	18.14016	27.90677	0.67	0.521
_cons	-382992	165973.6	-2.31	0.021

Source: Author's computation from data, coefficient significant @ 1%, 5% and 10% (\*\*, \*\* and \*)

The age of farmer (1%), household size (1%), fertilisers used (5%) and extension services (10%) were positively related to economic efficiency of table grape production and was significant at 1%, 5% and 10% respectively. This concurred with a study done by Lwelamira *et al.* (2015a), that stated that fertilisers used was significant at a 5% level. The educational level of farmers was significant at 1%, this was similar to a study that



was done by Oluwatayo and Adedeji (2019), which found that years of formal education played an important positive significant impact on the efficiency of production.

**Table 4.10: Inefficiency factors**

	Coefficient	Std. Err.	Z	P> z
Gender	-0.568	0.143	2.173	2.45
Age	0.223	1.506	1.593	0.000***
Educational level	0.5208	-0.258	-1.241	0.000***
Credit	-4532.50	4351.56	3.78	5.69
Marital status	-3458,54	8956.400	-3.25	-0.45
Extension services	719.601	317.4	-2.265	0.33*
Fertilisers	0.1956	-3.800	-0.418	1.66**
Household size	0.5208	-0.258	-1.241	0.000***
_cons	-0.8888	286.50	2.501	0.02

Source: Author's computation from data, coefficient significant @ 1%, 5% and 10% (\*\*\*, \*\* and \*)

### Summary of Efficiency Scores for Waterberg and Sekhukhune District Table Grape Farmers

Results showed that AE scores of table grape farmers had a mean of 0.6841, with a minimum of 0.473 and a maximum of 1,000. It was evident that farmers were not utilising inputs given the input price and average costs. Technical efficiency score ranged from 0.80 to 1,000 with a mean of 0.8925. This implied that 89% of the farmers were technically efficient and could produce over 80% of the maximum feasible output. This was similar to a study that was done by Tasevska (2012), that found technical score ranges between 0.80 and 1, 000. Economic efficiency scores on average were found to be 0.7256, with a minimum of 0.563 and a maximum of 1. This clearly implied that table grape farmers were economically efficient, and the cost of table grape production could be increased on average by approximately 56%.

**Table 4.11: Efficiency scores for table grape farmers**

Variable	Mean	Standard deviation	Minimum	Maximum
AE	0.6841	0.1432	0.473	1
TE	0.8925	0.078545	0.80	1
EE	0.7256	0.16532	0.563	1

Source: Author's computation from data

### Constraints Faced by Table Grape Farmers in the Study Area

A number of constraints were faced by the table grape farmers such as diseases, financial instability, theft, quality of water which affects sales, instabilities surrounding land policies, labour and electrical costs, marginalization of groups, maladministration and lastly corruption. The constraints that topped the rankings were labour costs and high electricity bills, instabilities surrounding land policies, thus, this poses a serious threat to the growth of their businesses, especially for the export market. Diseases, lack of rainfall, financial instabilities and theft ranked second when it comes to the constraints that they were faced with.

On the other hand, marginalization of groups, maladministration and corruption were ranked third, thus, this can be seen from farms that were provided through the land restitution programme. The land is owned in groups and profits are shared amongst themselves, however, proper monitoring and evaluation of the farms were not adhered to. Lastly, the quality of water which affected the sales of table grapes ranked fourth. This clearly showed that constraints that farmers faced, were the ones that hindered their progress in terms of growth in the production of grapes.

**Table 4.12: Constraints ranking by table grape farmers**

Constraints	Rankings
Instabilities surrounding land policies, labour costs, electrical costs	1
Diseases, rainfall, financial instability and theft	2
Marginalization of groups, maladministration and corruption	3
Quality of water which affects sales	4

Source: Author's computation from data

## CHAPTER FIVE

### SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 5.1 Introduction

This chapter summarises the findings and provide possible recommendations and conclusions. Here the objectives, aim of the study and research hypothesis are discussed further and finally the chapter also represents the suggested recommendations on the findings of the study.

#### 5.2 Summary of Findings and Conclusion

In this study, it was found that table grape production is a male-dominated field and majority of them are married. Furthermore, this type of field is much more labor-intensive and requires a lot of investment in terms of equipment and maintenance of the farm. Majority of the grape farmers are well educated as they have acquired a tertiary degree, while only a minority have acquired a secondary education.

The main occupation of the participants is mainly being table grape farmers. This clearly shows that they devote all their time and energy into ensuring that the business grows. Most of the farmers do have access to extension services, which enables them to make improvements on their grapes production. On the other hand, farmers that do not use the extension services, they usually make use of their own knowledge that they have acquired from tertiary level, informal schooling, workshops etc.

It was found that table grapes farming is dominated by middle-aged individuals, whom on average have 5 household members and on average their household income amounts to R47 600 per table grapes season. Meanwhile, the farming experience on average amounts to 16 years and a grape farmer has on average, 44.25 hectares. Table grape farming requires a lot of capital-investment. It was found that on average the cost of establishing a grape vine is R1,819 250.00 and as such, this clearly shows that it is quite expensive to start a vineyard. However, it is quite profitable in the long-run, provided one has established a potential market locally and internationally so.

There are costs that are associated with the production of table grapes and it was found that on average to maintain the farm it requires R502 458,33. Pesticides amounts to R794 365.17 on average. The minimum production quantity per season is 14 000 kg/ha,

while the maximum quantity produced amounts to 180 000 kg/ha. It was found that the price ranges for table grapes per crate ranges between R70 and R150, while on average is R100,83. The amount of labourers that are employed on the grapes farm on average amounts to 291 people. Labourers are employed according to the total number of hectares they must work under, meaning that the larger the farm the more labourers are to be employed. It was found that on average the wage amounts to R3116,42.

Despite the capital-investments such as labour and electrical costs that farmers should deal with in the production of table grapes, they are also constrained by the instabilities of land policies in the country. Farmers are faced with the repossession of land through the policy that stated that land should be given to its rightful owners without compensation. Thus, as such, this poses a serious threat to their farming businesses and to the economy. It was found that most of the farmers are economically efficient. The factors that were found to be positively related to the technical efficiency of table grape production were, age of the farmer, educational level, hectares, labour, extension services, fertilisers, household size and are also significant.

The hypothesis of the study stated that table grape farmers in the study area, are not economically efficient in their production. However, it was rejected because the study found that table grape farmers are economically efficient in their production. In addition, it was found that table grape farmers are technically efficient but not allocatively efficient in their production, meaning that they are not able to best utilise their inputs. This clearly indicates that a farmer can be economically efficient without being allocatively efficient but be technically efficient.

### **5.3 Recommendations**

Results in the study illustrated that there are factors that need to be considered for farmers to achieve efficiency. The farmers are technically and economically efficient but not allocatively efficient in table grape production. The study therefore, recommends the following measures to improve the economic efficiency of table grape production in the study area;

1. Educational level of the farmers was associated with increased efficiency and significant. This implies that farmers with the highest educational level are more efficient in grape production than those with low educational level. Thus, there is

a need to improve the educational levels of farmers who are less efficient by organising workshops and farmer to farmer visits. Furthermore, farmers would get more insights on how to improve productivity from other farmers who are more efficient in their production.

2. Farming experience was found to be significant and associated with increased efficiency. This means that increased experience in the utilisation of modern technologies can increase efficiency.
3. Labour was found to be significant and positively influenced by the quantity of grapes produced. This means that labourers are an important aspect of the farm as table grapes farming is labour-intensive. It is evident that more people need to be trained on how to run and maintain a grape farm as there is a high level of unemployment in the country.
4. Consequently, household size was found to be associated with increased efficiency and also significant. This clearly indicates that an increase in household size results in an increase in productivity.

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## **APPENDIX 1: PERMISSION LETTER FOR DATA COLLECTION**

02 December 2019

Director

Department of Agriculture, Forestry and Fisheries, Limpopo Provinces, South Africa  
Limpopo Provinces (Districts and Municipalities)

Permission to collect data

Dear Sir,

I hereby kindly request that you give Ms. NM Maponya permission to collect data. She is currently a student at the University of Limpopo (Student Number: 201210260), studying MSc in Agriculture (Agricultural Economics). The title of her dissertation is: 'Economic efficiency of table grape production in Waterberg and Sekhukhune Districts, Limpopo Provinces, South Africa'. Information obtained from the study will not be used to benefit the researcher, but to benefit the area in which she is going to work in order to improve their lives. Participants in this study will be properly selected and their responses or responses are held with the utmost respect, privacy and confidentiality. Individuals participating in the study are those who are willing to be asked questions. Information provided by participants will only be used for the sole purpose of this study.

I would really appreciate your assistance in obtaining table grape farmers in Waterberg and Sekhukhune Districts.

Kind Regards

Supervisor: Prof I.B Oluwatayo

MSc Student: Maponya NM

\_\_\_\_\_

\_\_\_\_\_



## **APPENDIX 2: PARTICIPANTS' CONSENT FORM**

I..... (Participants name) voluntarily agree to participate in this research study. I fully understand that I can withdraw at any time, even if I participate. I cannot answer questions that I feel are sensitive or uncomfortable. I strongly understand that I will not benefit directly from participating in this research. All the information I provide for this study will be kept confidential. I am aware that for any further information and information, I can freely contact the people involved in this research study.

Given the above information, I agree to voluntarily complete the questionnaire. I understand that the confidentiality of the answers will be respected.

Signature

.....

For any further questions, please contact Ms. NM Maponya (071 266 6223)

Email: [maponyanm@gmail.com](mailto:maponyanm@gmail.com)

## APPENDIX 3: QUESTIONNAIRE

### ECONOMIC EFFICIENCY OF TABLE GRAPE PRODUCTION IN WATERBERG AND SEKHUKHUNE DISTRICTS, LIMPOPO PROVINCES, SOUTH AFRICA

#### Preamble

This questionnaire was formulated as an instrument regarding the 'Economic Efficiency of table grape production in Waterberg and Sekhukhune Districts, Limpopo Provinces, South Africa'. Questions that are asked about this are mainly asked for the sole purpose of the study. Please feel free to answer these questions as your answers are kept with the utmost confidentiality.

#### TO BE FILLED IN BEFORE INTERVIEW RESUMES

Name of Enumerator .....

Contact details .....

Date of interview..... Please fill in the date only

#### SECTION A: SOCIO-ECONOMIC INFORMATION

Please tick where appropriate and complete the spaces below.

1. Gender: Male [  ] Female [  ]
2. Age of household head: .....
3. Marital status: single [  ] married [  ] divorced [  ] widowed [  ]
4. Number of household members: .....
5. Education level attained: never went to school [  ] primary education [  ] secondary education [  ] post-secondary education [  ]

6. Do agricultural extensionists visit your farm and assist with the production of table grapes? Yes [ ] No [ ]
7. Access to credit facilities: Yes [ ] No [ ]
8. If yes, please mention these types of credit facilities.....  
and if no, please justify your answer.....
9. Main occupation of household head: Full-time table grape producer [ ] part-time table grapes producer [ ] unemployed [ ] pensioner [ ] others [ ] please specify.....

**SECTION B: TABLE GRAPE PRODUCTION INFORMATION**

Please tick where appropriate and complete the space below.

10. Type of farmer  
Emerging farmer [ ] Smallholder farmer [ ] Commercial farmer [ ]
11. How long have you been a table grape producer? In years.....
12. How many hectares do you have for the production of table grapes? .....
13. What is the production quantity of table grapes per season? .....kg
14. Why did you engage in the production of table grapes?  
.....  
.....  
.....
15. Do you have any form of training? Yes [ ] No [ ]
16. If yes, from which organization or person did you receive training?  
.....

17. How much did it cost to establish or start the production of table grapes?  
R.....

18. What is your equipment operating costs on a monthly basis? R .....How  
do you ensure that you are able to manage your equipment costs?

Please explain .....

19. How much does maintenance of the farm cost you? R.....

20. How many seedlings do you usually plant per season? .....kg

21. Do you make use of pesticides? Yes [ ] No [ ]

22. What is the cost of these pesticides? R....., and if no, what is the mechanism  
that you use? .....

23. Do you make use of fertilisers? Yes [ ] No [ ]

24. What is the cost of these fertilisers? R....., and if no, what is the mechanism  
that you use? .....

25. How many litres of water do you use to irrigate the production of table grapes  
per week? .....

26. Do you pay for water and if yes, how much per month? R .....

27. Do you sell your produce? Yes [ ] No [ ]

28. If yes, how much do you sell your produce (per box, locally and for export) and if  
no, please provide reasons.....

29. How do you transport your products?

30. No transport needed [ ] Truck [ ] Van [ ] motor vehicle [ ]

31. What type of labour do you use?

Family labour [ ] Outsourcing [ ]

32. How many labourers do you employ? .....

33. How many days per week are you involved in the production of table grapes?

.....

34. How much do you earn per month from the production of table grapes?

.....

35. Do you have any other source of income?

36. Formal employment [ ] social grants / Pension [ ] Remittances [ ]  
Artisan [ ]

37. How much do you earn per month from the above source of income?  
R.....

38. What is your total monthly income? R.....

39. Do you know of any government support systems for table grapes producers in your area? Yes [ ] No [ ]

40. If yes, what are these? .....

41. Do you supply any local markets? Yes [ ] No [ ]

42. If yes, how much do you charge per product received?

.....

43. Do you receive any form of financial assistance from government? Yes [ ] No [ ]

44. If yes, explain what kind of support do you receive from them

.....

.....

.....

45. What are the constraints that you are facing as a smallholder table grapes farmer?

.....

.....

.....

46. Are you engaged in any agricultural organizations locally? Yes [ ] No [ ]

47. If yes, how does it benefit your production of table grapes to be part of these agricultural organizations?

.....  
.....

**END OF QUESTIONNAIRE.....THANK YOU FOR YOUR  
COOPERATION**

## BYLAAG 1: TOESTEMMINGSBRIEF VIR DATA-

### INSAMELING

02 Desember 2019

Direkteer

Department van Landbou, Bosbou en Visserye, Limpopo Provinsie, Suid-Afrika Limpopo Provinsie( Distrikte en Munisipaliteite)

#### Toestemming om data te versamel

Geagte Heer,

Hiermee versoek ek dat u Ms NM Maponya toestemming gee om data te samel. Sy is tans 'n student aan die Universiteit van Limpopo( Student Nommer: 201210260) wat MSc in Landbou studeer (Landbou-Ekonomie). Die titel van haar skripsie is : ' Ekonomiese doeltreffendheid van tafeldruifweproduksie in Waterberg en Sekhukhune Distrikte, Limpopo Provinsie, Suid Afrika'. Inligting wat uit die studie verkry is, sal nie gebruik word om die navorser te bevoordeel nie, maar om die gebied waarbinne sy gaan werk, te bevoordeel.Hierdie studie gee 'n uiteensetting van die belangrikheid wat tafeldruifboere speel om hul produksie moonlik te laat groei ten einde hul lewens verbeter. Deelnemeers aan hierdie studies al op die regte manier gekies word en hul antwoorde of antwoorde word met die grootste respek, privaatheid en vertroulikheid gehou. Individue wat aan die studie deelneem, is diegene wat bereid om gevra te word. Inligting wat deur deelnemers verskaf word, sal slegs gebruik word vir die uitsluitlike doel van hierdie studie.

Ek sal u hulp met die verkryging van tafeldruifboere in Waterberg en Sekhukhune-distrikte opreg waardeer

Vriendelike Groete

Toesighouer: Prof I.B Oluwatayo

MSc Student: Maponya NM

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## BYLAAG 2 : DEELNEMERS SE VRYWARINGS VORM

Ek .....(Deelnemers se naam)stem vrywillig daartoe in om aan hierdie navorsingstudie deel te neem. Ek verstaan ten volle dat ek te eniger tyd kan onttrek, selfs as ek deelneem. Vrae wat ek voel sensitief is of my ongemaklik maak, kan ek nie beantwoord nie. Ek verstaan ten sterkste dat ek ne direk sal baat by die deelname aan hierdie navorsing nie. Al die inligting wat ek vir hierdie studie verskaf, sal vertroulikbehandel word. Ek bewus daarvan dat vir enige verdere toeligting en inligting vryelik kontak kan maak met die mense wat by hierdie navorsingstudie betrokke is.

Gegewe bogenoemde inligting, stem ek in om die vraelys op 'n vrywillige manier te voltooi. Ek verstaan dat die vertroulikheid van die antwoorde nagekom sal word.

Handtekening

.....

Vir enige verdere vrae, kontak asseblief Ms. NM Maponya (071 2666223)

e-pos: [maponyanm@gmail.com](mailto:maponyanm@gmail.com)



## BYLAAG 3: VRAELYS

### EKONOMIESE DOELTREFFENHEID VAN TAFELDRUIFPRODUKSIE IN WATERBERG EN SEKHUKHUNE DISTRIKTE, LIMPOPO PROVINSE, SUID AFRIKA AANHEF

Hierdie vraelys is geformuleer as 'n instrument om ligting rakende die ekonomiese doeltreffendheid van tafeldruifproduksie in Waterberg en Sekhukhune Distrikte, Limpopo Provinsie, Suid Afrika. Vrae wat hieroor gevra word, word hoofsaaklik vir die uitsluitlike doel van die studie gestel. Voel asseblief vry om hierdie vrae te beantwoord, aangesien u antwoorde met die grootste vertroulikheid gehou word.

### HIERDIE AFDELING MOET INGEVUL WORD VOORDAT DIE ONDERHOUD HERVAT WORD

Naam van die teller:.....

Kontakbesonderhede: .....

Datum van die onderhoud:.....

#### Artikel A: SOSIO-EKONOMIESE INLIGTING

Merk asseblief waar toepaslik

1. Geslag: Manlik  Vroulike

2. Ouderdom van boer: .....

3. Huiwelikestatus: Enkele  Getroud  Geskei  weduwee

4. Aantal huishoudelike lede? .....

5. Opvoedkundige vlak bereik: het nooit skoolgegaan nie  primêre opvoeding  sekondêre onderwys  naskoolse onderwys

6. Jare van skoolopleiding .....

7. Besoek die ekstensiewe u plaas?: Ja  Nee

8. Toegang tot kredietfasilitete? Ja  Nee

9. So ja, noem asseblief hierdie soort kredietfasiliteite en indien nee, motiveer u antwoord .....

10. Hoofberoep van boer: voltydse tafeldruifboer  deelydse tafeldruifboer  werkloos  pensioenaris  ander  ander spesifiseer asseblief.....

AFDELING B: PRODUKSIE VAN TAFELDRUIWE

Merk asseblief waar toepaslik env ul die spasies

11. Tipe boer

Opkomonde boer [ ] kleinboer [ ] kommersiële boer [ ]

12. Hoe lank was u 'n tafeldruiweboer? In jare .....

13. Hoeveel hektara het u vir die produksie van tafeldruiwe? .....

14. Wat is die produksie hoeveelheid tafeldruiwe per seisoen?..... kg

15. Waarom het u betrokke geraak by die produksie van tafeldruiwe?

.....  
.....  
.....

16. Het u enige vorm van opleiding? Ja [ ] Nee [ ]

17. So ja, van watter organisasie of persoon het u opleiding ont vang?

.....

18. Hoeveel het dit gekos om die produksie van tafeldruiwe te bepaal?

19. Wat is u bedryfskoste vir toerusting? R .....

20. Hoe bestuur u toerustings koste? Verduidelik asseblief.....

21. Hoeveel kos die onderhoud van die plaas jou? R.....

22. Wat is hoeveelheid saailinge wat u gewoonlik plant? ..... kg

23. Gebruik u kunsmisstowwe? Ja [ ] Nee [ ]

24. Hoeveel kos hierdie kunsmisstowwe? R.....

25. As u nie kunstimissowwe gebruik nie, op watter metode gebruik u dit?

.....  
.....  
.....

26. Gebruik u plaagdoders? Ja [ ] Nee [ ]

27. Hoeveel kos hierdie plaagdoders? R.....

28. As u nie plaagdoder gebruik nie op watter metode gebruik u dit?

.....  
.....  
.....

29. Hoeveel liter water gebruik u om die produksie van tafeldruiwe per week te?

.....  
.....

30. Hoeveel betaal u maandeliks vir water? R.....
31. Verkoop u u produkte? Ja [ ] Nee [ ]
32. So ja, hoeveel verkoop u u produksiesiklus? Indien nie gee redes  
 .....  
 .....  
 .....
33. Hoe Vervoer u u produkte?  
 Geen Vervoer nodig nie [ ] koel vragmotor [ ] bakkie [ ] voertuig [ ]
34. Watter tipe arbeid gebruik u? Gesinsorbeid [ ] Uitkontraktering [ ]
35. Hoeveel arbeiders werk u in? .....
36. Hoeveel dae per week is u betrokke by die produksie van tafeldruiwe?  
 .....
37. Ontvang u enige ander bron van inkomste?  
 Formale indiensneming [ ] maatskaplike [ ] overmakingen [ ] vakman [ ]
38. Hoeveel verdien u per maand uit bogenoemde inkomstebron?
39. Wat is u totale maandelikse inkomste? R.....
40. Weet u van enige regeringsondersteuningstels els vir tafeldruiwboere in u omgewing? Ja [ ] Nee [ ]
41. So ja, wat is dit? .....
42. Lewer u enige plasslike market aan? Ja [ ] Nee [ ]
43. So ja, hoeveel? R.....
43. Wat is die beperkinge wat u as 'n tafeldruiwboer in die gesig staar?  
 .....
44. Is u plaaslik besig met enige landbou-organisasies? Ja [ ] Nee [ ]
45. So ja, hoebevoordeel dit u produksie van tafeldruiwe? .....

EINDE VRAELYS..... DANKIE VIR JOU  
 SAMEWERKING