PROFITABILITY OF SWEET POTATO ENTERPRISES IN LIMPOPO PROVINCE: A CASE STUDY OF VHEMBE DISTRICT

By

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Dissertation submitted in fulfilment of the requirements for the Master of Science degree in Agriculture (Agricultural Economics)

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DEDICATION

I dedicate this work to my mother Mrs. Esther Libago. This is the fruit of the unwavering support you have given me all these years. Glory to the Almighty God, I am blessed to be your son. Further dedication to my family, for their support and motivation; also to my friends, let's keep on working hard and being a source of motivation for each other.

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DECLARATION

I, **KHULISO LIBAGO (11580559)**, hereby declare that this thesis for Masters of Science in Agriculture (Agricultural Economics) at the University of Venda hereby submitted by me, has not been submitted previously by any student for a degree at this or any other university, that it is my own work in design and in execution, and that all reference material contained therein has been duly acknowledged.

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“Commit thy works unto the LORD, and thy thoughts shall be established. Proverbs 16:3”

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ABSTRACT

This research aimed to assess the profitability of sweet potato production enterprises. The focus areas were on: determining differences in profitability of different sweet potato enterprises located in different villages; identifying factors that affect the profitability of sweet potato enterprises; determining differences in the sweet potato markets; and identifying marketing channels utilised by sweet potato enterprises. The study was carried out in 8 villages in Makhado and Thulamela local municipalities of the Vhembe district of Limpopo province. There were 78 sweet potato farmers identified and interviewed as respondents in the study. A gross margin analysis model was used to calculate the profitability of sweet potato enterprises, while a multiple regression model was adopted to analyse factors that affect profitability of sweet potato enterprises. The study revealed the domination of females in sweet potato production, wherein 69.2% of the respondents were females. Furthermore, the study revealed that 16.7% of the respondents were illiterate, 24% of the respondents had never received any form of agricultural training. The findings of the study revealed that sweet potato production is a viable and profitable enterprise in the study area. Farmers recorded an average gross margin of R11 329.94 per ha. Furthermore, labour cost and fertilizer cost accounted for the highest costs incurred in production contributing 45% and 32% respectively to total costs. The results of the study further revealed that six variables were statistically significant to profitability. Occupation status, farming experience, unpaid family members, and labour cost were statistically significant to profitability at the 1% level of significance; whereas tractor hire cost and chemical cost were statistically significant to profitability at the 5% level of significance. The study recommends that stakeholders involved in agriculture and community development should attend to issues such agro-processing trainings and extension services offered to the farmers in the Vhembe district.

Keywords: *sweet potato, marketing, gross margin, labour cost, production, profitability*

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ABBREVATIONS

ABET	Adult Basic Education and Training
ARC	Agricultural Research Council
BC	Before Christ
DAFF	Department of Agriculture, Fisheries and Forestry
FAO	Food and Agriculture Organization
FAOSTAT	Food and Agriculture Organization Corporate Statistical Database
IDP	Integrated Development Plan
NDA	National Department of Agriculture
NFPM	National Fresh Produce Markets
NGO	Non-Governmental Organization
OFSP	Orange Fleshed Sweet Potato
PDP	Professional Development Programme
SPSS	Statistical Package for the Social Sciences
VAD	Vitamin A Deficiency

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CHAPTER 1

INTRODUCTION

1.1 Background

Sweet potato (*Ipomoea batatas (L.)* Lam*)* is a creeper, belonging to the *Convolvulaceae* family (morning glory), and the origin traces back to the Central and South American countries as of 8000-6000 BC (Andrade *et al.,* 2009; Ohajianya and Ugochukwu, 2011). The crop is primarily cultivated for its edible storage roots which are high in energy and Vitamin A, while the leaves and shoots are also consumed as a green vegetable in some parts of the world (DAFF, 2012). The crop can be used as a staple food, animal feed, as well as for industrial purposes (Andrade *et al.,* 2009; Attaluri *et al.,* 2010; Zhu, 2011). As a result of its uses, sweet potato has the potential to alleviate poverty and reduce malnutrition.

Sweet potato is grown in tropical and subtropical regions, whereby the crop is cultivated in more than 100 countries, with China being the leading producer (DAFF, 2011a). The crop is generally essential for food security in Africa, including South Africa due to its consistent and reliable yield. It can be grown on marginal land and can survive areas with long dry seasons; it does not thrive in frosty regions, making Limpopo province an ideal region for sweet potato production (Kassali, 2011; DAFF, 2012; Jones *et al.* 2012). The subtropical areas of Limpopo, Mpumalanga, KwaZulu-Natal and Western Cape are the major producing areas in South Africa, where sweet potato plays a significant role as a traditional crop (DAFF, 2011a; Laurie, 2012).

Sweet potato is an important source of food in the homes of rural and urban poor, as well as a source of income (Jones *et al.,* 2012). In South Africa, the crop is popular amongst resource-poor farmers (Laurie and Magoro, 2008). Limpopo province being predominantly rural and exposed to poverty, with the province rated second largest poorest in South Africa after the Eastern Cape, involvement and improvement in sweet potato production can aid overcome socio-economic challenges and improve livelihood for different communities within the province (Kyei, 2011; Jones *et al.,* 2012).

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Agricultural production is important among poor communities because agriculture is viewed as a precursor to economic development and industrial transformation, therefore, improvement in agricultural performance can lead to improvements in incomes of the poor, provision of affordable food, and drive structural transformation (World Bank, 2009). This view is supported by the FAO (2014:2) general statement which states that 'eradicating malnutrition and its associated social and economic costs must begin with agriculture and food systems'. FAO (2014) perceives the role of agriculture in food production, income generation and livelihood supporting as fundamental.

The agricultural sector employs around 80% of the rural population in Africa through forward and backward linkages (Mutai *et al.,* 2013). Therefore, to meet challenges of reducing poverty and rural income improvement, there is a need for rural agricultural system to be transformed from subsistence production system into a more commercialised agriculture. Omiti *et al.* (2009) in their study indicated that improvement of smallholder farmers into commercialised farming system, results in decline of food prices, due to the increased competition and reduced cost of food marketing and processing.

Laurie and Magoro (2008) undertook a study in four provinces in South Africa, namely: Mpumalanga province, KwaZulu-Natal province, North West province and Limpopo province. In this study they were determining the adaptability and acceptability of various varieties, whereby they recommended sweet potato cultivars for production in those areas. In Limpopo province, the study was conducted in the areas of Bushbuckridge, Marble Hall area (TompiSeleka) and Tshiombo in Venda. Phala, Ndou and Excel cultivars were recommended for Venda; Monate, Excel, Serolane and Ndou were recommended for Bushbuckridge; while Mokone, Excel and W-119 were the cultivars recommended for the Marble Hall area (TompiSeleka). The sweet potato recommendations stated above substantiate that Limpopo province is suitable for sweet potato production; hence it is listed as one of the major producing regions in the country.

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Andrade *et al.* (2009) revealed that sweet potato is mainly produced by smallholder farmers, with majority of them being women, for home consumption. Oke and Workneh (2013) identified that sweet potato opportunity lies in producing it: '(1) fresh and processed for human consumption, (2) fresh and dried for animal feed, and (3) for starches and flours for food and non-food uses'. Such information is required at farmers' level so that they are informed of different marketing opportunities available, so as to capitalise and profit from them.

Based on market values, the sweet potato industry in South Africa is smaller compared to other African countries and other world market participating countries (Modipadi, 2014). The country is ranked number eight in the world, and in the year 2011 it only represented 1.62% of world exports (DAFF, 2012). The market for sweet potato in South Africa is not regulated, leaving the prices to be determined by the market forces of demand and supply (DAFF, 2012). The industry utilises different channels including the fresh produce market, informal market, processor and direct sales to wholesalers and retailers (DAFF, 2012).

The records from the National fresh produce markets reveal that 2010 was the year in which production peaked with 32 080 tons sold, while 22 237 tons, 22 700 tons, were sold in 2011 and 2012 respectively; whereas 19 302 tons were sold in quarter 3 of 2013 (DAFF, 2012; DAFF, 2013a; DAFF, 2013b). In terms of prices, in the year 2012 sweet potatoes were sold at R3 650 per ton, whereas in quarter 3 of 2013 they were sold at R2 797 per ton (DAFF, 2013a; DAFF, 2013b). The quarterly production value in quarter 3 of 2013 was at R 41 227 532, which is 0.02% less compared to the previous quarter (DAFF, 2013b). The values depicted above show that in South Africa, sweet potato has a market in which producers can partake, and attain profit.

DAFF (2012) records indicate that Greater Sekhukhune District is the main producing and exporting region in Limpopo province, followed by the Waterberg District, although in recent years the values have been decreasing in both districts. Vhembe registered their first export records in 2011. With regard to the share towards national exports, in 2011, Limpopo province contributed 8.96% of total export, coming second to Gauteng province which contributed 89.13%. This is a great decline as in 2010, Limpopo

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province had contributed 54.20% share of total sweet potato export (DAFF, 2012). There are various factors which might have led to a decrease in the share contributed to exported sweet potato coming from Limpopo province. Possible reasons might be that farmers preferred local informal markets as compared to the fresh produce markets, high transaction costs in accessing these markets, pre- and postharvest challenges, poor quality and low yield (Ezeano *et al*., 2009; Mutai *et al.,* 2013).

This current study was focused on profitability of sweet potato production in Limpopo province, endeavouring to reduce the gap in available information on the crop's marketability and associated financial benefits. Market information is essential in helping farmers to be more business oriented and be able to produce for the markets. Providing the required information will help support producers in making sound and informed decisions and thereby positively influencing production, market access, and profitability, thus improving their livelihood.

1.2 Problem statement

Small-scale, subsistence and semi-commercial farming sectors in South Africa still face challenges in accessing lucrative markets and hence get lower returns (Andrade *et al.* 2009; Maponya *et al.* 2014). According to Singh *et al* (2009), small-scale farms are not viable, wherein they require financial assistance to improve their productivity, marketability and hence improve their returns. Moreover, Ezeano *et al* (2009) identified lack of cash, high cost of transportation and low market returns, as the factors constraining small-scale sweet potato farmers in marketing and profitability. For better and higher returns to be realised, market information, proper marketing strategies and market access are considered essential. Mmasa *et al* (2013) and Modipadi (2014) identified lack of market information which can lead to poor market choice taken, as one of the factors which negatively influence market access and profitability. Mutai *et al* (2013) further revealed that despite an increase in production and prices, few small-scale farmers participate in markets, which further highlight the importance of improving market information access to these rural farmers.

Limpopo province despite being one of the major agricultural regions, it has no major functional fresh produce market. Lack of functional fresh produce markets has a

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negative effect on the accessibility of markets by small-scale farmers and rural communities in the province. The current study analysed the various market options used by the producers, and returns associated with these markets. Furthermore, the study also analysed producers' characteristics and their effect on the profitability.

1.3 Rationale of the study

Marketing and market access are interlinked to income generation and profitability in any business institution, including farming. Farmers need a market to sell their produce, and lack of access to market results in loss of possible income and profits. Farmers are faced with tasks to keep their businesses running and sustainable, hence they need a market to sell their produce and generate an income.

Various studies have been conducted in relation to sweet potato marketing and profitability, revealing gaps that new research can look at. Ezeano *et al* (2009) in their study revealed the need to explore various uses of crop to increase its marketability. Furthermore, Mutai *et al* (2013) highlighted the need to investigate the various market options available and the farmers' characteristics which determine their participation in these markets. This study identified available markets utilised by farmers, and factors affecting their profitability, and provided information which will assist in making better market choices, improving the farmers income and profitability.

1.4 Objectives of the study

1.4.1 Main objectives

The main objective of this study is to assess the profitability of sweet potato production enterprises.

1.4.2 Specific objectives

The specific objectives of the study are:

I. To determine the profitability of sweet potato enterprises located in different villages in Limpopo province.
II. To identify factors affecting the profitability of sweet potato enterprises in Limpopo province.

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III. To determine differences in the sweet potato markets, and their effect on profitability.
IV. To identify marketing channels utilised by the sweet potato enterprises.

1.5 Research Questions

I. Are there differences in the profitability between sweet potato enterprises located in the different villages?
II. What factors affect the profitability of sweet potato enterprises in the study area?
III. Are there differences in profitability of farmers in the respective market channels?
IV. What marketing channels are available to the sweet potato farmers in Limpopo province?

1.6 Research hypotheses

I. There are differences in profitability between sweet potato enterprises located in different villages.
II. Socio-economic factors affect profitability of sweet potato enterprises.
III. There are differences in profitability between markets utilised by sweet potato farmers.
IV. There are a few marketing channels available in Limpopo province.

1.7 Limitations and delimitations

- The study was conducted with farmers that were willing to participate, wherein important and useful information might have been lost from the farmers who were not willing to be part of the project.
- Time factor, in terms of the balance between questionnaire administering and work commitments by the farmers could have led to the omission of useful information or less information provided.
- The farmer's judgement/interpretation of some questions might have led to less information provided, as they might have deemed some questions as private and confidential (for example information on age and finance).

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- Misinterpretation of questions, lack of reliable data or recorded data by farmers might have led to inaccurate information provided and recorded.
- Only sweet potato farmers participating in the markets or selling sweet potatoes where considered irrespective of the market type or size.

1.8 Structure of the thesis

Chapter 1 provides an overview of the project and gives the direction of the project. This includes; the background and problem statement, the rationale of the study, it highlighted the study's objectives and the hypotheses to be tested, and the limitations and delimitations which affected the project. Chapter 2 presents a review of the sweet potato industry in South Africa and other countries, covering issues on production, marketing and market channels available, various uses of the crop, consumption and profitability. The chapter also outlines the benefits associated with sweet potato and challenges faced by farmers. In addition, the chapter gives references from previous and related studies on marketing and profitability of sweet potato. Chapter 3 focuses on the research methodology used in the study, which includes the data collection and method used, the study area, data analysis and models adopted to achieve the objectives of the study. Chapter 4 discusses the results of the study. Chapter 5 provides the summary, conclusions and recommendations to the study.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction to literature review

This chapter presents a review of the sweet potato industry in South Africa and other countries, covering issues on production, markets and marketing channels, uses, consumption and profitability. The chapter also provided an overview of the various benefits associated with sweet potato, and the challenges faced by the farmers. In addition, the chapter gives references from previous and related studies on marketing and profitability of sweet potatoes.

2.2 Global sweet potato production

Sweet potato is regarded as one of the most important and widely grown root crops in developing countries (Andrade *et al*., 2009; Oke and Workneh, 2013). It is ranked as the fifth most important food crop following rice, wheat, maize and cassava (Kassali, 2011). Sweet potato production employs a lot of people during planting and harvesting (Adewumi and Adebayo, 2008) and therefore, has potential to create job opportunities for farmers and farm labourers, thus, act as a source of wage income for households. Apart from its potential to create employment, sweet potato is essential in sustaining food security and rural peoples' livelihoods because it requires relatively few inputs in production and is easy to manage (Mmasa *et al.,* 2013).

Worldwide, China is the highest producer, with its production ranging between 80% and 85% of total sweet potato production (Oke and Workneh, 2013). Sweet potato production in Africa is mainly practiced by smallholder farmers, mostly by women farmers, whereby the crop is grown as a subsistence crop for food security while excess production is sold on the markets to raise some income (Andrade *et al*., 2009; Mmasa *et al.,* 2013).

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In trading sweet potatoes, FAOSTAT (2014a) records show that Asia dominates the world's export market, with 74% of export coming from Asia, 12.7% from America and 2.7% from Africa. On the import market, Europe leads with 74% of the imports, followed by Asia, with 17.2%, while Africa's imports are only 0.3%. Africa's meagre showing in the world market can be attributed to different challenges faced by farmers in production and marketing, especially for those countries which are dominated by smallholder farmers. Some of the challenges faced by smallholder farmers include lack of investment and credit access, limited access to production technology, poor infrastructure and lack of bargaining power (Chauke *et al.,* 2013; Maponya *et al.,* 2014). As a result, farmers sell their produce through informal channels which include; selling to neighbours, local shops and in monthly pension markets (Ortmann and King, 2007).

Smallholder farmers are deemed to be poor and thus lack resources and financial power which can enable them to invest on their farming practices for improved production. Izekor and Olumese (2010) and Yuguda *et al.* (2014) in their studies identified factors that hinder production potential and profitability of smallholder farmers as limited access to credit facilities, modern technology and farm inputs, inefficient use of resources and lack of capital. A study by Kassali (2011) revealed that the use of improved technologies in farming positively influences the yield and income, but farmers were found to be reluctant to adopt them. These improved technologies include fertilizers, irrigation practices and hybrid seeds. In another study conducted by Van den Berg (2013), it was revealed that farmers were unwilling to invest in these improved technologies despite their benefits.

The reluctance and unwillingness to adopt or invest on these improved technologies can be attributed to the smallholder farmers' characteristics, wherein they lack the financial power, and also due to the high cost associated with these inputs. In support of the aforementioned statement, Laurie *et al.* (2013) on their study argued that the farmers' reluctance to invest was a result of limited financial support. Kassali (2011) and Van den Berg (2013) further specified high inputs costs as the major economic constraints in sweet potato production. Evidence provided in this section shows that smallholder farmers are faced with challenges of improving their farming systems to

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increase their productivity and hence profitability, due to lack of physical and financial resources.

2.3 Sweet potato production in South Africa

Sweet potato production in South Africa mirrors the dualism in the agricultural industry, where commercial producers regard sweet potato as a cash crop while smallholder farmers produce it mainly for household consumption but sell surplus. The main producing regions of sweet potato in the country are Northern Cape, Western Cape, Limpopo, Free State, Eastern Cape and Gauteng (DAFF, 2012).

According to DAFF (2012), South Africa produces enough sweet potatoes to feed its population, and exports surplus to regional and international markets. However, when compared to other countries, South Africa is one of the low producing countries with a marginal 55 775 tons and 55 400 tons of sweet potato produced in 2011 and 2012 respectively (FAOSTAT, 2014a). Within the country, sweet potato is ranked outside the top ten commodities with regard to production quantity and value (FAOSTAT, 2014b).

Figure 1 reveals the comparison of the sweet potato production and consumption between 2002 and 2011 in South Africa. South Africa's average consumption for the ten-year period was recorded at 48 662 tons per annum. Due to a decrease in production in 2011 the consumption of sweet potato decreased by 15.5% in the same year. The drop in production was attributed to climatic conditions and increased cost of production (DAFF, 2012). In addition, climatic conditions and increased costs did not only affect the volume of production, but also affected the quality of produce or marketable produce and potential income.

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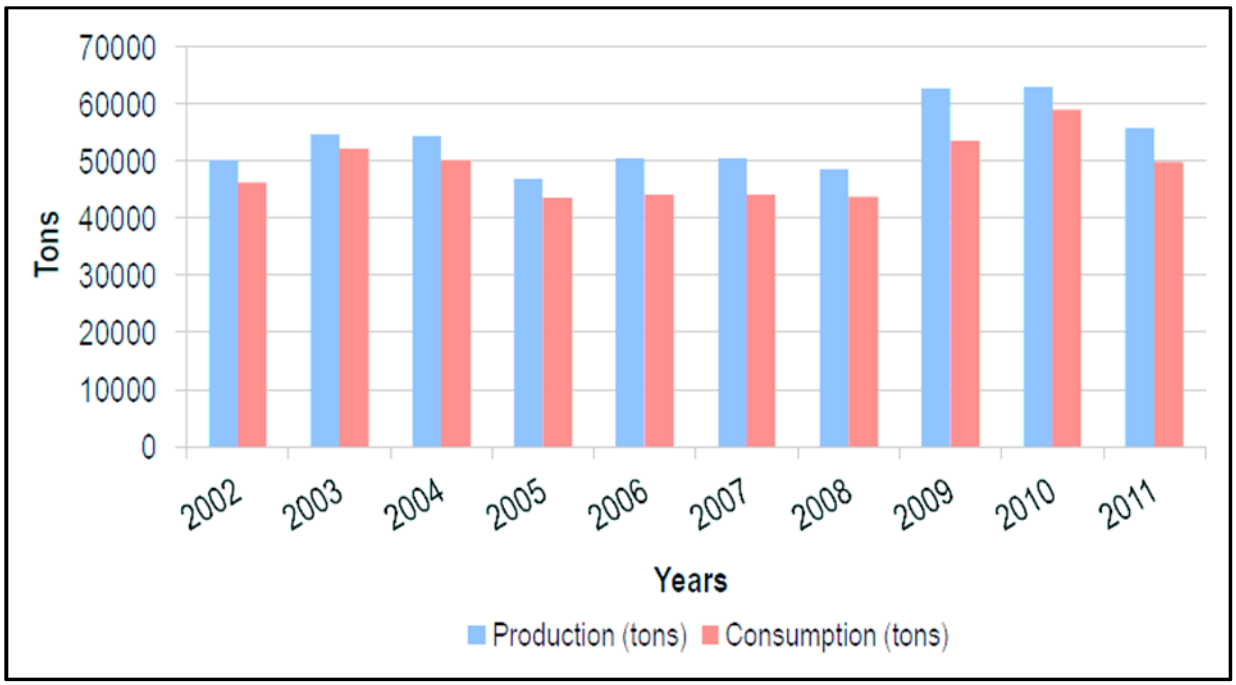

Figure 1: Production vs Consumption, Source: (DAFF, 2012).

More than 70% of sweet potato production in South Africa comes from commercial producers and the remaining 30% from smallholder farmers. Amongst other reasons, production from smallholder farmers is minute because they often plant sweet potato vines from previous harvests. A few farmers buy their planting materials, while most acquire cuttings from friends and families, and some use those saved from the previous seasons which are shared between farmers (Jones *et al.,* 2012; Laurie *et al.,* 2013). Repeatedly using plants from the same source can result in pest and disease infestations (Laurie *et al.,* 2013). Major infestations damage the sweet potato roots, some resulting in production of bitter-tasting chemicals by the crop, which can lead to a decrease in market value of sweet potato, as well as a decrease in yield (Jones *et al.,* 2012; Mmasa *et al*., 2013).

2.4 The uses and benefits of sweet potato

Sweet potato has grown in importance, both as a food and cash crop in developing countries (Andrade *et al.,* 2009; Ohajianya and Ugochukwu, 2011; Laurie *et al.,* 2013). Sweet potatoes recently rose to prominence owing to the nutritional and health benefits associated with the crop. The crop is an essential source of Vitamin C, carbohydrates

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and β-carotene (beta-carotene), which is a precursor of Vitamin A (Andrade *et al.,* 2009; Kassali, 2011). Moreover, β-carotene is only found on the Orange-Fleshed Sweet Potato (OFSP) which has been promoted in developing countries as a way of improving Vitamin A intake.

The OFSP is rich in β-carotene which has shown to improve Vitamin A status of infants and young children (Hotz *et al.* 2011). Vitamin A deficiency (VAD) is a problem for children under the age of five and for pregnant and lactating women (Odebode *et al*., 2008). Furthermore, serious VAD can lead to blindness, and chronic deficiency which lessen a child's ability to fight other diseases. Laurie *et al* (2013) on their study revealed that in South Africa, VAD affects 64% of 1-9 years old and 27% of women at childbearing age, and it is considered a public health problem. Therefore, consumption of sweet potatoes helps assist in addressing issues of food and nutritional security (Andrade *et al.,* 2009; Kassali, 2011; NDA, 2013).

The transformation in the importance of sweet potato and the induced demand has led to a significant increase in production of the crop in Africa by commercial farmers (Attaluri *et al.,* 2010). The increase in production and importance of sweet potato in regions is also due to the crop's adaptability in diverse weather conditions, when compared to other dominant staple crops (Andrade *et al.,* 2009). The crop is grown for both human and animal consumption, and is the only crop among the root and tuber crops that has a positive per capita annual rate of increase in production in the sub-Saharan Africa (Tewe *et al.,* 2003; Ohajianya and Ugochukwu, 2011).

Leaves and shoots of the sweet potato crop are edible, even though roots are mostly utilised for human consumption (DAFF, 2012). Both the leaves and roots are utilised in animal feed, whereby nearly half of the sweet potatoes produced in Asia are used for animal feed (Adewumi and Adebayo, 2008; Mmasa *et al.,* 2013). In animal feed, they can be utilised still fresh or made into a dried meal and fermented silage for livestock, including pigs, cattle and poultry (Odebode *et al.,* 2008).

Figure 2 illustrates various uses of sweet potatoes and opportunities available for sweet potato producers who seek to add value to their produce. Furthermore, the diagram

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illustrates possible markets and business adventures in which producers can participate in. Sweet potatoes can be processed to a number of products ranging from baby food, flour, noodles, butter and alcohol. These value adding options, present potential opportunities to improve the farmers' overall farm income and present employment opportunities for communities.

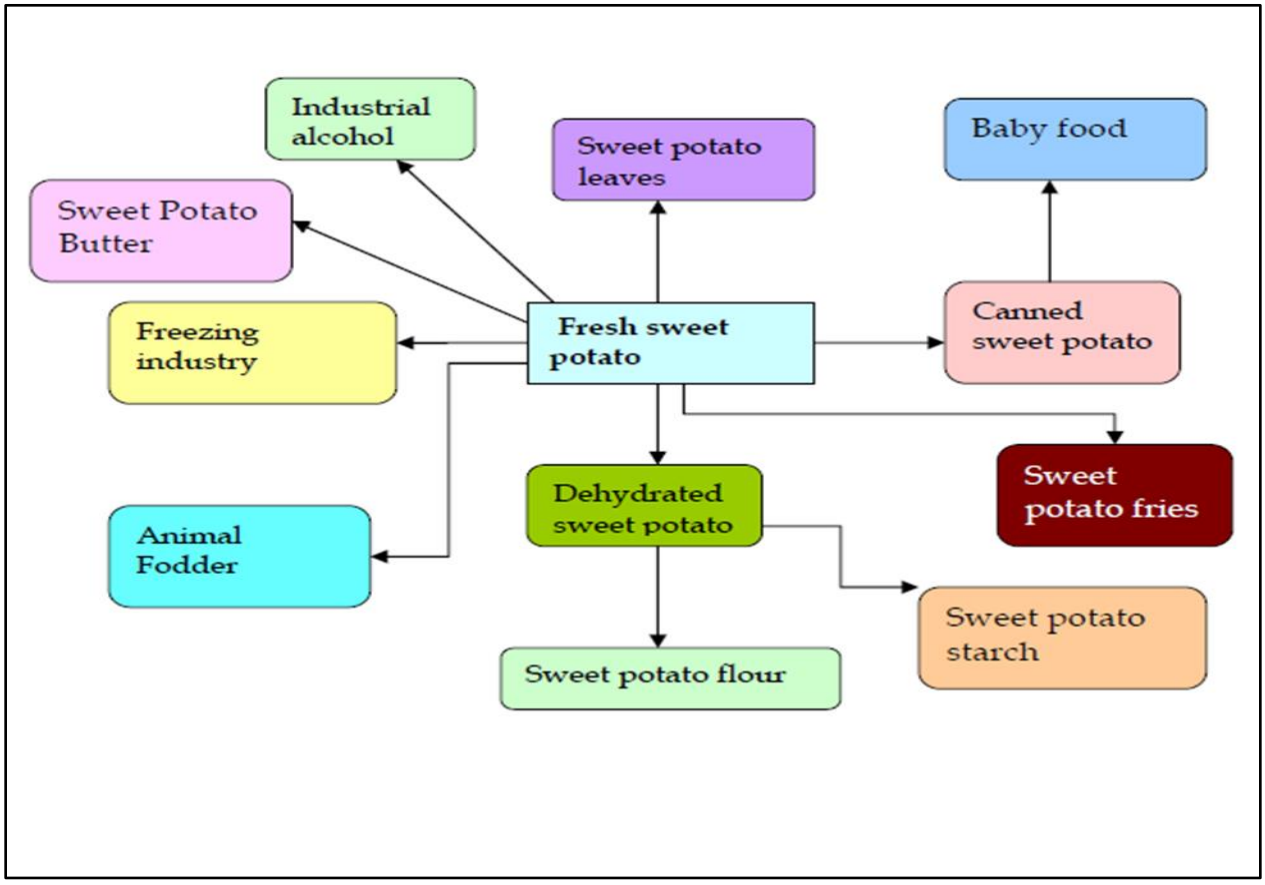

Figure 2: Sweet potato value chain tree explaining its uses, Source: (DAFF, 2012).

2.5 Sweet potato marketing

In South Africa there are no restrictions in the marketing of sweet potato, whereby the prices are determined by the market forces of demand and supply (DAFF, 2012). Tewe *et al.* (2003) suggested that the cultivation of root and tuber crops is threatened by the low prices of the crops and their products. However, with value adding opportunities and better marketing campaigns, sweet potato prices are likely to increase. Various market

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structures within the sweet potato industry in South Africa include local fresh produce markets, informal markets, processors and direct selling to wholesalers and retailers, and export markets.

The National Fresh Produce Markets (NFPM) is the most important channel utilised for selling fresh sweet potatoes in South Africa. In 2011, 40% of all sweet potatoes produced in the country were distributed through the NFPMs. The remaining 60% represented sales through other channels such as the informal market, direct sales from producers to wholesalers and retailers, processor and exports (DAFF, 2012). In 2011, 22 237 tons, 4 862 tons and 1 115 tons were sold through NFPM, exports and processors respectively. In the period 2011/12, the gross margin of sweet potato amounted to R186 249 000 (DAFF, 2012; DAFF, 2013b). The value of the gross margin is an indication that sweet potato is profitable at the national level; however, the question remains whether the same applies in ground level with the rural small-scale farmers. This study therefore sought to investigate and come with the answers on the profitability of small-scale sweet potato farmers.

Small-scale farmers are faced with difficulties in accessing markets, wherein despite the increase in production and market prices, some farmers fail to participate in markets (Ortmann and King, 2007; Mutai *et al.,* 2013). Failure of these farmers in accessing lucrative markets, leads to loss of possible income and profit for their produce. The farmers then resort to selling through markets that offer low prices (Ortmann and King, 2007). Omiti *et al.* (2009) on their study indicated that 52% of rural farmers participate in markets wherein they sell less than half their produce. However, this can be attributed to the marketing factor, whereby they lack a ready market to sell the bulk of sweet potato produced (Ezeano *et al.,* 2009). Ezeano *et al.* (2009) in their study also suggested a need to explore various industrial uses of sweet potato to improve marketability. This will be helpful to the farmers in that they will be having a large market pool wherein they can sell their produce, and avoid instances where they are left with unsold produce.

The majority of farmers prefer the local market option, due to its close proximity enabling them to incur lower transportation costs, while others sell at the farm gate

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(Adewumi and Adebayo, 2008; Mutai *et al*., 2013). However, in the local market option, farmers tend to settle for low prices and hence low income as a result of an overcrowded market with excess supply (Mutai *et al.,* 2013). A study by Tadesse (2011) on marketing chain analysis revealed that the majority of farmers do not negotiate on the selling prices for their produce, therefore, are price takers. A study by Mmasa *et al.* (2013) revealed that in local market or village level, while there are price negotiations in place, buyers have more power in dictating the price, since producers find it uneconomical to transport few bags to an urban market.

Singh *et al.* (2009) and Mmasa *et al.* (2013) in their studies highlighted the need for producers to form a cooperative or union, in order for them to improve their situations and control the business. Thus, instead of producers being price takers, they will be the ones to determine the prices and form of payment to be accepted. Mutai *et al.* (2013) support the suggestion, highlighting the possible benefits associated with working collectively, including access to distant markets offering good prices, usage of common transport, increases in bargaining positions of farmers and transfer of marketing information.

Figure 3 depicts different levels of the sweet potato supply chain in South Africa, which can be broken down into the following levels: the producers of sweet potato (farmers); pack house owners (cleans, grade and quality control); cold storage and transport facilities (store and transport sweet potato on behalf of farmers); traders in sweet potato (market and sell sweet potato); processors (add value to sweet potato and process sweet potato to other usable forms); and end users (consumers). However, one can add that value adding, increases the potential of producers in earning more income and also open up employment opportunities.

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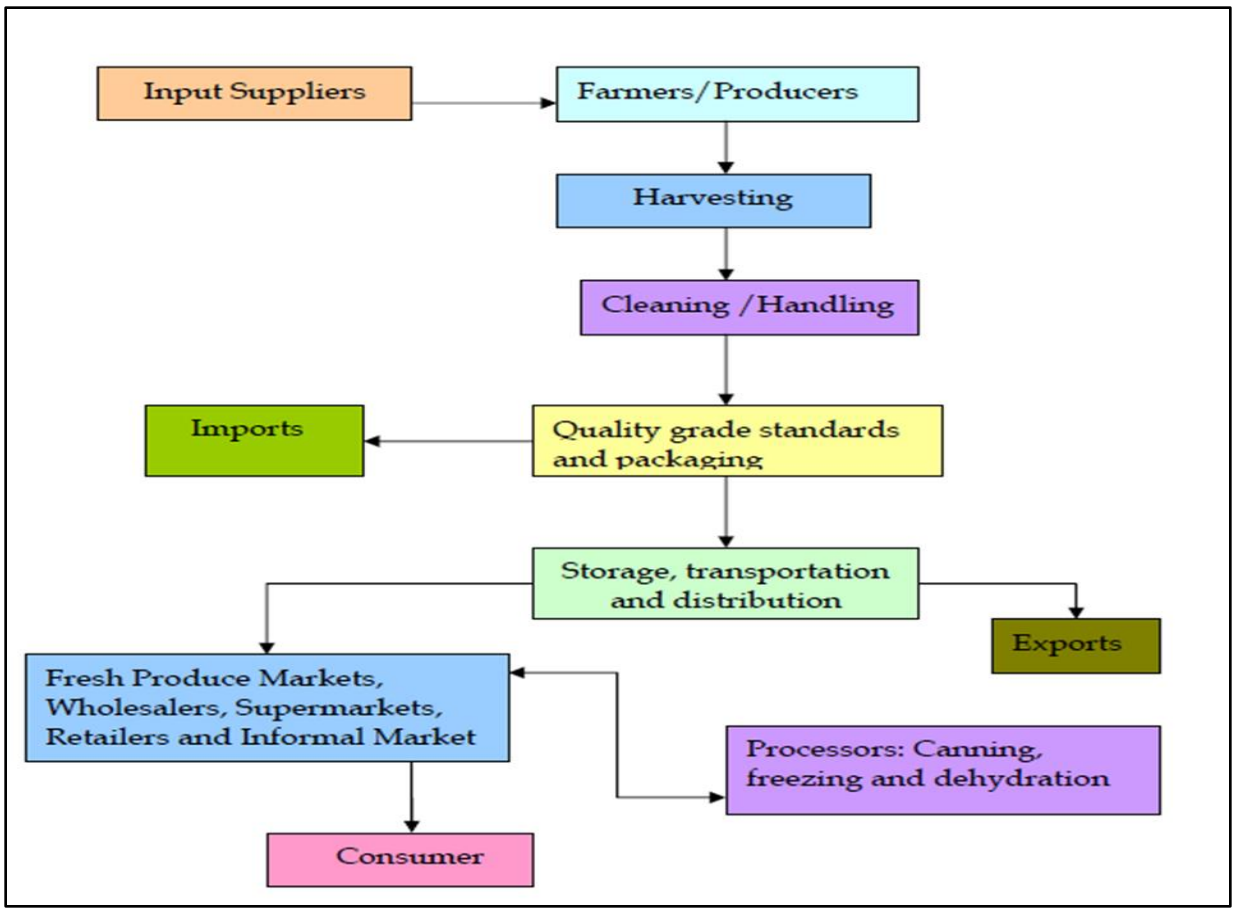

Figure 3: Supply Chain for sweet potato. Source: (DAFF, 2012).

The sweet potato supply chain starts with the input suppliers which include the nurseries, fertilizer companies and seed companies. Farmers can participate at this stage of the chain as sweet potato nurseries where they supply vines for sweet potato root production. From input suppliers, the next stage is the sweet potato producers, then to the market. The final participants in the supply chain are the consumers. When marketing, certain marketing channels can be followed, ranging from farm gate to local and export marketing. As expected, there is a variation in prices offered at different levels of the marketing channel, wherein prices offered at farm gate are lower as compared to those offered at wholesale level (Mmasa *et al.,* 2013). The difference can be attributed to value addition along the market chain.

Sweet potato vine growers can participate in sweet potato production at two levels, thus as vine growers and as sweet potato crop growers. Laurie *et al.* (2013) studied both the vine growers and sweet potato crop growers, and a gross margin analysis was

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performed for the vine production. The study revealed that prices for the vines are set at 50 cents per cutting for orders less than 3000, while for orders above 3000 the price was 30 cents. The vine production had a positive gross margin of R36 110 per ha. In the same study, three provinces were investigated for the sweet potato marketing, wherein they focused on sales of Orange fleshed sweet potatoes.

The marketing data was collected from Limpopo (Tshiombo), KwaZulu-Natal (eManguzi) and Eastern Cape (Uitenhage and IIitha), whereby different marketing channels and prices are adopted in these different provinces. In KwaZulu-Natal, farmers sold their produce to hawkers and directly to the community, at a price of R4/kg. In Limpopo, farmers sold their produce to hawkers, wholesalers and directly to the community, with prices ranging from R5 to R10 per kilogram. In Eastern Cape, sweet potato was sold to local community, schools and in grant pays point, and prices were R3/kg and R2.5/kg in Uitenhage and IIitha respectively (Laurie *et al*., 2013).

A number of questions remain to be answered from the study made by Laurie *et al.* (2013). One might want to know the factors that influenced farmers in selecting marketing channels, and if they had knowledge of other channels like the NFPMs. Also, what challenges were faced by farmers in accessing the NFPMs? Did they make any profit or positive returns from their sales in these various channels? Is it viable for them to continue their production under such circumstances? The current study will attempt to provide answers to some of these questions.

2.6 Costs and returns associated with agricultural production enterprises

Behjat and Ostry (2013) labelled agriculture as a risky and challenging enterprise, wherein profit maximising is one of the most important part of farm business survival. The study further explained that profit maximisation is not only important to the farmer, but also to improve the farms' competitiveness, and to the people associated with the farm business which include labourers and input supply businesses. Sadiq *et al.* (2013) in their study revealed that in smallholder farms, profitability's importance expands to policy makers, since it can be used in improving policies and development strategies, and also to judge the effectiveness of reforms already in place. However, there are

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various factors which affect profitability including high input costs and resource allocation which in turn affects the farms productivity (Abubakar *et al.,* 2005; Aboki and Yuguda, 2013). Abubakar *et al.* (2005) labelled high input costs as disincentives, due to the negative effect they have on the profit margins of marketable surplus. Aboki and Yuguda (2013) identified better farm management system as an important aspect in the efficient allocation of resources, since it is vital in a profitable farm enterprise.

A wide range of research has been undertaken, analysing the profitability of various agricultural enterprises and the associated factors that affect profitability. Izekor and Olumese (2010) undertook a study on determinants of yam production and profitability. The study used gross margin analysis to determine the profitability of N58 400/ha for yam farmers in the Edo State of Nigeria, which indicated that yam production enterprise was profitable. Furthermore, the study identified lack of adequate capital for investment as the most critical challenge faced by farmers, while labour cost accounted for the highest cost of operation.

Sadiq *et al.* (2013) on their study on profitability and production efficiency of small-scale maize farmers, found the maize production enterprise to be profitable. This study used gross margin to determine the profitability N55 191/ha for farmers maize farmers in the Niger state of Nigeria. It further revealed the enterprise to be highly profitable in the area with a percentage profit of 150%, which also shows that the enterprises in this area are economically viable wherein they can pay off their costs and still have more funds for investment. However, farmers were found to be constrained by lack of production land, access to credit facilities and provision of improved rural infrastructures. In relation to the study by Izekor and Olumese (2010), labour was found to have accounted for the highest cost of production, with 24% of the total cost of production.

Aboki and Yuguda (2013) conducted a study on determinants of profitability in Cowpea production in Taraba state of Nigeria. The analysis of the study revealed cowpea production enterprise to be a profitable venture, and used the gross margin analysis to determine the profitability of N54 909.75/ha for the farmers in the study area. The study also supports findings from Izekor and Olumese (2010) and Sadiq *et al.* (2013) in that, labour constitutes the highest cost in production, with the study revealing that 46.78% of

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total cost incurred was for labour. However, it was highlighted that the high cost of labour was as a result of lack of able bodied men in the study area to carry out the labour required, resulting in mechanised labour for ploughing which was very costly to these farmers. Furthermore, the study revealed cost of inputs to be inversely related to profit. Whereby, as the cost of fertilizers and cost of mechanised and hired labour increased by 10% and 5% respectively, there was a 0.78% decrease in the farmers' profit. To help reduce this high input cost, the study suggested formulation of cooperative societies among farmers, to assist and allow them to enjoy economies of scale in bulk input purchases, sourcing of mechanised labour and in marketing of their products.

Yuguda *et al.* (2014) conducted a study on profitability level of Cassava enterprise in Taraba state of Nigeria. The study indicated that cassava cultivation is profitable in the study area, and used the gross margin analysis to determine the profitability of N113 749.77/ha for the cassava farmers. Furthermore, it revealed that cassava production is a viable enterprise due to the positive return to investment, whereby the profit returns was almost double the amount invested. As a way of improving production and hence increase profitability, the study suggested that the government, NGOs and other stakeholders improve educating farmers on issues pertaining to production, processing and marketing.

Based on evidence from various research, agricultural production enterprises are proved to be profitable at small-scale farming level. The current study will be focused on the profitability of sweet potato production enterprises. Sweet potato production has shown to be profitable, where sweet potato farmers generally have a positive return on investment, however, profitability margins tend to differ along the different production levels, whereby at small-scale level, farmers only gain marginal benefits (Mmasa *et al.,* 2013).

Gains in profit are often influenced by the market that is utilised by the farmer in selling produce because prices differ with markets. In South Africa, NFPM remains the main important channel for the sale, and is desirable to farmers, especially to farmers producing large quantities. Prices in the NFPM range from R2 936 to R5 686 per ton.

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On the other hand, prices offered at informal markets (hawkers) range between R4 and R10/kg (DAFF, 2012; Laurie *et al.,* 2013). If the prices offered at informal markets are compared to those at NFPMs, the former sometimes offer higher prices. However, informal markets fail to absorb large quantities at once. The NFPM and other formal markets are more desirable to farmers possibly because they source produce in large quantities and farmers stand to sell all their produce, compared to informal rural or local markets wherein they sell less than 50% of their produce as revealed in the study by Omiti *et al.* (2009).

Kassali (2011) undertook a study to determine profitability, scale and resource use efficiency among sweet potato growers in Oyo state of Nigeria. This study used costs and returns analysis to determine profitability of $298.66, which revealed that sweet potato production was profitable. Moreover, labour cost accounted for 68% of the total cost, making it the highest cost of production. The rate of return on investment was 1.11, which indicates that sweet production is profitable (Kassali, 2011). In the same study, sensitivity analysis was performed which revealed that costs of production and market prices affected the profitability. An increase in production costs led to a reduction in profit, while an increase in market prices was favourable to the producers as it increased the profit.

A study by Adewumi and Adebayo (2008) which describes the socio-economic characteristics of sweet potato farmers, evaluated the profitability and the technical efficiency of sweet potato production. The study used gross margin analysis to determine the profitability of N15 293.15/ha in the study area. The results provided similar findings as the study by Kassali (2011). The study findings revealed that sweet potato was a profitable enterprise, and similarly the study indicated labour cost as the largest constituent of their variable costs. A study by Mmasa *et al.* (2013) further identified weeding and harvesting as the most expensive operations for the farmers, resulting in the high labour cost. In addition, the study revealed that households resorted to utilization of household labour to undertake weeding and harvesting, in order to reduce production and hence increase their profit levels.

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2.7 Socio-economic characteristics of farmers associated with marketing and profitability

There are various social and economic factors that affect farmers' production capabilities. These factors can have an influence on the production system, marketing of farm produce, and hence affect the income generated. Various research have looked at how socio-economic characteristics affect both the marketing and profitability of agricultural production enterprises.

Dlamini and Masuku (2013) used multiple linear regression model to identify variables which influences the profitability of sugarcane farmers in their study. This study revealed that farm size, farming experience, labour costs and fertilizer costs where the significant variables which influence profitability for the farmers. These results support the findings by Kassali (2011) and Mutai *et al.* (2013) which identified labour cost, planting materials and land size as significant variables. Mutai *et al.* (2013) further revealed that farmers with larger portion of lands attain more and income and profit.

A study by Kassali (2011) revealed that sweet potato production is dominated by older people, with an average age of 50 years. The findings are in line with those of Adewumi and Adebayo (2008), which revealed a mean age of 52 years. This implies that sweet potato production is dominated by an ageing population, with few young adults actively involved in sweet production. A study by Van den Berg (2013) identified age as one of the factors which might negatively affect adoption of improved technology, highlighting that a low number of young people are involved in agricultural production. Older farmers might also find challenges in using mechanization which require heavy man power in agriculture. In addition, accessing distant markets might be challenging to elderly farmers as they may not be willing to travel long distance to access markets. All these factors affect the farmers' income negatively.

Gender issues have been discussed a lot, wherein development in the agricultural sector is viewed as gender biased. Andrade *et al.* (2009) and Mmasa *et al*. (2013) on their respective studies revealed that sweet potato production is dominated by women. However, this contradicts with the findings on studies by Adewumi and Adebayo (2008),

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and Kassali (2011) wherein they identified the industry being male dominated. In the study by Adewumi and Adebayo (2008) all the respondents from the study area were males. It was further explained that men were the farm owners, and women were only engaged in activities around the farm which include fetching water for irrigation, fertilizer application and transportation of harvested sweet potato to the selling point. A study by Kassali (2011) shows a male dominated sweet potato production, with 70% of respondents being males.

Mohammed and Abdulquadri (2012) in their study revealed that men and women involvement in agricultural production differs as a result of various constraints including access to and control over resources, and their roles in decision making. This includes access to land for production, land title, access to credit facilities and access to markets, which in some societies might be gender biased, and this will affect the production, marketing and profitability of a farmer differently among women and men.

Mutai *et al.* (2013) in their study used multinomial logit model to analyse the choice of market option by the farmers. This study found gender to be significant to participation in high paying markets, wherein they further revealed that male farmers were likely to participate more in these high paying markets compared to women, resulting in women left with the option of selling in the village or local markets with low income, and low profitability. However, Mohammed and Abdulquadri (2012) identified that women were more constrained and face difficulties with access to credit, input and information. This can be due to that in some societies women do not have access to land and only the men or husbands have title to land, and therefore lead to difficulties in accessing credit as they won't be having land as a form of collateral. However, the study further revealed an increase on women's involvement in agriculture by 4%.

The marginal land size for production is regarded as one of the characteristics that influences production and profitability of small-scale farming. Land is a critical asset for production, however, small-scale farmers are deemed to be resource poor even in relation to land access and ownership; majority of their farm holdings range between 1-2 ha (Izekor and Olumese, 2010; Mutai *et al*., 2013). A study by Kassali (2011) regarded sweet potato production as a small-scale enterprise with respect to the land

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size, revealing a mean size of 1.20 ha, while 60% of the farm size in their area of study ranged between 0.6 ha and 1.5 ha. The findings are in line with those of Adewumi and Adebayo (2008), which revealed an average land size of 1.5 ha under sweet potato production.

Mutai *et al.* (2013) further revealed that total land owned has a positive influence on market participation, wherein those with large plots of land are more likely to participate in larger markets which offer lucrative prices. The study furthermore revealed that farmers with larger farms were involved in a wide range of markets. Farmers with an average farm size of 4.3 ha sold their produce at the larger regional market, whereas those with an average farm size of 3.3 ha, 2.1 ha and 2 ha, sold at local town, village and neighbourhood markets respectively. This implies that farmers with large land stand a chance to access the larger and lucrative markets, and hence attain more income and profit.

Educational level of farmers is considered as one of the significant aspects of an agricultural production enterprise's viability, whereby it also influences adoption of new improved techniques of production (Singh *et al*., 2009; Izekor and Olumese, 2010). Various studies have revealed that majority of small-scale farmers have no formal education. Izekor and Olumese (2010) in their study revealed that 58% of farmers in the study area had no formal education. These findings agree with those of Adewumi and Adebayo (2008), which revealed that 63.16% of farmers in their study area had no formal education. The study also revealed that farmers' low level of technology adoption and lack of or non-appropriate farm record keeping, might be as a result of lacking formal education. Therefore, in order to improve farmers' educational level, there is a need for promotion of rural household education through adult literacy education (Izekor and Olumese, 2010; Sadiq *et al*., 2013).

For small-scale farmers to improve and increase their production scale, they require assistance, which is in the form of extension workers, who act as liaison between the farmers and other stakeholders associated with the agricultural sector. A study by Mmasa *et al.* (2013) revealed that majority of farmers require extension services to improve their farming activities, with 84.7% of the respondents requiring the services.

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Extension services provided to farmers can include training on farm management systems, training on new improved technology or techniques for production, providing assistance on access to credit facilities and information on markets (input/output), and fostering of relationships amongst farmers such as formation of cooperatives.

A study by Mutai *et al.* (2013) revealed that access to extension has a positive influence on the farmers' participation to various markets. Extension officers provide farmers with information on available markets where they can source their inputs and sell their produce. A study by Van den Berg (2013) identified extension methods as one of the major factor influencing adoption of improved agricultural practices in Limpopo Province. Mutai *et al.* (2013) suggested the need for government to provide trained extension officers to advise farmers on new farming practices.

In various studies, labour cost accounted the highest in the cost of production, and thus negatively affecting profit. To reduce this cost, most farmers have resorted to using family labour, especially those with a large family size. Family labourers are employed to various activities which include planting, ridging, weeding and harvesting, as a measure of reducing the cost of production (Kassali, 2011; Mmasa *et al.,* 2013). Adewumi and Adebayo (2008) in their study identified family size as an important source of family labour. Singh *et al.* (2009) in their study identified family size as one of the factors responsible for viability of a farm. Utilising family labour in some farming activities, often reduce cost of production and thus leading to an increase in profit, implying more funds available for investment back to the farm.

Farmers require finances in the form of capital to assist in improving their production level, whereby with better financial power or access to finance, it can help with investment on the farm. A study by Ezeano *et al.* (2009) identified finance as one of the factors that constrain production and marketing of sweet potato among small-scale farmers. Mutai *et al.* (2013) in their study identified access to credit as one of the significant factors which determines participation in the different market options. Financial access remains a critical challenge to small-scale farmers owing to their continued production at subsistence level.

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Lack of finance constrains farmers from using improving technologies (Ezeano *et al*., 2009). A study by Adewumi and Adebayo (2008) revealed that few farmers purchase their vine cuttings, whereas majority of them source their cuttings from other farmers, relatives and from previous harvest. This can be due to the farmers' lack of finances and difficulties in accessing credit facilities, which results in farmers' lack of adoption on improved technologies and high costs associated with these inputs. Therefore, these challenges affect the farmers' productivity, the output produced and quality produced, which in turn will affect their marketability and income generated, and hence affect the profitability of the enterprise.

2.8 Summary of literature review

In this chapter, sweet potato production in South Africa and globally was discussed, along with its uses, marketing, and its profitability. China is the highest producer in the world, with over 80% of the total sweet potato production coming from the country. In Africa, sweet potato production is dominated by resource-poor smallholder farmers, and contributes a meagre 2.7% in the world market. In South Africa, sweet potato production is dominated by commercial farmers, wherein they contribute 70% of the production in the country.

Sweet potato has grown in importance both as a food and cash crop, as a result of an increased demand for the crop. The crop is grown for both human and animal consumption. There are various market structures available for sweet potato which includes informal markets, fresh produce markets, processors, directly selling to wholesalers and retailers, and the export market.

Sweet potato production has been found to be a profitable enterprise. However, various factors negatively affect the profitability of sweet potato production. Amongst the cost incurred, labour cost was found to be the highest cost that farmers incur in sweet potato production. Other factors can include high inputs cost, lack of resources, poor access to infrastructure, lack of information and lack of funds. Furthermore, the types of market farmers participate in also affect their profitability. However, farmers favour formal markets, compared to informal or regional markets which are associated with low sales.

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Socio-economic characteristics of farmers also have an effect on their market participation and profitability opportunity. Sweet potato production has been found to be dominated by ageing farmers with no education. This is likely to affect adaptation of improved technologies and market participation, which thus affect their production and profitability. Other factors can include farming experience, land size, and gender. Furthermore, extension services and trainings are also essential in improving farmers' production level, product quality, and market participation and thus improve their profitability.

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CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

The aim of this chapter is to provide information on the study area and the methodology used in this study. This chapter presents the detailed background on the study area which includes its location, socio-economic factors, information on the agricultural sector and challenges faced by the farmers within the study area. The chapter also discusses the research method which includes data gathering techniques, instruments used for data collection and the models used for analysis.

3.2 Study Area

The study was conducted in Makhado and Thulamela local municipalities of the Vhembe District, which is situated in the Limpopo Province of South Africa. Sweet potato farmers who were located in the two local municipalities and actively involved in selling sweet potatoes were interviewed for the purpose of the study.

3.2.1 Background of the Study Area

Vhembe district is located in Limpopo province, situated in the far northern corner of the province. Limpopo province has five districts, namely: Capricorn Districts; Mopani District; Sekhukhune District; Waterberg District; and the Vhembe District. The province is ideal for agricultural production, with climatic conditions enabling all year round production (Local government, 2014). The winters are mild and moist, while summers are wet and warm, with temperatures in the district ranging from 10^0C minimum during winter to a maximum of 40^0C (IDP, 2012). Moreover, the district receives an annual rainfall of approximately 500mm per annum, of which 87.1% falls between October and March. In Vhembe district, agriculture is one of the main economic sectors along with mining and tourism (Local government, 2014). The Vhembe district is easily accessible to SADC markets through the borders it shares with countries such as Botswana, Mozambique and Zimbabwe.

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Vhembe district is home to over 1.2 million occupants, stretched along the four local municipalities, namely: Makhado; Musina, Mutale and Thulamela (IDP, 2012; Local government, 2014). The study was conducted in Makhado and Thulamela local municipalities. The study area is characterized by numerous small-scale farmers involved in producing a variety of crops including, sweet potatoes. The various motives in which farmers in the study areas are involved in agricultural production include own food production and income generation through marketing produce. In marketing produce, these farmers supply various markets such as the local markets, retailers, and some also reach export markets. The two local municipalities were chosen as areas of the study because they are the main sweet potato producing areas in the Vhembe district.

Figure 4 shows a map of Limpopo province, with the 5 districts which constitute the province. Furthermore, Figure 5 shows a detailed map of the Vhembe district, showing the local municipalities which make up the district and those that form part of the study namely: Makhado and Thulamela local municipalities.

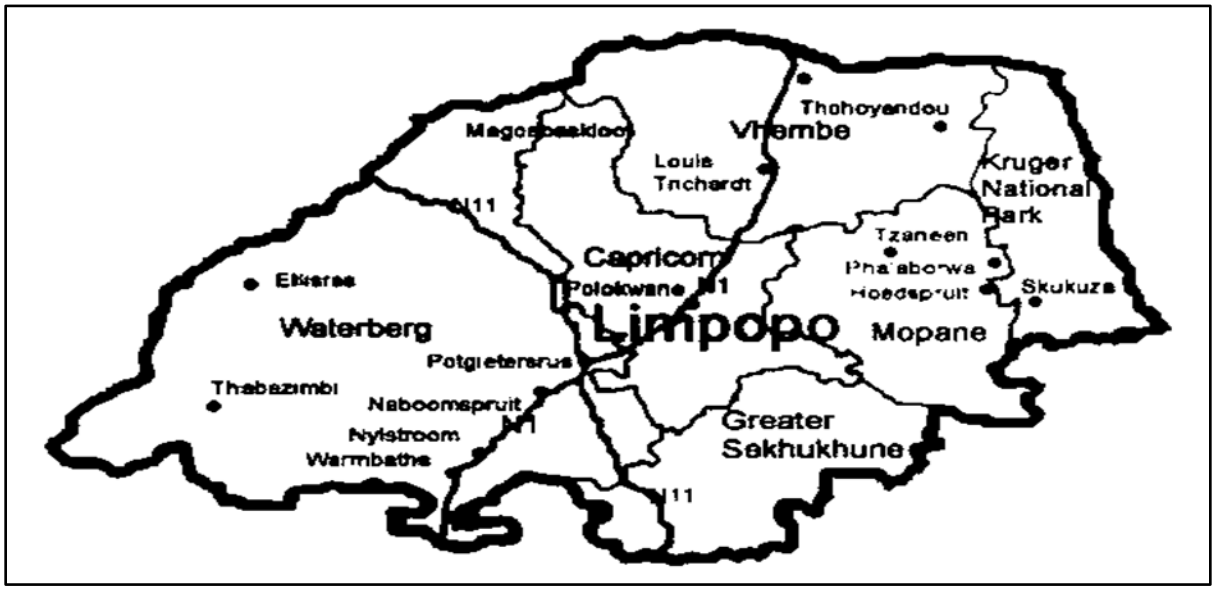

Figure 4: Map of Limpopo Province. Source: (Common.Wikimedia, 2014)

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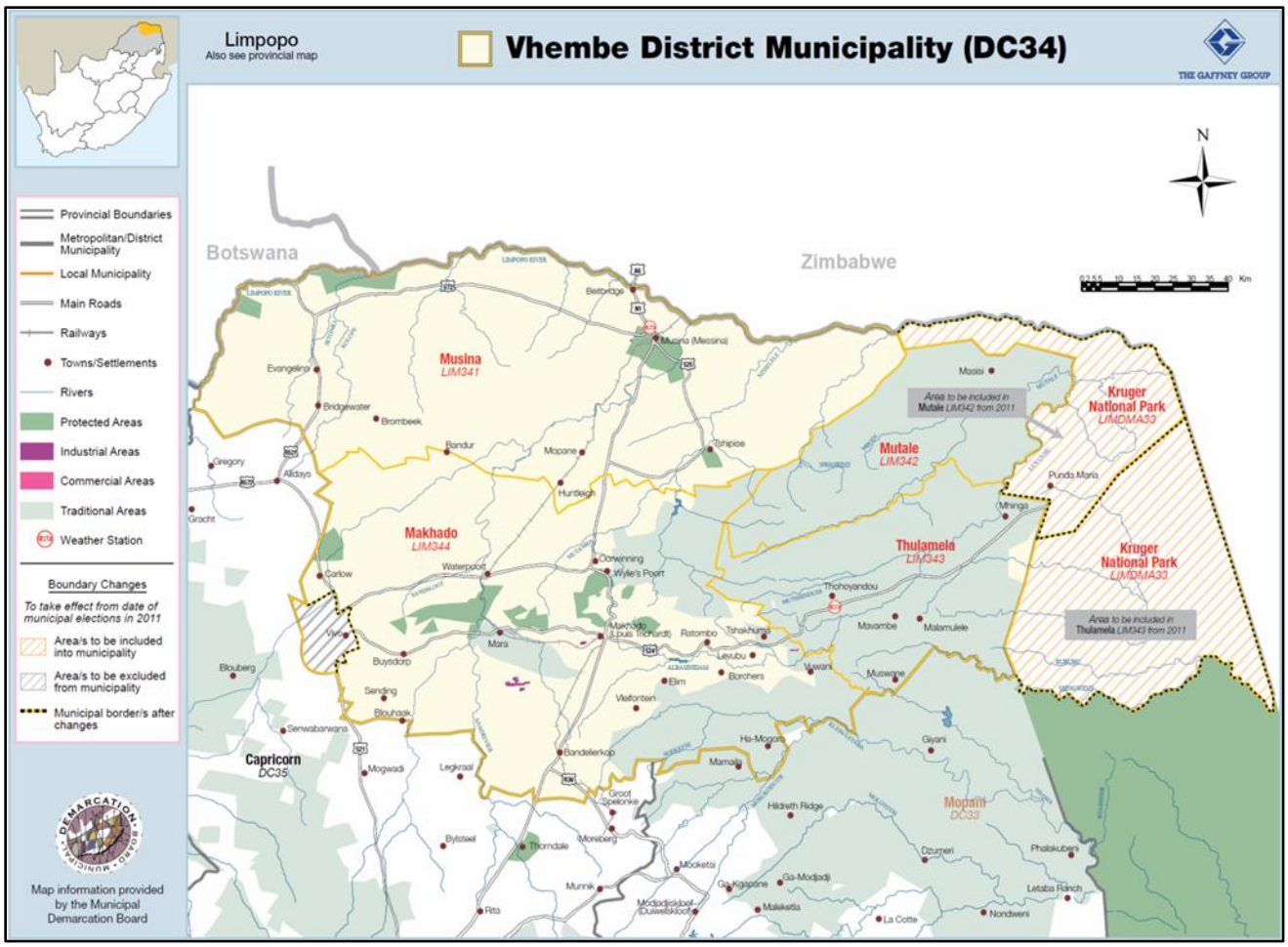

Figure 5: Vhembe District map. Source: (CoGTA, 2011)

3.2.2 Socio-economic Factors

Vhembe district is mostly rural and less developed in comparison to other parts of the Limpopo province, and is rated as one of the poorest districts in South Africa (Kyei, 2011). The Vhembe district has a poverty rate of 55.85%, while Makhado and Thulamela local municipalities have a poverty rate of 64.29% and 68.81% respectively. This signifies the extreme state of poverty in the district and the local municipalities, whereby more than half the population is living in a state of poverty (Kyei, 2011; IDP, 2012). The Vhembe district IDP (2012), revealed the availability of various programmes in place to address the poverty and unemployment conditions faced in the district. However, such platforms are being delayed and failing due to various factors including:

- Lack of business management skills

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- Lack of market research
- Lack of scarce skills
- Food insecurity
- Transfer of indigenous skills
- Lack of information about opportunities.

The population composition of the Vhembe district is female dominated, with females accounting for 54.4%, while males accounted for 45.6% of the district's occupants (Local government, 2014). A study on socio-economic indicators from Vhembe district by Kyei (2011), in terms of racial composition, revealed that the district is dominated by the black population which accounted for 98.48%, while whites and Asians accounted for 1.14% and 0.38% respectively. Furthermore, the study revealed a breakdown of the district's population composition according to culture, language and race, which is as follows: Venda (68.25%); Tsonga (26.40%); North Sotho (2.33%); Afrikaans (1.14%); English and other minorities (1.88%). This information indicates that the Vhembe district is mainly dominated by the Venda population, wherein it accounts for more than half of the overall population in the district.

3.2.3 Agricultural Production in the Study Area

Limpopo is one of South Africa's provinces that excel in agricultural production, with majority of its rural population engaged in agricultural activities. The agricultural sector is a great source of welfare for the rural occupants, wherein it offers employment opportunities, food production and a source of income for the farmers. In the Vhembe district, along with mining and tourism, the agricultural sector is one of the main sources for rural economic development. Out of the four local municipalities in the district, Thulamela local municipality is deemed suitable for arable farming because it has more fertile soils (IDP, 2012; Local government, 2014).

The agricultural system in the Vhembe district is divided into two sectors, namely large-scale commercial farming sector and small-scale farming sector. The large-scale commercial farming sector has access to 70% of arable land, which equates to 174 830 ha; while the small-scale farming sector has access to 30% of arable land, equating to

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74 927 ha (IDP, 2012). Efforts have been made to reduce the land disparity between small-scale farming and commercial farming, in an attempt to improve rural economy and eradicate poverty. However, such efforts are constrained due to the land tenure system in place, and because a large portion of the land falls under tribal authorities within the district (IDP, 2012).

3.3 Data Collection and Sampling

3.3.1 Sampling Technique and Sample Size

A purposive sampling technique was used to select farmers who were interviewed for this study. The criteria employed for selecting respondents was that only farmers who were actively involved in the production and marketing of sweet potatoes to any market were chosen for this study. This sampling technique was used so that the farmers interviewed can offer informed data related to the study's objectives. Purposive sampling technique was chosen for the study because it is time saving as it only focuses on a certain group of respondents (Babbie, 2001). In this case it was only focused on active sweet potato farmers, who were active participants in the market.

A sampling frame was obtained from the extension officers, wherein a list of sweet potato farmers was provided. Further engagement and communication with the extension officers and farmers was conducted, to find suitable time and to request the availability of farmers who were willing to participate in the study. A total of 78 farmers were interviewed as part of the study, from various villages across Makhado and Thulamela local municipalities of the Vhembe District. Table 1 summarizes the distribution of the study respondents.

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Table 1: List of interviewed farmers in the Vhembe district

Village Name	Local Municipality	Number of farmers interviewed
Dzimauli	Thulamela	16
Maraxwe	Thulamela	17
Matombotswuka	Thulamela	5
Mbahela	Thulamela	2
Mianzwi	Thulamela	2
Mutshenzheni	Thulamela	8
Ha-Mandiwana	Makhado	12
Tshiombo	Thulamela	16
TOTAL		**78**

Source: Survey 2016

3.3.2 Data Collection Methods and Instruments

Primary data was collected from sweet potato producers at Makhado and Thulamela local municipalities of the Vhembe district. A structured questionnaire was designed for collection of both the qualitative and quantitative data. The questionnaire was comprised of a mixture of open-ended and closed-ended questions, to allow for capturing of a variety of data. The questionnaire was designed to capture data such as: demographic information like age, sex, family size and educational status; production information; marketing information; costs associated with production and marketing; income generated; and challenges faced by the sweet potato farmers.

Data was collected by administering the questionnaire through face-to-face interviews with the respondents. The justification to using the face-to-face interview method was because it reduces the loss of important data through misinterpretation of the questions. This is because the respondents can engage with the interviewer where they do not understand for further explanation. Furthermore, the interviewer too has the chance to have more follow up questions and get additional information which might be valuable to the study (Salkind, 2010). For interviews, farmers were visited at their farms. In some cases, interviews were also held at the extension offices and community halls in the

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farmers' villages, due to farmers having other commitments and were organized through communication with the farmers and their respective extension officers. The interviews were conducted with respondents who were involved with day-to-day running of the farm, to enable capturing of valid and reliable data. In most cases, head of the households were interviewed, but in cases where the head were absent, spouses and children who were involved in the farm were interviewed.

3.4 Data Analysis Technique and the Model

The Statistical Package for the Social Sciences (SPSS Version 23) and Microsoft Excel 2010 were used to capture and analyse the data collected from the study's respondents. To answer the objectives and test the hypotheses of the study; descriptive statistics, gross margin analysis and a multiple regression model were used.

Descriptive statistics was used to analyse marketing information collected to identify marketing channels used by the farmers, and to determine differences in the sweet potato markets. According to Patton (1990), descriptive statistics are used to summarise the important characteristics of large data sets and consolidate a mass of numerical data into useful information.

Gross margin analysis was used to determine the profitability of the sweet potato enterprises in the Vhembe district. Gross margin per hectare was used as a proxy for profitability of sweet potato farmers. According to Visagie and Ghebretsadik (2005), gross margin is the difference between the Gross Income (GI) derived from each enterprise minus the total variable costs (TVC). The formula for calculating gross margin can be shown as: GM = (GI – TVC); wherein:

GM= Gross Margin (R/ha)

GI= Gross Income (R/ha)

TVC= Total Variable Cost (R/ha)

Thus, GI represents the income received after sales of sweet potatoes, whereas TVC is a summation of operational costs incurred that vary with changes in scale of operation.

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GI is measured in terms of the current market price. Whereas, TVC includes operational costs such as input costs like fertilizers, seeds and chemical costs; transport costs; labor and land preparation costs.

The reason why gross margin analysis was employed is that it uses the information that farmers readily have from their records, such as costs of production, marketing, and income generated. Gross margin analysis enables farmers to assess the profitability of the crop, and hence allow farmers to compare with other crops and then chose the most efficient type of crop to produce.

A multiple linear regression model was adopted and implemented to analyse the factors affecting profitability of the sweet potato producers in the Vhembe district. The regression analysis is a statistical tool for investigating the relationships between variables, where the investigator seeks to learn the causal effect of one variable upon another (Alexopoulos, 2010). A multiple linear regression model is used to predict the effects of individual independent variables on the dependent variable without the effects of other variables taken into account. It is useful for both quantitative and qualitative independent variables (Cohen *et al.,* 2003). A Multiple linear regression model is applicable when there is more than one potential outcome (Dielman, 2001). In this case, the individual independent variables are expected to either have a positive or negative effect on the dependent variable. The multiple linear regression model was appropriate because the dependent variable gross margin is a continuous variable. An econometric model for the analysis of the profitability of sweet potato enterprises can be expressed as a function of different factors as:

$$Y= f(X_{1,}X_{2,}X_{3,\ldots..,}X_{n})$$

For this study, a multiple regression model which was used to fit the variables that affect or influence the profitability of sweet potato farmers in the Vhembe district is expressed by the following function:

$$Y= \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \mu$$

Where:

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Y= is profitability of sweet potato production, measured by gross margin per hectare

β_0= Constant/intercept

β_1-β_7= estimated coefficients of explanatory variable

X_1-X_7= explanatory/independent variables

μ= the random error or disturbance term.

Table 2 show the variables fitted into the regression model and their description.

Table 2: Description of the dependent and independent variables used in the regression model

Variables	Variables Description	Unit of Measure	Expected Sign
Dependent Variable			
Y= Profitability	Profitability of sweet potato production	Rands	
Independent Variables			
X_1= Occupational Status	1. Unemployed; 2. Permanently Employed; 3. Contract Worker; 4. Casual/Piece Jobs; 5. Pensioner	Categorical	-
X_2= Farming Experience (In Years)	1. Less Than One Year; 2. Between 1-5 Years; 3. Between 6-10 Years; 4. Over 10 Years	Categorical	+
X_3= Type of Training Received	1. Never Trained; 2. Technical Training; 3. Business Management; 4. Both Technical & Business Management	Categorical	+
X_4= Labour Cost	Total amount of the labour cost incurred, paid for working at the farm	Rands	-
X_5= Unpaid Family Members	Total number of unpaid family members who assist in the farm	Number	+
X_6= Tractor Hire Cost	Total amount of tractor hiring cost incurred	Rands	-
X_7= Chemical Cost	Total amount of chemical cost incurred	Rands	-

Source: Survey 2016

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3.5 Ethical Considerations

As a standard protocol prior to the commencement of the study, various meetings were conducted with various stakeholders at the Vhembe district namely: DAFF officials (Manager and Extension officers); Local communities' authorities (Headmen); Local farming cooperatives chairpersons and farmers representatives. The aim of the meetings was to introduce and explain the aim and objectives of the study; to seek permission to conduct the study; and to request the availability of farmers. The study only commenced after the ethical clearance certificate was granted by the university. During the data collection process, consent to undertake the study or make interviews was requested from the respondents. The purpose of the study was clearly explained to them before being interviewed. The farmers were also informed of their rights to take part, not take part or to discontinue with the interviews and were respected for their choices. Furthermore, the farmers were assured of privacy and confidentiality of the data collected during the survey. No farmer was forced, threatened, paid or bribed to participate in the study; only farmers who were voluntarily willing to be participants of the study were considered and interviewed.

3.6 Summary of the Study Project

Table 3 shows the summary of this study which includes the objective, hypotheses, the type of data collected for analysis, and the analytical tools used.

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Table 3: The tabular summation of the study and data type collected

Specific objectives	Hypothesis	Data for analysis	Analytical tool
To determine the profitability of sweet potato enterprises located in different villages in Limpopo province	There are differences in profitability between sweet potato enterprises located in different villages.	Financial information associated with the production and marketing of the produces, including production costs, income received	Gross Margin Analysis
To identify factors affecting the profitability of sweet potato enterprises in Limpopo province.	Socio-economic factors affect the profitability of sweet potato enterprises.	Demographic information, marketing and market accessibility.	Multiple linear regression Model.
To determine differences in the sweet potato markets, and their effect on profitability.	There are differences in profitability between markets utilised by sweet potato farmers.	Market information, the market prices and processes on different available markets.	Descriptive statistics, Gross Margin Analysis.
To identify marketing channels utilised by the sweet potato enterprises.	There are a few marketing channels available in Limpopo province.	Market information, Financial information including production costs, income received.	Descriptive statistics

3.7 Summary of the Chapter

In this chapter, a description of the research study area, Vhembe district, Makhado and Thulamela local municipalities was given. Furthermore, the chapter discussed the methodology adopted when conducting the study. Data was collected from 78 sweet potato farmers, who are also involved in marketing sweet potatoes. A purposive sampling technique was adopted to select farmers involved in the study, wherein a structured questionnaire was administered through face-to-face interviews to collect data from the respondents. The gross margin analysis and the multiple linear regression models were chosen to analyze data. The ethical considerations prior and when conducting the study were also discussed in this chapter.

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CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

The aim of this chapter is to present and discuss the results of this study. Descriptive statistics with the aid of tables and figures were used to illustrate the results. The demographic characteristics of the farmers are also discussed in this chapter. Furthermore, the calculation of the gross margin of the sweet potato farmers are provided and discussed, as well as the results of the gross margin analysis and the multiple linear regression models.

4.2 Descriptive Statistics

In this study, primary data was collected from 78 farmers through the administration of a structured questionnaire, in a face-to-face interview.

Table 4 reveals the farm size and production of sweet potato in the study area. The table shows that all farmers in the study cultivated in a total land size of 92.9 ha. However, only 41.3 ha of land were allocated to sweet potato production. The farmer with the largest land size had a 4.5 ha farm, while the smallest farm was 1 ha. In the study area, the largest land allocated to sweet potato production was 2 ha, with the lowest being 0.1 ha plot. Sweet potato was cultivated as an intercrop with other crops and vegetables, while grown in small plots. This finding on intercropping from the study agrees with the findings by Low *et al.* (2001) and Kassali (2011). A total of 331 tons of sweet potato was produced and sold by the farmers with an average production rate of 8.01 tons/ha. This value is a bit low as compared to an average of 20 tons/ha that can be obtained by commercial farmers in South Africa (Modipadi, 2014). However, with more support and investment for the farmers the yield can increase as well as the farmers' income.

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Table 4: Farm Size vs. Production

	Farm Size(ha)	Area Under Sweet Potato Production (ha)	Sweet Potato Produced & Sold (Tons)
Total	92.9	41.3	331
Maximum	4.5	2	14.3
Average	1.2	0.53	4.24
Minimum	1	0.1	1.38
Average Production Rate is 8.01 Tons/ha			

Source: Survey 2016

Table 5 summarizes the results of the descriptive statistics on the socio-economic characteristics of the farmers interviewed for the study. The results show that sweet potato production in the area is dominated by old farmers as 50% of the respondents were of the age of 61 years and above. A minimal 2.6% of the respondents were between 21 and 40 years, which highlights the lack of youth involvement in sweet potato farming.

Andrade *et al.* (2009) in their study revealed that sweet potato production is female dominated. Moreover, the results in the study has revealed that the Vhembe districts' sweet potato productions' population composition is female dominated. This is supported by the fact that over half of the respondents were females, with 69.2% of respondents found to be females. The male sweet potato farmers in the study area constituted 30.8% of the respondents.

In the study area, 57.7% of the respondents had a household of between 1 and 5 members; respondents with a household of between 6 and 10 members were 37.2%. Moreover, respondents with a household of 11 and above members were represented by 5.1%%. As a measure of reducing labour cost, some farmers resort to family members as a source of labour force in some farming activities. Therefore, in this case a large household is favorable to those farmers who are able to get free family labour force to carry out farm activities.

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Table 5: The Descriptive statistical analysis of the socio-economic characteristics of the farmers

Parameters	Frequency	Percentage (%)
Age (years)		
21-40 Years	2	2.6
41-60 Years	37	47.4
61 and above	39	50
TOTAL	**78**	**100**
Sex/Gender		
Male	24	30.8
Female	54	69.2
TOTAL	**78**	**100**
Household Size		
1-5	45	57.7
6-10	29	37.2
11 and above	4	5.1
TOTAL	**78**	**100**
Educational Level		
Never Attended	13	16.7
Primary	23	29.5
Secondary	38	48.7
Tertiary	3	3.8
Other(i.e. ABET)	1	1.3
TOTAL	**78**	**100**
Occupational Status		
Unemployed	2	2.6
Permanent Employment	1	1.3
Contract Worker	5	6.4
Casual/Piece Job	44	56.4
Pensioner	26	33.3
TOTAL	**78**	**100**
Main Source of Income		
Farming	36	46.2
Social Grant	30	38.5
Employment	10	12.8
Remittances	2	2.6
TOTAL	**78**	**100**
Farming Experience (years)		
1-5	7	9.0
6-10	11	14.1
11 and above	60	76.9
TOTAL	**78**	**100**
Training Received		
Never	19	24.4
Technical	20	25.6
Business & Technical	39	50
TOTAL	**78**	**100**

Source: Survey 2016

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In the study area, 57.7% of the respondents had a household size of between 1 and 5 members; respondents with a household of between 6 and 10 members were 37.2%. Moreover, respondents with a household of 11 and above members were represented by 5.1%%. As a measure of reducing labour cost, some farmers resort to family members as a source of labour force in some farming activities. Therefore, in this case a large household is favorable to those farmers who are able to get free family labour force to carry out farm activities.

Table 5 further indicates that with regard to the educational level 16.7% of the respondents had never attended school. Majority of those respondents were older females who cited that when growing up, as females they were restricted from attending school. Furthermore, 48.7% of the respondents attended secondary school, while 3.8% and 29.5% attained tertiary and primary education respectively. A marginal portion of the respondents of 1.3% had attained other form of education with the ABET school. Therefore, in total 83.3% of sweet potato farmers in the study area had attained a formal education.

These results which show that the majority of the respondents acquired formal education is quite encouraging as education potentially plays a role on how farmers

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respond to trainings offered. This is due to that having acquired education it will entice their willingness to get more knowledge and easy assimilation of courses and trainings offered to them (Ibrahim *et al.,* 2013). Half of the respondents (50%) received training in both the technical and business aspect of farming, while 24.4% of the respondents never received any form of training. The technical aspect of training include planting, breeding, plant protection and harvesting measures; whereas on the business aspect, farmers received training on financial recordings, human resources skills and marketing skills.

Table 5 further shows that farmers with farming experience between 6 and 10 years represented 14.1% of the respondents, while 76.9% of the respondents had a farming experience of 11 years and above. Thus, 91% of the respondents in the area have been into the farming sector for more than 5 years. The duration a farmer has in farming is expected to potentially have an influence on their management skills (Dlamini and Masuku, 2013). Therefore, farmers who have been involved in sweet potato farming for many years are expected to perform better than the new farmers. This is due to the experience gathered in the vast amount of years they have been involved in sweet potato production, wherein they will be more knowledgeable on production and marketing practices that will result in high yield and hence potential more income.

In the Vhembe district, farming is a source of employment and income. However, some of the respondents are full time farmers, while others are part time farmers and had other sources of income besides farming. Table 5 reveal that 56.4% of the respondents take casual or piece jobs outside farming to sustain their living, whereas 1.3% is permanently employed. Furthermore, from the sampled sweet potato farmers 33.3% of them are pensioners. The farmers also revealed that the money received from these other employment opportunities is also used to assist and invest in the farm.

Further analysis of Table 5, indicates that despite the farmers having other sources of income, farming remains the main source of income in the area. This is shown by 46.2% of respondents revealing farming as their main source of income. Moreover, social grants and employment are the main source of income to 38.5% and 12.8% of the respondents respectively.

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4.3 Sweet Potato Market Channels and Options

There are various marketing channels available for sweet potatoes in South Africa as already discussed in literature. The channel starts from the input supplier and ends up with the consumer. However, this study only focused from the farmer to where they sell their produce; thus, formal or informal markets, individuals or retailers.

Despite the availability of various market channel opportunities in which farmers can potentially target and participate in, farmers in the study area were participants in the informal type of market. Thus it was a buyer vs. seller, farm gates sales type of market with no contracts or regulations binding the buyer or seller. Moreover, farmers had a set price in which all the farmers charge as agreed by the farmers collectively. Sweet potatoes are only harvested when customers come to buy and are sold unwashed. This is also due to lack of infrastructure, wherein farmers lack storage facilities and washing facilities.

In this type of market channel, farmers incur no marketing cost. This is because customers come directly to the farms to buy the sweet potatoes. All the farmers in the study area participated in this type of market. This market option is the most common option for sweet potato farmers, owing to that there are no costs or less costs associated with market participation (Mutai *et al.,* 2013). However, farmers in the study area expressed an interest to venture into other markets which are more rewarding such as exporting, selling to retailers and national markets. Moreover, they cited lack of concrete information on markets, poor resources and high input prices as some of the challenges restricting them.

However, for some farmers who seek to make more income and maximize their profit, they take their produce to other areas and market themselves. These farmers market their produce at social grants paying points across the neighboring community villages. Furthermore, the farmers market to other areas such as Tshakhuma Markets, Giyani, Thohoyandou and Malamulele areas. Therefore, unlike in the farm gate sales market type, in these markets, the farmers incur a marketing cost in terms of the transport cost.

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The farmers hire trucks to transport their produce to the respective areas wherein they seek to sell their products. The transport is paid for that particular trip or day in which the farmer decides to go to the market, and prices vary on who you find and how you negotiate with the owner of the transport. In the study area 35.9% of the respondents are involved in this market channel. This market option can be both rewarding and risky to farmers compared to the farm gate option. This is because farmers do not have ready-waiting customers, they still have to attract customers. However, farmers stand to benefit more due to less competition available and have the benefit of setting their own prices. Furthermore, in this market option, sweet potatoes are sold in a scale of a basket not in crate which also differ in prices offered. Although the farmer has a set price, customers are able to negotiate a price suitable for them and take advantage of the farmers.

Farmers in the study area have revealed various reasons leading them to not pursuing the formal markets and other markets which might turn out to be more rewarding for them. The respondents' revealed lack of information as one of the challenge they face, wherein they lack information on available markets, grading and quality requirements in the markets, contracts and policies in various available markets. Furthermore, the farmers also highlighted the need for more support from other stakeholder within the agricultural sector such as extension officers, donors/sponsor; to improve infrastructure around the areas such as storage facilities, road networks and irrigation facilities. This will assist farmers in improving their production and attract possible new markets for their produce.

4.4 Model Results

Two models were utilised in this study, namely gross margin analysis and multiple linear regression models. The gross margin was used to calculate the profitability of sweet potato farmers, while the multiple linear regression technique was used to identify factors affecting the profitability of sweet potato enterprises. In the study area, it was revealed that sweet potato prices varied according to the measure of scale used and also in terms of the location. They were sold while measured in crates and in baskets or buckets. The baskets used as scale varied in terms of weight from 2kg to 10 kg. For the

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sweet potatoes sold in crates their price ranged from R100 to R150 per crate, whereas when sold in baskets or buckets, their price ranged from R20 to R60 per basket or bucket.

4.4.1 Gross Margin Analysis

An average gross margin was calculated to measure the profitability of the sweet potato enterprises in the Vhembe district. Calculations were made from the data collected from 78 respondents from Makhado and Thulamela local municipalities of the Vhembe district. Furthermore, the operating capital ratio was calculated in order to determine the percentage of the gross income that goes to covers the cost of production of sweet potato in the area.

Table 6: Average gross margin of sweet potato enterprises in Vhembe District

ITEMS (per ha)	VALUE (R)
Average Revenue	**R25 448.81**
Variable Costs	
Labour Cost	R6 346.36
Tractor Hire Cost	R2 518.31
Fertilizer Cost	R4 555.23
Vine Cost	R311.45
Transport Cost	R204.49
Chemical Cost	R183.03
Total Variable Cost (R)	**R14 118.87**
Gross Margin (R)	**R11 329.94**

Source: Survey 2016

Table 6 illustrates the average gross margin for sweet potato producers in the Vhembe district. The results indicate that the average gross income for the production of sweet potatoes for the 78 farmers in the study area was R25 448.81 per ha. The gross margin (GM) which was derived by subtracting the total variable cost (TVC) from the gross income (GI) was R11 329.94 per ha. This can be expressed mathematically as follows:

GI = R25 448.81

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TVC = R14 118.87

GM = GI - TVC
GM = R25 448.81 - R14 118.87
= R11 329.94

Furthermore, the operating capital ratio for the sweet potato farmers in the study area was calculated. The operating capital ratio was derived using the following formula:

OR= TOC/GI,

Where: OR= Operating Capital Ratio; TOC= Total Operating Costs; GI= Gross Income.

OR= 14118.81/25448.81
= 0.55

Therefore, the operating capital ratio calculated shows the proportion of the gross income that went to pay for the cost of production of sweet potato in the Vhembe district. From the results, the ratio indicates that the operating expenses were 55% of the gross income. This reveals that the gross income obtained from sweet potato covers all the costs incurred on the variable inputs utilised by the farmers.

Table 7: Farmers performances in relation to the gross margin

Measure against average gross margin	Frequency	Percentage (%)
Above average gross margin	27	34.6
Below average gross margin but positive	49	62.8
Below average gross margin but negative	2	2.6
TOTAL	**78**	**100**
***Average GM for 78 sweet potato farmers was R11 329.94 per ha**		
Farmer with highest gross margin per ha	**R64 286.67**	
Farmer with lowest gross margin per ha	**R-1 472.90**	

Source: Survey 2016

Table 7 reveals the analysis of sweet potato farmers' performances in relation to the average gross margin. The analysis compares the farmers' individual gross margins with the average gross margin of all 78 farmers. Therefore, the results as indicated in table 7 shows that 34.6% of the farmers had attained a gross margin greater than the

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average gross margin of R11 329.94 per ha. Moreover, a large portion of farmers attained a gross margin less than the average gross margin.

Having a gross margin less than the average gross margin does not necessarily mean the farmer is operating at a loss. In the study area, 62.8% of the respondents had a positive gross margin less than the average gross margin. This indicates their gross income was greater than the costs incurred in production. However, the remaining 2.6% of respondents had a negative gross margin, which implied that their income generated was less than the costs incurred in production, and thus operate at a loss. The farmers attributed their negative gross margins on drought, failure to purchase and apply fertilizer, and also negligence of some critical stages during production due to other commitments outside farming. Therefore, this impacted on their yield and income generated.

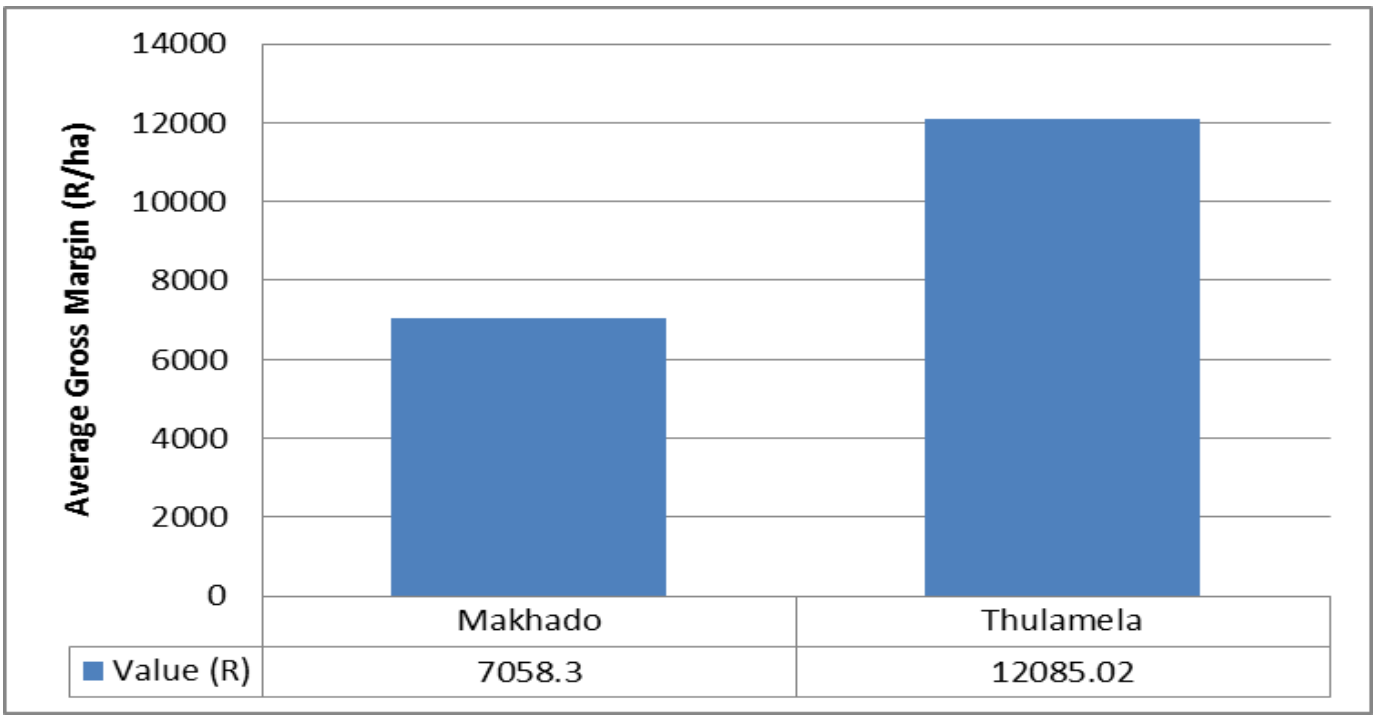

Figure 6: Average Gross Margins of Makhado and Thulamela local municipalities.

Source: Data Survey 2016

Figure 6 shows the performances of the two local municipalities of the Vhembe district, who were part of the study in terms of the average gross margin of sweet potato production. The figure shows that Thulamela local municipality sweet potato farmers

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performed better in the market, compared to farmers from Makhado local municipality. Thulamela recorded an average gross margin of R12 085.02 per ha, compared to R7 058.30 per ha of Makhado. The gross margin of Thulamela farmers is also higher than the recorded gross margin of farmers in the district which is R11 329.94 per ha. Although profitable, in comparison to the overall gross margin of farmers in the district, farmers in Makhado had a lower gross margin.

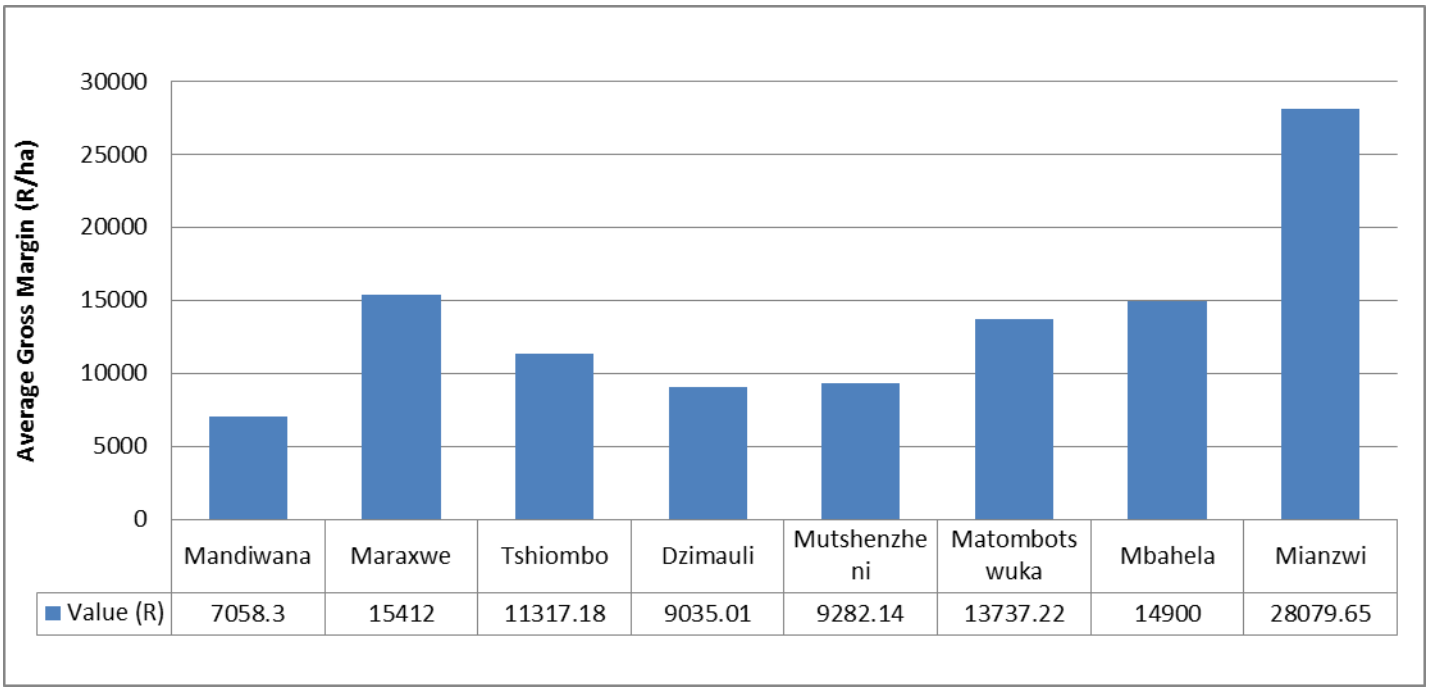

Figure 7: Average Gross Margin of sweet potato producers in the Vhembe district.

Source: Survey 2016

Farmers' performances in the market vary from village to village. This is due to different challenges that sweet potato farmers face in each village. Such challenges or factors that affected farmers' production and market performance included: relationship amongst farmers; farmers' relationship with their respective extension officers; market availability or distance to market; farmers' relationship with the community and communities' organizations.

Farmers in Mandiwana village revealed that they were mostly affected by drought which resulted in low yield attained. In Mbahela, farmers revealed that they were now less motivated due to lack of financial support and the high cost of inputs. The farmers in

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Matombotswuka revealed that lack of communication and assistance from their extension officer was a challenge to them. Moreover, those in Mianzwi listed poor relationship with the community leading to stock theft. The farmers in Maraxwe, Tshiombo, Dzimauli and Mutshenzheni revealed that they had challenges with access to water for irrigation, which is shared with communities for household use and with farmers from other communities.

Figure 7 shows the market performances of sweet potato farmers in villages which were part of the study in relation to their average gross margins. Mianzwi village recorded the highest average gross margin amongst all the villages, with the value of R28 079.65 per ha. Coming further with the second highest recording was Mbahela village, wherein farmers had an average gross margin of R14 900 per ha. The figure also shows Mandiwana village as the lowest ranked, wherein farmers had a recording of R7 058.30 per ha. Furthermore, farmers in Dzimauli, Mandiwana, Mutshenzheni and Tshiombo villages' records were lower than the overall average gross margin of sweet potato production in the study area. However, in contrast, sweet potato producers in Maraxwe, Matombotswuka, Mbahela and Mianzwi villages had recorded average gross margins which were higher than the overall average gross margin, which is R11 329.94 per ha.

Furthermore, the study has revealed that farmers in the study area participate in an informal market type. These farmers sell their sweet potatoes in their farm, while others seek alternative markets in other villages and within the district. In this study, 64.1% of the farmers sold their produce directly from their farms, whereas 35.9% went to seek available alternative markets outside their farms to sell their produce. The farmers selling within their farms had an average gross margin of R11 390.05 per ha, while those with alternative markets had an average gross margin of R11 171.73 per ha. This indicates that farmers selling sweet potatoes within their farms make more profit compared to those who sell in alternative markets. This could be due to them incurring an extra cost in the form of transport cost, or difficulty in attracting customers in those markets and low prices for their produce in those markets.

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There are various factors that affect farmers' production and income generation. Table 8, reveals some of the factors which affected the sweet potato farmers in the study area, which are the variable costs.

Table 8: Descriptive analysis of the variable costs in sweet potato production

Variable Costs for sweet potato production	Distribution per variable		Overall distribution to the variable cost
	Frequency	Percentage (%)	Percentage (%)
Labour Cost			
Yes	68	87.2	
No	10	12.8	**45**
TOTAL	**78**	**100**	
Tractor Hire Cost			
Yes	73	93.6	
No	5	6.4	**18**
TOTAL	**78**	**100**	
Fertilizer Cost			
Yes	76	97.4	
No	2	2.6	**32**
TOTAL	**78**	**100**	
Vine Cost			
Yes	15	19.2	
No	63	80.8	**2**
TOTAL	**78**	**100**	
Chemical Cost			
Yes	19	24.4	
No	59	75.6	**1**
TOTAL	**78**	**100**	
Transport Cost			
Yes	37	47.4	
No	41	52.6	**2**
TOTAL	**78**	**100**	
TOTAL			**100**

Source: Survey 2016

The analysis on table 8 offers an insight on why other farmers performed poorly in the area, and thus had a negative gross margin. The results show that labour costs constituted the highest share in costs incurred by the farmers in the area, with 45% of the variable cost being the labour cost. Furthermore, 87.2% of the respondents incurred labour cost, while 12.8% didn't incur any labour cost. This is due to the fact that some of the farmers resort to using free family labour in their farm to reduce costs of production. In the area, farmers hire manual labour for: planting, watering, weeding and harvesting sweet potatoes.

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Further analysis of table 8 reveals that, fertilizer cost and tractor hire cost constituted 32% and 18% respectively to the variable cost. In the study 93.6% of the respondents hired a tractor, and 97.4% bought fertilizers. Furthermore, 6.4% of the farmers did not incur a tractor hire cost, while 2.6% did not buy fertilizer for sweet potato production. Farmers in the area revealed that fertilizers are very expensive, hence some of them are unable to afford them or they buy few fertilizers that they manage to afford. These farmers in the study area are resource poor, and situated far from input markets. However, their production costs are sometimes reduced when extension officers assist them with free fertilizers and tractors to prepare their fields.

Transport cost and vine cost constituted 2% each of the farmers' variable cost in the study area, while chemical cost was only 1%. This indicates that farmers in the Vhembe district spend less on chemical cost, transport cost and vine cost on their sweet potato production. The respondents revealed that they use hired transport for carrying fertilizers bought from markets far away from their areas, and when transporting sweet potato to other markets. Therefore, 47.4% of the respondents incurred a transport cost. Most of the respondents also revealed that they do not buy vines, they use vines cutting from previous productions, with only 19.2% of the farmers having incurred the vines cost. Furthermore, 24.4% of the respondents incurred chemical costs for purchasing of chemicals used in sweet potato production.

Further analysis of table 8, the factors analyzed affect the production and profitability of sweet potato. In order for farmers to produce above-average yield; application of fertilizers, use of new and improved seeds, weed control and herbicides use is critically essential, whereas availability of transport influence participation in distant markets (Harb and Columba, 2010; Mutai *et al.,* 2013). Therefore, the sweet potato farmers in the area need to spend money on inputs in order to increase their yield and get transport for them to sell to other markets outside their village. The farmers revealed that replanting of sweet potato vines from previous plantation does affect their yield, and on occasion they buy new vines after replanting it 2 or 3 times. This is because they want to reduce costs associated with production and also due to difficulty of finding a

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nursery in nearby locations, and they gather money and buy together with other farmers so that they use one transport when fetching the vines.

Kassali (2011) revealed that market price and labour cost affect the farmers most, and in other cases discourage them from production. Some of the farmers in the area are not keen to venture into other markets outside their village or farm, due to uncertainty on possible income, and also because of the additional transport cost. Therefore, they prefer to sell in their farms where customers come directly to them. However, these are not the only factors that affect sweet potato production in the area. Farmers in the study area revealed other factors such as: lack of access to water; high temperatures in the area; lack of information on market opportunities or availability; lack of access to funding; lack of resources and infrastructures such as tractors, storage facilities and irrigation equipment.

In the instance of access to water, farmers have to share the already demand-strained available water resource with villagers. This is due to the areas having no water supply for household consumption, and also farmers amongst villages' structure days in which they are only able to use water on those specific days. Therefore, farmers can go for up to two or three days with no access to water for irrigation purposes, coupled with high temperatures in the area, production will be reduced and lose possible income and profit.

4.4.2 Multiple Regression Analysis

The estimates of the parameters of the multiple regression model were obtained through the use of the Statistical Package for the Social Science (SPSS Version 23). The multiple regression analysis carried for the study revealed that there is a significant relationship between sweet potato profitability and six variables. These variables are: Occupation status, farming experience, unpaid family members, labour cost, tractor hire cost, and chemical cost.

A summary of the model presented in Table 9 shows the adjusted coefficient of determination of R^2 value of 0.501. This indicates that 50.1% of the variation in the profitability of sweet potato is explained by the independent variables. Furthermore, it

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indicates that 49.9% of the variations in the profitability of sweet potato are determined by other factors not considered. The factors not considered can include climatic conditions of the area; distance to various possible markets; requirements in possible available markets' and the amount of time farmers spend in the farm or away from the farm. The results indicate that occupation status, farming experience, unpaid family members and labour cost were significant to profitability at the 1% significance level. Furthermore, tractor hire cost and chemical cost were found to be significant to profitability at the 5% significance level.

Table 9: Regression results of factors affecting sweet potato profitability

Variables	Beta (β)	t	Sig	Expected Sign
Constant		5.181	0.000**	
Occupation Status	-0.292	-3.390	0.001**	-
Farming Experience	-0.260	-3.007	0.004**	+
Training Received	0.164	1.813	0.074	+
Unpaid family Members	0.365	4.102	0.000**	+
Labour Cost	0.506	5.693	0.000**	-
Tractor Hire Cost	-0.208	-2.459	0.016*	-
Chemical Cost	-0.202	-2.444	0.017*	-
R^2= 0.547; Adjusted R^2= 0.501				
Significance level: (*)= 5%; (**)= 1%				

The results in Table 9 show that the Beta weight ranged from -0.292 to 0.506, this implies that from the six significant independent variables considered, labour cost is the most influential variable. This is denoted by the fact that labour cost has the highest value of 0.506. The results show that a unit increase in occupation status will result in a decrease of 29.2% of sweet potato profitability with all other factors held constant. This implies that profit declines as the farmer is engaged in other activities than farming. This may be due to the fact that the farmer will then have less time available for farming activities.

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The results of the study also reveal that a unit increase in farming experience will result in a decrease of 26% of profitability in the sweet potato production in the study area with all other factors held constant. This implies that profit declines as the farmer gain years of experience. This may be due to that the farmer may be reluctant to change his production method and stick to what has been working for him, and thus possibly miss out on high return cultivars and profitable markets.

The results further show that with all other factors held constant, a unit increase in training received will result in an increase of profitability by 16.4%. This implies that profit rises as the farmer undergoes training. This may be due to that the farmer gains more knowledge and skills in farming which he can use and thus increases his returns and sweet potato production profitability.

The results also show that a unit increase in unpaid family members will result in an increase of 36.5% of profitability of sweet potato enterprises with all other factors held constant. This indicates that profit rises as the farmer uses unpaid family members. This may be due to the fact that the farmer will not incur any financial cost when using family members for farming activities unlike when employing a hired labour.

The results in Table 9 show that a unit increase in labour cost will result in an increase of 50.6% of profitability in sweet potato production in the study area with all other factors held constant. Therefore, this suggests that profit rises when the farmer utilizes hired labour force. This may be due to the fact that hired labours are efficient than family labour and are more experienced in the task that they are employed for.

The results also show that a unit increase in tractor hire cost will result in a decrease of 20.8% of profitability of sweet potato with all other factors held constant. This implies that profit will decline as the farmer utilises the tractor for ploughing, ridging and discing activities. This may be due to the fact that the costs of hiring a tractor for such farming activities in the study area are very high.

The results in Table 9 further reveal that a unit increase in chemical cost will result in a decrease of 20.2% of profitability in sweet potato production with all other factors held constant. This implies that profit drops as the farmer purchases chemicals used in

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sweet potato production. This may be due to the high costs associated with purchasing the chemicals required in production.

4.5 Challenges faced by sweet potato farmers in the study area

Agriculture has potential to eradicate poverty and support rural economic development in Vhembe district, due to the district's agricultural activities and capabilities (IDP, 2012). However, there are various challenges restricting farmers in the district from fulfilling their potentials. Some of the challenges faced by the farmers include land tenure system, access to resources, lack of or poor infrastructure, and socio-economic factors

Sweet potato requires water, especially during the early stages of production. However, farmers in the Vhembe district are faced with challenges to access water for irrigation. Farmers from Makhado local municipality rely on the Nzhelele River for irrigation water, while farmers in the Thulamela local municipality rely on Mutale River for irrigation water. Moreover, these farmers employed furrow irrigation method, and had to share the water with other farmers from other villages, wherein there are only specific days in which they can have access to the water. In Thulamela, due to lack of access to water in the area, the same water channeled for irrigation is also used in the households among the villages. Therefore, there is high demand for water in the area, and a need for refurbishment of the furrows since they are old and cracked.

Access to markets, is one of the challenges encountered by the sweet potato farmers in the Vhembe district. Being poor and lacking resources, some of the farmers face challenges accessing both the input and output markets as they would like. Coupled with difficulty in accessing transport and information, these also affect their production process and potential income generation. Most farmers in the district sell their produce in the farm or farm gate, while those with cars are able to sell their sweet potatoes to other consumer in far areas, and others hire transport to access those markets.

Lack of access to capital such as funding hinder their production capabilities. Farmers in the district lack proper information of how to access such funds, while others reveal the lack of collateral as the reason for not getting the funds. Farming has become expensive and funding is required so they can access inputs, which are very expensive.

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These high input costs lead farmers to resort to cheaper means of farming, wherein other farmers do not buy seeds, fertilizers and chemicals due to their high costs.

The district being one of the poorest in the country, and farmers being resource poor, lack of mechanization and infrastructure also affect the agricultural production in the district. Farmers require machinery and implements to prepare the land like tractors, irrigating implements like sprinklers, proper roads to the farms, facilities such as a pack house are required so farmers can store their produces in bulk. However, to access some of these resources, farmers are encouraged to work in groups or as cooperatives to reduce cost associated with accessing such resources.

There are other challenges faced by farmers in the district which affect their production, such as cases of stock theft, lack of clear land status or land tenure system, lack of marketing of their produce, and unsatisfactory extension services in some areas. Due to lack of security in the farms like fencing, farmers encounter stock theft from villagers and invasion on their farms by animals. The farmers also complain about the service rendered by some of the extension officers, wherein they feel are not doing enough and do not visit their farms to offer them much needed support and motivation.

Despite all the challenges faced by the farmers in the district, there are some existing development and potential in the district to assist and improve the agricultural production. Some farmers in both Makhado and Thulamela local municipalities get assistance from their respective extension officers, wherein they are supplied with tractors to plough their fields, supplied with fertilizer, offered training to improve their knowledge and agricultural production, and farm tours to other farmers across the province and country so they can learn. There is existing water resources, which only need refurbishments in order to supply the farmers with water for irrigation. Therefore, with such support structure, potential improvements and investment, this will increase farmers' potentials to improve their production. Also, there is a need for agro-processing facilities, since the district has great potential in agricultural production. This will help farmers in having various options in terms of their output market and in increasing their production

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4.6 Discussion of results

There is a notion that sweet potato is a crop for females, which is attributed to the perception that males prefer high cash crops such as maize compared to sweet potato (Andrade *et al.,* 2009). This current study found sweet potato production in the study area to be female dominated, with 69.2% of the respondents being females. The male respondents made up the remaining 30.8%. This result on female dominance is similar with the findings by Mmasa *et al.* (2012). However, the result is in contrast to the findings by Kassali (2011), and Tiku *et al.* (2015), which revealed a male dominated sweet potato production population.

The rural-urban migration phenomena coupled with the lack of youth involvement in farming poses a huge challenge in agricultural production, since the majority of farming population is ageing (Ango *et al.,* 2014). In support of the aforementioned statement, the study revealed an ageing sweet potato producers' population in the study area, with 97.4% of the respondents over the age of 40 years old. The findings of the study on the ageing farming population are in line with those of Adewumi and Adebayo (2008), Kassali (2011), and Mmasa *et al.* (2012). It was revealed that the current generations' youth have little or no interest in working in farming or rural villages, but rather prefer lucrative employment opportunities in the cities. Further engagement with the respondents, revealed that youth in the study area are not interested in working in the farms. This is because they deem agriculture as not more rewarding and they prefer going to cities to search for more rewarding employment opportunities.

The study found that 16.7% of the respondents were illiterate, whereas 83.3% had acquired a formal education. Education is essential as it is suggested that farmers with a formal education are more likely to interpret and analyse information than those with no education. This can be more beneficial during training seminars, decision making, formal market participation and adoption of technology (Reza *et al.* 2012; Okpachu *et al.,* 2014). This result concurs with the findings by Xaba and Masuku (2013), and Chauke *et al.* (2014) who also found out that a significant percentage of smallholder farmers in South Africa is illiterate. For illiterate farmers, there is Adult Basic Education and Taining (ABET) programmes offered, wherein they can acquire a formal education.

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In a formal market, farmers' education would be very helpful. It will enable farmers to deal with and interpret the paper work and contracts required in such markets. Therefore, they will be able to make and take informed decision regarding market participation.

The sweet potato farmers in the study area revealed that lack of information, lack of transport and lack of infrastructure restricts them from participating in potentially high income return formal markets. These farmers are then confined to selling in informal markets, through farm gates and local markets. In these markets, products are bought without being graded or weighed, while the transaction is made in cash at hand. The study found that all farmers in the study area sell their produce in farm gate, while 35.9% of the respondents also sell to nearby villages and informal markets within the district. This result coincides with the findings of Mmasa *et al.* (2013), Mutai *et al.* (2013), and Ddungu *et al.* (2015) who also found that the majority of smallholder farmers are confined to informal markets due to a variety of challenges. An improvement on the transfer of information, road networks and infrastructure is required to assist and motivate farmers to participate in various markets.

Despite being involved in the informal market, the farmers in the study area recorded an average gross margin of R11 329.94 per ha. Furthermore, the farmers had an operating capital ratio of 0.55, which implies that the farmers are able to cover all their operating expenses incurred during sweet potato production. However, due to lack of resources and machinery, farmers depend on manual labour for farm activities resulting in high labour cost. Therefore, to reduce costs incurred, farmers need to be subsidized by the government and other stakeholders involved in agriculture on some of the inputs such as fertilizers, chemicals and tractor hiring. The results found in the study reveal that sweet potato production in the study area is profitable. This result on the profitability of sweet potato production concurs with the findings by Kassali (2011), Chauke *et al.* (2014), and Tiku *et al.* (2015).

Due to farmers' lack of resources in the study area, sweet potato farming requires a lot of manual labour. Labour cost constituted 45% of the cost incurred in sweet potato production. Despite the huge negative influence it has on profitability, labour cost in

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contrast to *a priori* expectations was positively signed and statistically significant at the 1% level of significance. Hired labour in comparison to family labour are always available to work on the time required, and work hard so that they are called again and also for positive reference for future employment opportunities. Therefore, this enables that critical stages during production are covered, which will improve production yield and possible income. This result implies that a unit increase in labour cost would increase sweet potato profitability by 50.6% with all other factors held constant. This may be due to the fact that hired labour is more efficient than family labour, and therefore, with all things being equal an increase in hired labour may increase returns for more profit. However, this result on labour cost contradicts with findings of Aboki and Yuguda (2012), Owombo *et al.* (2012), and Dlamini and Masuku (2013); but confirms the findings by Kassali (2011), Onoja *et al.* (2012), and Adekanye and Oyekale (2015).

Family members are a very useful and dependable source of free labour for the farmers in the study area. Since most of the activities are manually done in sweet potato production, and as a measure of reducing labour cost, farmers recruit family members for assistance and to supplement hired labour. In agreement with *a priori* expectations, unpaid family members has a positive relationship with profitability and statistically significant at the 1% level of significance. This implies that, a unit increase in unpaid family members will lead to an increase in profit by 36.5% with all other factors held constant. This result on family members as a source of labour force confirms similar findings by Onoja *et al.* (2012). However, the result contradicts the findings by Adekanye and Oyekale (2015). This was attributed to the fact that some of the family members may not be readily available in some critical production operations, and also maybe lacking experience in certain tasks they are required to perform.

The study has revealed that the sweet potato farmers in the study area have other occupations outside farming. It was revealed that not all farmers are fulltime farmers, which was also evident during the data collection process. These other occupations besides farming, determine the level of involvement and amount of time farmers have available in their farming adventures. This has an impact on the sweet potato production and hence income generated by the farmer, depending on their time available. The

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various occupations that these farmers have included; school and crèche teacher, builders, hawkers, shoe repairer, and carpenter. In conformity with *a priori* expectations, occupation status is inversely related to profitability, although statistically significant to profitability at the 1% level of significance. The result implies that a unit increase in occupation status would decrease profitability by 29.2% with all other factors held constant. This may be due to the fact that farmers engaged in other non-farming activities may not contribute much to the farm, which might lead to poor supervision and implementation of other farming activities. The result on farmers' occupation status contradicts with the findings by Kassali (2011) where other forms of employment provided a source of money for financing inputs and activities.

In contrast to *a priori* expectations, farming experience had a negative effect. However, it was found to be statistically significant to sweet potato profitability at the 1% level of significance. The result indicates that a unit increase in experience of sweet potato farmers decreases profitability by 20.6% with all other factors held constant. This result on the farmers' experience contradicts the findings by Kassali (2011), and Dlamini and Masuku (2013). However, this result on the farmers' experience is similar to findings by Ndungu *et al.* (2013), and Oluwasola and Ige (2015). This result was not expected, however various reasons could have accounted for this result in the study which could include; the farmers' reluctance in changing their production process or ways i.e. adopting new sweet potato vines/variety, venture into other markets, unwillingness to work with others or in a cooperative, and thus stick to what have been working for them. Also farmers may be weighing the economical rewards/returns of sweet potato with other crops leading to less interest or focus on sweet potato production.

The cost of hiring a tractor was third highest in the cost incurred by sweet potato producers in the study area. As expected, tractor hire cost had a negative sign, but statistically significant at the 5% level. The result suggests that profitability will decrease by 20.8% with all other factors held constant, if there is a unit increase in the tractor hire cost. This result on the cost of hiring machinery for farm activities such as a tractor is similar to the findings by Aboki and Yuguda (2013). Farmers in the study area hire tractors to plough, disc and make ridges in their farms. The cost incurred in these

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activities decreases their income and potential profit. However, in some cases, extension officers assist with the supply of tractors, which can be encouraged to help ease costs incurred by the farmers.

The study has revealed that few farmers in the study area make use of chemicals (Herbicides/Pesticides), with only 24.4% having incurred chemical cost. This result on chemical cost is similar to findings by Adewumi and Adebayo (2008), and Kassali (2011), which revealed the low level of chemical usages by sweet potato producers, which is a result of their high cost and farmers' reluctance to invest in chemicals. Furthermore, in conformity to a priori expectations, chemical cost had a negative sign, but statistically significant to profitability at the 5% level. This result indicates that a unit increase in chemical cost will lead to a decrease in profitability by 20.2% with all other factors held constant. This result on chemical cost contradicts with the findings of Zakaria *et al.* (2014), and Adekanye and Oyekale (2015). Although proper usage of the chemicals could lead to an increase in production and quality of produce, the low level of usage and high cost might lead to misuse or improper application of the chemicals. As a result, there will be less or no impact in productivity, but decrease income and profit due to their high costs.

4.7 Summary of the chapter

This chapter revealed and discussed the results of the study. The socio-economic characteristics of the farmers and the model results were discussed. The study revealed an ageing sweet potato farming population which was female dominated. In the study area, 97.4% of the respondents were over the age of 40 years old, which depicts lack of youth involvement in sweet potato farming, while females made 69.2% of the respondents. As for Education, 83.3% of the respondents had attained a formal education. None of the farmers were involved in a formal market type, they all participated in an informal market, wherein they sold their produce within their farms or searched for other consumer markets within the district. The farmers recorded an average gross margin of R11 329.94 per ha, which indicate a profitable sweet potato enterprise in the study area. However, labour cost constituted 45% of the cost incurred in sweet potato production, followed by fertilizer cost with 32%. The study further

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revealed that there were variables found to be statistically significant to sweet potato profitability, which were: Occupation status, farming experience, unpaid family labour, labour cost, tractor hire cost and chemical cost. However, occupation status, farming experience, unpaid family members, and labour cost were statistically significant to profitability at the 1% level of significance; while tractor cost hire and chemical cost were statistically significant at the 5% level of significance. Moreover, of the variable costs, labour cost and unpaid family members had a positive relationship with profitability, while occupation status, farming experience, tractor hire cost and chemical cost had a negative relationship with profitability.

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CHAPTER 5

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

In this chapter, the summary of the study is presented; conclusion and recommendations are also made with regards to the findings. Furthermore, in the chapter the hypotheses mentioned in chapter 1 are discussed.

5.2 Hypotheses Testing

Hypothesis 1 stated that: There are differences in profitability between sweet potato enterprises located in different villages. The findings revealed that farmers in the 8 villages had recorded different profits in comparison to each village. Farmers in Mianzwi, Maraxwe, Mbahela and Matombotswuka recorded a profit of R28 079.65, R15 412, R14 900 and R13 737.32 respectively; while farmers from Tshiombo, Mutshenzheni, Dzimauli and Mandiwana recorded a profit of R11 317, R9 282.14, R9035.01 and R7058.3 respectively. Therefore, the finding of the study accepts the first hypothesis

Hypothesis 2 stated that: Socio-economic factors affect profitability of sweet potato enterprise. The results of the study revealed seven factors that were found to have an effect on the profitability. The factors are occupation status, farming experience, unpaid family members, labour cost, tractor hire cost, chemical cost and training cost. Therefore, the finding of the study accepts the second hypothesis.

Hypothesis 3 stated that: There are differences in profitability between markets utilised by sweet potato enterprises. The study revealed that farmers in the study area participated in one market, which was an informal market. Although farmers in the area sold in different ways, others sold only in their farms, while others also extended to selling in nearby communities, they all participated in an informal market. Therefore, the findings of the study were inconclusive in the attempt to test the third hypothesis, since farmers only participated in an informal market.

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Hypothesis 4 stated that: There are a few marketing channels available in Limpopo province. The findings of the study revealed that farmers in the area only had an informal market, wherein they sold their produce in their farm gates. Furthermore, other farms sold their produce in neighboring communities' to residents and hawkers. Therefore, the farmers had only an informal market channel as their option to sell their produce. Therefore, the finding of this study accepts the fourth hypothesis.

5.3 Summary

The study was conducted in Makhado and Thulamela local municipalities of the Vhembe district, which is located in Limpopo province. The main objective of the study was to assess the economic viability of sweet potato production enterprises. The specific objectives of the study were: to identify marketing channels employed by the sweet potato enterprises; to identify factors affecting the profitability of sweet potato enterprises; to determine differences in the sweet potato markets and their effect on profitability; and to determine the profitability of sweet potato enterprises located in different villages in Limpopo province.

Data was collected from 78 sweet potato farmers in the study area. Sweet potato farmers who were active participants of the market were targeted and interviewed in the study area. The data was collected through an administration of a structured questionnaire in a face-to-face interview with each farmer. A gross margin analysis model was used to determine the profitability of the sweet potato farmers. Moreover, an operating capital ratio was calculated to determine the value of gross income that was used to cover the cost of production. A multiple regression model was also adopted to analyse the factors that affect the sweet potato profitability of these enterprises.

The farmers in the study area had an average land size of 1.2 ha, however, the farmer with the largest land size had a 4.5 ha plot. Furthermore, farmers in the study area had a sweet potato production rate of 8.01 tons/ha. Farming was a major source of income for the majority of the respondents, with 46.2% mainly depending on farming. Household members were a great source of free labour, 57.7% had a household size of between 1-5 members, while 42.3% had a household size of over 5 members.

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The socio-economic characteristics of the farmers revealed that females made up 69.2% of the farmers, with 50% of the farmers being above the age of 60 years old. Furthermore, 16.7% of the respondents were illiterate and thus had never attended school. The study also revealed that 33.3% of the respondents were pensioners, and 1.3% was permanently employed. Furthermore, 24.4% had never received any form of agricultural training.

The farmers in the study area participated in an informal market. None of the respondents was involved in a formal market, which they blamed on the lack of information and support. The farmers sold their produce directly to consumers from their farms; however, others had alternative markets outside the farms and sold around villages in the district. Moreover, there was no value addition, since the sweet potatoes were sold unwashed. Only 35.9% of the farmers had an alternative market and thus incurred an additional cost in a transportation cost.

The study revealed that the sweet potato farmers in the study area recorded an average gross margin of R11 329.94 per ha, which indicates a profitable sweet potato enterprise in the study area. Moreover, the operating capital ratio was 0.55, implying that 55% of the gross income covers the cost incurred, while the remaining 45% can be invested back on the farm or for household usage. Labour cost, fertilizer cost and tractor hire cost were the highest cost incurred by the farmers; contributing 45%, 32% and 18% of the variable cost respectively. Furthermore, 2.6% of the respondents recorded a negative gross margin, while 97.4% had a positive gross margin and thus attain a profit.

The farmers in Thulamela local municipality performed well in the market compared to farmers in Makhado local municipality. In Thulamela, farmers recorded an average gross margin of R12 085.02 per ha, while those in Makhado had R7 058.30 per ha. Therefore, in the Vhembe district, sweet potato production is more profitable in Thulamela local municipality. Furthermore, farmers selling their produce only within their farms were more profitable than those with another alternative market. This could be attributed to an additional transport cost incurred by those farmers with another alternative market. Farmers selling within their farms recorded an average gross margin

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of R11 390.05 per ha, which is higher than that of those with an alternative market who recorded R11 171.73 per ha.

The study further revealed variables which were statistically significant to sweet potato farmers' profitability. The significant variables are: occupation status, farming experience, unpaid family members, labour cost, tractor hire cost, and chemical cost. Furthermore, occupation status and farming experience were negatively signed and statistically significant at the 1% level of significance, while while tractor hire cost and chemical cost were also negatively signed but statistically significant to profitability at the 5% level of significance. Moreover, unpaid family members and labour cost had a positive sign and statistically significant to profitability at the 1% level of significance.

5.4 Conclusion

Sweet potato production in the Vhembe district is profitable. The farmers recorded an average gross margin of R11 329.94 per ha, which shows that sweet potato production is profitable. This was further supported by the operating capital ratio of 0.55, which indicates a portion of the gross income that goes to pay the cost incurred, which was 55%. Moreover, it does again show that farmers in the study area had 45% of their gross income to invest in the farm or to improve their livelihood.

The findings from the study revealed that an average gross margin of R11 329.94 per ha was recorded by the farmers in the study area. Furthermore, the study revealed that farmers who sold their produce within their farms had an average gross margin of R11 390.05 per ha, while those with an alternative market recorded R11 171.73 per ha. This shows that although farmers were confined to few market opportunities, they were still able to record a positive gross margin.

One of the findings of the study was that there are a few marketing channels available in Limpopo province. Furthermore, the study revealed various factors which affected profitability, and therefore, supports the hypothesis that there are socio-economic factors affecting the profitability of sweet potato enterprises. Again the study found that all farmers in the study were participants of an informal market channel. The study

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found that there are differences in profitability between sweet potato enterprises located in different villages of the study area.

There were various factors which need attention, which were also a constraint to sweet potato farmers in the Vhembe district. The farmers revealed various challenges that hinder their production, marketing and potential income, which includes:

- Lack of access to water, due to depleted and demand-strained water resources.
- Lack of information on available and potential market opportunities.
- Lack of proper relief and support programmes from natural causes such as drought, hail and floods.
- High input cost such as costs for fertilizers, tractor hire, chemicals and seeds/vines.
- Unsatisfactory extension services and trainings provided.
- Difficulties in accessing and attracting funds and sponsors.
- Lack of security, sanitary areas and stock theft in the farms.
- Poor access to resources and infrastructure such as road networks, tractors, and storage facilities.

5.5 Recommendations

Sweet potato farmers in the study area were smallholder farmers; and they are faced with a variety of challenges that need urgent attention to assist and motivate them, to improve their production, profitability and their livelihood.

Water is an essential element in agricultural production, and thus access to water for farmers remains a priority. However, farmers in the study area are faced with challenges in accessing water and have to share water resources initially set up for farming, with the communities for household usage. Therefore, the study recommends the repairs and improvement of available water resources to ensure availability of water for agricultural production. Thus, stakeholders involved in agriculture and community development such as the department of agriculture; department of water and sanitation;

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public works; and others in the public and private sector need to provide the community with water for household consumption, and also repair the damaged agricultural irrigation schemes available in the study area. Furthermore, they can also introduce new and various water saving irrigation method to the farmers.

Farmers in the study revealed constant contact with extension officers; however, they explained that extension officers do not or hardly visit their farms. Therefore, the study recommends the review of the extension services offered in the study area. The public departments such as the department of agriculture; department of rural development; department of education; and other private training institutes can offer compulsory extension services revitalization progammes to the extension officers. These programmes will impact more knowledge and skills to the extension officers, and hence motivate them, and improve their working relationship with farmers.

The study further recommends a review on training programmes offered to farmers. The farmers in the area require trainings that will motivate them to be self-dependent and revive their roles as farmers. This is due to that most farmers reveal that they are no longer motivated to continue with farming and solely wait on government for handouts. Therefore, stakeholders involved in agriculture such as the department of agriculture; department of rural development; National Agricultural Marketing Council; national fresh produce markets; and others in the public and private sector should implement and offer trainings to meet the farmer's needs. Such trainings must show farmers ways and options of acquiring funding, the importance of financial management, how and where to source various inputs, how and where to market their produce, and on working with each other as farmers.

The study shows that there is no value addition performed by the farmers before they sell their produce. This then restricts the farmers from reaching to other markets and only confines them to few marketing channels. Therefore, the study recommends agro-processing trainings for the farmers. The stakeholder involved in agriculture such as the department of agriculture; department of rural development; national fresh produce markets; retailers; and others in the public and private sector should provide farmers

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with these trainings. This will enable farmers to have the advantage of having various marketing channel opportunities and avoid loss of potential income through produce spoilage and forced low price sales.

Farmers in the study area also cited challenges of lack of infrastructure such as better road networks and storage facilities, and also of stock theft. Therefore, the study recommends that the stakeholders within the agricultural sector and community such as department of agriculture; department of rural development; department of public works; and others in public and private sectors to address the said issues, since they affect the farmers' production, market participation and potential income generation opportunities. This will assist farmers as their farms will be easily accessible by potential customers, there will be security, and they will also be able to produce in bulk as they will have storage facilities.

In conclusion, the study has found sweet potato production in the Vhembe district viable. Therefore, the recommendations of this study need to be implemented to improve the farmers and farming status in the study area.

5.6 Areas of further study

The study has identified certain areas which need attention for further study in order to improve agriculture in rural areas. There is a need for a study in areas where farmers have access to both the formal and informal markets, so that the study can address the differences in these markets and their benefits to farmers.

Furthermore, the study has identified a need for a study to address the trainings offered to farmers in various areas. Such trainings should seek to identify trainings that farmers can be offered in their respective areas, taking into account the available resources and specific challenges in their areas.

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APPENDIX A: QUESTIONAIRE

This questionnaire is made in line with the research project of Mr. Libago Khuliso, for his Master research programme (MSc Agricultural Economics) registered with the University of Venda, student NO: 11580559. The questions to be asked and your responses are to be used only for the research project, and will be dealt in a state of anonymity. At no time will your information be made public or available to anyone other than for this project. Your right to not answer some of the questions you feel not comfortable with answering will be respected. Thank you.

Interviewer's Name	
Contact Details	
Local Municipality	
Village Name	
Date of interview	
Questionnaire number	

DEMOGRAPHIC PROFILE

1. Household position		2. Gender		3. Age	4. Household Size
Head		Male			
Spouse		Female			
Child					
Others:					

5. Education attained		6. Occupational status		7. Main source of income & according to rank	8. Number of Years in farming (Experience)
Never Attended		Permanently employed			
Primary Level		Contract worker			
Secondary Level		Casual/Piece jobs			9. Years in Sweet Potato Production
Tertiary		Others:			
Others:					

PRODUCTION MANAGEMENT STRUCTURE

10. Size of the farm (ha)	11. Size of land under sweet potato production (ha)	12. Land tenure system of land in use		13. Production process involved in	
		Communal		Vine growing	
		Rented/Leased		Sweet potato production	
		Privately owned		Both	
		Others:			

14. Production time/season	
Summer only	
Winter only	

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Both Summer and Winter			

15. Do you have a business plan for your farming operation?	
Yes	
No	

PRODUCTION SCHEDULE

16. Months sweet potato planted	17. Area planted (ha)	18. Sweet potato variety planted	19. Months harvested

20. Indicate the type of employment and number of employees working in your farm:				
Type of employment	Full-time employees	Part-time employees	Unpaid family members	TOTAL

21. Household members involved in farming activity						
Household members' position	Gender	Age	Education attained	Role in the farm	Main economic activity	Experience in farming (years)

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22. Type of training received		23. Contact with extension officers (in a year)		24. Are you a member of any organization?	
Never been trained		No visit		Yes	
Technical training		1-2 times		No	
Business management training		3-4 times			
Coaching & mentoring training		5 times and more			
Others:					

25. If yes to Q.24, name the organization and list the benefits from the organization

26. Table of satisfaction levels from the services offered					
Extension services		Organizations' benefits and work		Training received	
1		1		1	
2		2		2	
3		3		3	
4		4		4	
5		5		5	

1-Very satisfied; 2-Satisfied; 3-Neutral; 4-Dissatisfied; 5-Completely dissatisfied

27. Additional input or comments on service provided		
Extension services	Organizations	Training received and provision

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28. Area under irrigation (ha)	29. Source of irrigation water

30. Have you ever received a loan?		31. List sources of finance for farming activities, from main to least
Yes		
No		

32. Table of inputs sourcing information				
Inputs	Quantity	Cost	Total cost	Place of purchase
Fertilizers				
Vines				
Chemicals (i.e. fungicides, pesticides etc)				

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33. Additional costs associated with farming practice and marketing	
Services	Cost of service
Labour costs (working hrs and cost/hr)	
Transportation costs	
Interest paid on loan	

34. Do you have access to own car, utilised for farming activities?	
Yes	
No	

35. The scale and distribution of sweet potato produced and harvested (tones/bags)		
Total Harvested (tones/bags)	Home consumption	Sweet potato sold in market

36. Output markets utilised by producers (local communities, local markets/hawkers, retailers, national fresh produce markets (NFPMs), etc				
Output market type	Prices at the market (i.e. R/ton, R/Kg etc)	Amount sold through the market (i.e. tons, bags)	Total Income received from the sales (in Rands)	Reasons for market use/preference

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37. Quality and Marketing requirements from preferred markets (i.e. grading/packaging etc.)	38. Means and period of marketing produce (how do your customers know about your produce?)

39. Sweet potato varieties and their market performance		
Cultivar	Market/consumer's preference (from most preferred to least)	Price allocation for cultivar type

1=Most preferred/best selling; 2=Neutral; 3=Least preferred/low sales

40. Preferred or utilised market information			
Market	Distance (or location of market)	Transport arrangement (i.e. own transport, hired etc)	Price setters (i.e. own price settings, market set price, negotiate for price etc)

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41. List the source of market availability information

42. State your five biggest challenges starting with most challenging one to the least challenging

The End……. Thank you for your time

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APPENDIX B: Table of results from SPSS

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.739[a]	.547	.501	7486.0607	.547	12.058	7	70	.000

a. Predictors: (Constant), Chemical Cost, Total Labour Cost, Total Tractor Hiring Cost, Occupation status, Number of Unpaid family members, Number of years in farming (experience), Type of training received

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4730235685.352	7	675747955.050	12.058	.000[b]
	Residual	3922877388.343	70	56041105.548		
	Total	8653113073.695	77			

a. Dependent Variable: Profit attained

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b. Predictors: (Constant), Chemical Cost, Total Labour Cost, Total Tractor Hiring Cost, Occupation status, Number of Unpaid family members, Number of years in farming (experience), Type of training received

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	34062.212	6573.831		5.181	.000	20951.118	47173.305
	Occupation status	-3816.245	1125.880	-.292	-3.390	.001	-6061.742	-1570.748
	Number of years in farming (experience)	-4352.284	1447.621	-.260	-3.007	.004	-7239.474	-1465.095
	Number of Unpaid family members	1960.789	478.062	.365	4.102	.000	1007.325	2914.254
	Type of training received	1336.182	736.801	.164	1.813	.074	-133.321	2805.685
	Total Labour Cost	1.558	.274	.506	5.693	.000	1.012	2.104
	Total Tractor Hiring Cost	-2.620	1.065	-.208	-2.459	.016	-4.745	-.495
	Chemical Cost	-5.228	2.139	-.202	-2.444	.017	-9.493	-.962

a. Dependent Variable: Profit attained

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