Factors influencing production and market participation among smallholder tomato farmers in Madibong and Manganeng Villages, Makhuduthamaga Municipality in Greater Sekhukhune District

by

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DECLARATION

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

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ABSTRACT

The agricultural sector in the Limpopo Province, comprises both commercial and subsistence farming. The smallholder farmers in the province are mainly producing for subsistence purposes and play an important role in poverty alleviation and livelihood creation. These smallholder farmers produce lower quantities of products that are also of low quality. Consequently, their products are rejected in the markets and by processors, and this affects the extent to which they participate in the market. This presents a challenge since the smallholder farming is highly labour intensive and represent the main source of income-generating occupations and a source of economic relief for the majority of people residing in the former homeland areas of the Limpopo Province.

This study examined the factors influencing production and market participation among smallholder tomato farmers in Madibong and Manganeng Villages, at Makhuduthamaga Municipality in Greater Sekhukhune District, using the Multiple Linear and the Logistic Regression Models. The Multiple Linear Regression Model was used to analyse the socio-economic factors influencing tomato production among smallholder farmers in the study area. The results of the model indicated that extension access, fertiliser application, marital status, use of agricultural equipment and income from production output significantly influence tomato production among smallholder farmers.

The Logistic Regression Model was used to analyse the socio-economic factors influencing market participation among smallholder tomato farmers in the study area. The Logistic Regression results indicated that factors such as educational level, gender of the farmer, farming experience, marital status, and farm size positively and significantly influence market participation while market distance negatively influences market participation among smallholder tomato farmers in the study area.

Based on the findings of the study, it is recommended that the local municipality invest more in rural adult education in order for the farmers to adopt new farming skills and utilise the market information provided. In addition, the investment in adult education has the potential to contribute to rural development and job creation in the study area. The study recommends that there should be a comprehensive producer support such

as input subsidies, that focuses primarily on subsidising smallholder farmers when purchasing production input such as fertilisers and pesticides.

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CHAPTER 1: INTRODUCTION

1.1. Background

The agricultural sector plays an indispensable part in the livelihoods of the poorest households, mainly, because it is a primary source of income for the rural population and contributes to foreign exchange earnings for Southern African economies [Southern Africa (SAT) and Institute for Democratic Alternatives in South Africa (IDASA), 2011]. Agriculture forms a significant portion of the economies of all African countries and contributes to African priorities such as eradicating poverty and hunger, boosting intra-Africa-trade, investment, economic transformation, creating jobs, and providing food security (National Department of Agriculture (NDA), 2012).

Furthermore, the agricultural sector is crucial for economic growth and contributes one-third of the world's Gross Domestic Product (GDP) (International Fund for Agricultural Development (IFAD), 2013). The agricultural sector is also the most important source of income, employment, food security and livelihoods across the world (NDA, 2012). For example, agriculture contributes 30% of the African continent's GDP and contributes 60% of employment in the Sub-Saharan African region (IFAD, 2013). According to the International Labour Organisation (2007), agriculture provides 70% of the world's workforce and 36% of people's livelihoods around the world. Thus, in developing countries, agriculture is the backbone of rural economies (Development Bank of Southern Africa, 2007).

Seventy-eight percent of the world population, who live in rural areas, depend on agriculture (IFAD, 2013). For this reason, the commercial agricultural sector contributes significantly to agricultural-based economies and plays an important role in the economies of many countries in Africa (Pinder and Wood, 2003). Thus, the sector contributes to the GDP of these countries through national exports, domestic purchase of inputs such as fertilisers, seeds, and machinery, as well as the provision of employment.

In South Africa, agriculture is a dualistic sector that constituting a majority of white commercial farmers who are market players and the smallholder sector which comprises a majority of black farmers who struggle to participate in the markets (Ngemntu, 2010). Production in the smallholder sector is mainly for subsistence purposes and to a lesser extent, marketable surplus (NDA, 2012). According to

Ramoroka (2012), the Millennium Project Hunger Task Force of 2004 asserted that smallholder agriculture is the main source of food for the rural population as well as an income-generating occupation because it is the main activity for many rural parts in developing countries. The significant role of smallholder agricultural productivity cannot be ignored or treated as a small adjusting sector in the market economy as the sector plays a crucial role in poverty and hunger alleviation (Delgado et al., 1998).

The agricultural sector in the Greater Sekhukhune District of the Limpopo Province consists of both commercial and subsistence farming with Ephraim Mogale and Elias Motsoaledi Local Municipalities, housing one of the largest clusters of commercial farming in the country (District Rural Development Plan, 2016). Despite the agricultural sector being one of the greatest contributors to employment within the district, it remains a marginal contributor to the GGP (Gross Geographic Product) at approximately 9.7% (District Rural Development Plan, 2016).

Oni et al. (2018) indicated that Greater Sekhukhune District's contribution to the provincial agricultural GGP was less than 1%, suggesting that the district has a low potential for agricultural investments and growths. However, agriculture remains a highly labour intensive sector, and a source of economic relief from poverty for the majority of people residing in rural areas in the Limpopo Province (Masegela, 2019). Thus, people involved in agricultural practices in the Greater Sekhukhune District are farmers trying to earn a living from the production of livestock, broilers, fruits and vegetables, and cereals.

1.2.   Problem statement

Tomato is one of the vegetables that ensure food security within households and the Limpopo Province is the major production area that accounts for more than 75% of the total area where tomatoes are planted in South Africa (DAFF, 2014). Although the Limpopo Province is the major producer of tomato, smallholder farmers in the villages are unable to produce high quantities of tomatoes and their production is very low to an extent that they produce only for consumption (Mogale, 2015). Due to a low production output, the smallholder farmers are now reluctant to participate in the market because of their incapability of producing a high quality and quantity of tomatoes, and this is a clear indication of the hindrance of the community's development (Segage et al., 2018).

Smallholder farmers in the Greater Sekhukhune District are finding it difficult to obtain high crop yields due to low and unreliable rainfall (Mpandeli et al., 2015). For instance, the farmers in Madibong and Manganeng villages are practicing a mono-cultural farming system, with low production evident in most cases, causing a reduction in production. Reduction in production is usually caused by factors such as insects and crop diseases (Mogale, 2015). According to Eltoum (2008), factors such as land preparation cost, clearing weeds cost, fertiliser quantity, and the number of labourers also affect tomato production by smallholder farmers. Production of agricultural commodities is also influenced by socio-economic characteristics, attributes, and the location where the smallholder farmers are based (Segage et al., 2018).

Smallholder farmers depend on the production of agricultural commodities for sustainable livelihood even though agricultural policies and market conditions are not making it easy (Segage et al., 2018). For instance, the extent to which smallholder farmers participate in the market depends on the location, socio-economic and institutional factors (Baloyi, 2010). Although research has been done on commodities such as groundnuts (Segage et al., 2018; Mogale, 2015), limited or no research has been done on tomato in particular and or on how smallholder tomato farmers can produce sufficient quantity to allow them to participate in the market. This study, therefore, attempts to investigate factors influencing the production and market participation of smallholder tomato farmers in Madibong and Manganeng Villages in the Greater Sekhukhune District of the Limpopo Province.

1.3. Motivation of the study

Smallholder farmers in the Limpopo Province play an important role in poverty alleviation and livelihood creation even though their production is extremely low. DAFF (2012) indicates that smallholder farmers are characterised by the use of out-dated technology, low returns, and high seasonal labour fluctuations, which are dictating the productivity of farmers in the rural areas. The declining agricultural productivity has been a major cause of poverty among the rural population (Intergovernmental Panel of Climate Change (IPCC), 2007). If there is a decline in agricultural productivity, market access will be affected because the quality and quantity of the produce by smallholder farmers determine their accessibility to the market (Rangoato, 2018). Although the availability of emerging markets offers high returns, those markets are

sometimes accompanied by various risks. This is because agricultural productivity highly depends on weather conditions that are caused by climate change (IPCC, 2007).

Smallholder farmers in South Africa are situated in the former homelands where lack of infrastructures limits their expansion. For example, infrastructural challenges such as the lack of proper roads hinder farmers from transporting their inputs and produce. According to Rangaoto (2018), even where the government intervenes by offering subsidies, their major focus is on the commercial farmers who can give greater returns. Smallholder farmers are being undermined in most African countries because they operate in a small area of land, lack investments and institutional supports, while commercial farmers receive subsidies to enhance their productivity (Delgado et al., 1998).

Marketing and financial skills are some of the issues of concern when it comes to smallholder farmers because most of them lack those skills (Mathagu, 2016). This results in farmers being unable to meet the quality standards set by the markets and food processors. When farmers do not have knowledge on the product, they end up producing lower quality products. The majority of smallholder farmers produce lower quantities of products that are of poor quality, and this lead markets and processors to reject their products (DAFF, 2012).

For the smallholder farmers to produce for the market, they need resources such as land, water, on-farm and off-farm infrastructures, labour force, capital, and a good management of these resources. Lack of or poor access to these resources will affect how smallholder farmers can benefit from the opportunities in the agricultural market as this hampers the quantity and quality of their products (Baloyi, 2010).

According to Mathagu (2016), the policies that are now in place in South Africa are not commodity-based. Hence, this study hypothesises that this is also the case for production and market participation of smallholder tomato farmers. The study will contribute to the body of knowledge that may form the basis for a commodity-based policy that will enable smallholder tomato farmers to produce and participate in local and international markets. Given that tomato is one of the important vegetables grown by smallholder farmers in Makhuduthamaga Municipality, a specific and targeted policy will ensure that tomato production and marketing by smallholder farmers yields

food security and poverty alleviation through income generation. Therefore, a study of this nature is necessary and needs to be conducted.

1.4. Scope of the study

1.4.1. Aim

The study aimed to analyse the factors influencing the production and market participation of smallholder tomato farmers in Madibong and Manganeng Villages, Makhuduthamaga Municipality in Greater Sekhukhune District of the Limpopo Province.

1.4.2. Objectives

The specific objectives of the study were to:

I. Identify and describe the socio-economic characteristics of smallholder tomato farmers in the study area.
II. Analyse the factors influencing tomato production among smallholder tomato farmers in the study area.
III. Analyse the socio-economic factors influencing market participation among smallholder tomato farmers in the area.

1.4.3. Hypothesis

I. Socio-economic factors do not influence production among the smallholder tomato farmers in the study area.
II. Socio-economic factors do not influence market participation among smallholder tomato farmers in the study area.

1.5. Organisational Structure

This study is divided into four chapters: Chapter 2 which presents the literature review which includes definitions of the key concepts, a review of literature related to this study from previous studies, and a summary of the literature review. Chapter 3 describes the area in which the study was conducted, data collection and analysis techniques used to conduct the study. Chapter 4 provides the results of the empirical analysis. Lastly, Chapter 5 provides the summary of the study, conclusion as well as policy recommendations.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

This chapter begins by defining important concepts of the study and ends with a review of previous studies conducted on topics related to the present study. This chapter also provides an overview of the factors influencing production and market participation identified by other researchers.

2.2. Definition of Key Concepts

2.2.1. Tomato Production

Tomato is a winter season plant that grows under a wide range of climatic and soil conditions since it is resistant to heat and drought. It usually requires 3 to 4 months of seeding to produce the first ripe fruit (Machele, 1996).

2.2.2. Smallholder farmer

A smallholder farmer is a producer who consistently markets a surplus but does not necessarily regard agriculture as a full-time activity or as the only source of income (Cousins and Scoones, 2010). DAFF (2012) defines smallholder farmers in terms of the endowment of their limited resources relative to other farmers in the agricultural sector and indicates that they grow subsistence crops and one or two cash crops relying almost exclusively on family labour. This study defines smallholder farmers according to DAFF's (2012) definition, precisely because of its encapsulation of limited resources endowment to farmers as relative to other farmers in the agricultural sector.

2.2.3. Market participation

Selowa et al. (2015) define market participation as the ability of the farmers to sell their produce to formal agricultural output markets. Market participation occurs when a farmer can generate profit by exchanging his/her produce in the markets (Manokoana, 2017). Agricultural market participation is defined as the integration of smallholder farmers into the input and output markets of agricultural products to increase their income level, thus reducing poverty as well as improving livelihoods (Gani and Adeoti, 2011). For the purpose of this study, market participation is defined as the ability of

smallholder tomato farmers to sell 30% of their tomato output in the formal and informal market in 2019/2020. According to Selopyane (2014), the majority of smallholder farmers have 0.5 to 5 hectares of land size, therefore, selling 30% of their output would mean that the farmers are able to sustain production while participating in the market.

2.3. Review of Previous Studies

Tomato as a crop has an enormous economic market and health potential that could contribute significantly to the viability and sustainability of rural economy. Put succinctly, tomato production plays a crucial role in the generation of income, wellbeing and diet of smallholder farmers (Eltoum, 2008). Thus, tomato is an important vegetable with a wide range of reported nutritional and health benefits (Dorais et al., 2008). Asgedom et al. (2011) indicate that tomato is in high demand compared to other vegetables, and this suggests that the market for tomato is generally very good. However, the seasonal nature of tomato production is considered a bottleneck that hampers year-round availability. Tomato crops are planted at the offset of the frost period and harvested before the rainy season comes. Tomato is therefore abundant for a limited period and are scarce during the period between the harvest and the coming season. Farmers suffer from the seasonal nature of the production because many farmers produce tomato at a specific time and the market is saturated with tomato (Masunga, 2014).

Tomato Production Worldwide

Tomato is one of the leading vegetable crops worldwide and its production industry, worldwide, is estimated at 161 793 834 tons per year with the productivity of 33.6 tons per hectare (Food and Agriculture Organisation (FAO), 2012). This implies that the crop has the potential for development to high-value crop. Tomato was first domesticated and cultivated in central America by an early Indian civilisation of Mexico when the Spanish explorers introduced tomato in Spain, and was later taken to Morocco, Turkey and Italy (DAFF, 2012).

In 2012, more than 4.8 million hectares were dedicated by the world to tomato cultivation which resulted in the total production yield of 161.8 million tons where the average farm yield was 33.6 million tons per hectare (FAO, 2014). During the year 2012, tomato farms in the Netherlands were highly productive with an average of 476

million tons per hectare, followed by Belgium with 463 million tons and Iceland with 429 million tons per hectare (FAO, 2014). The total production of tomato, at a global level, increased from 161.8 million tons in 2012 to 170.8 million tons in 2014. The major producers during the period 2012 and 2014 were farmers in China, India, the United States of America, and Turkey (FAO, 2015).

Tomato Production in South Africa

Tomato is the second most important vegetable commodity after potatoes, planted to about 6 000 hectares and contribute about 24% of the total vegetable production in South Africa (DAFF, 2014). In South Africa, tomato is produced during summer and winter in frost-free areas, and their production is concentrated in Limpopo, the Mpumalanga Low-veld and Middle-veld, the Pongola area of Kwazulu-Natal, the southern parts of the Eastern Cape, and the Western Cape, respectively (DAFF, 2014).

Tomato Production in Limpopo Province

The Limpopo Province is the major production area of tomato, with more than 75% of the total area devoted to the production of tomato (DAFF, 2012). The province is a major tomato growing region in South Africa, producing 66% of the total annual tonnage of tomato (Tshiala, 2014). ZZ2 is the dominant commercial tomato producer in the Limpopo Province and produces about 160 000 tons of tomato annually. Moreover, ZZ2 dominated the local tomato industry with its 32% market share in 2011 (FAO, 2015). Although the Limpopo Province is the major producer of tomato, smallholder farmers in Limpopo villages are unable to produce larger quantities of tomato because their production is extremely low to an extent that they produce only for consumption (Selopyane, 2014).

Factors Influencing Production

Tomato yield and quality are a function of several possible factors, namely: climate, soil, cultivar, management, pest and disease control, plant nutrition and irrigation. Although the aforementioned factors are generally known to influence tomato yield and can be reviewed in isolation, tomato yield, is essentially influenced by a complex combination of these factors (Malherbe, 2016). According to Eltoum (2008), tomato

production in Khartoum State was influenced by land preparation cost, clearing weed, number of labourers, fertiliser quantity, pesticides cost and the expected profits.

Al-Shadiadeh et al. (2012) state that the socio-economic and institutional factors are known to influence agricultural productivity among smallholder farmers in terms of the quantity and quality of agricultural produce. Altarawneh et al. (2012) Further indicated that the influential degree of socio-economic and institutional factors depends on the type of crop and its associated production technologies. Factors such as age, labour availability, farm size, income, household size, marital status, educational level and farming experience, according to Masunga (2014), are the socio-economic and institutional factors that highly influence tomato productivity amongst smallholder farmers. According to Wachira (2012), institutional factors that influence crop production include farmers' access to extension services, credit and market access, mass media and farmers organisation whereas for Altarawneh et al. (2012), the socio-economic factors that influence agricultural productivity include age, gender, level of education, sizes of farms, farmers' income, sizes of households, sources of information, extension service, markets, farmers' organisations and financial services.

Bizoza (2005) indicates that there is a positive relationship between socio-economic characteristics and household production wherein, the cultivated production area, liquidity, family size, and age of the household head significantly increase the use of operating inputs, which in turn positively impact the production yield. Rangoato (2018) indicates that elasticities of market access, farm experience, fertilizers, capital and membership to association(s) are the determinants of productivity among smallholder farmers. Although Al-Shadiadeh et al. (2012) and Altarawneh et al. (2012) indicate that socio-economic and institutional factors influence production, Usman et al. (2013) assert that the two main socio-economic factors affecting production are lack of capital, and extension services. Moreover, the major socio-economic factors influencing production are age, annual income and household size (Ani et al., 2013).

Tomato Production Constraints

Biotic and abiotic factors are the constraints that farmers face during crop production, and tomato production, like any other vegetable, is also constrained by biotic factors such as lack of improved seeds, pest and diseases and the abiotic factors which include drought, markets, input supply and soil nutrients (Anang et al., 2013). Maerere

et al. (2006) assert that the critical challenges in tomato production faced by farmers are biotic factors, namely; pest and diseases.

According to Robinson and Kolayalli (2010), constraints hampering the production of tomato in Africa include pest and diseases, low quality and insufficient quantity of tomato produced against competition from imports. Nouhoheflin et al. (2007) also indicate that pests and diseases caused by bacteria, nematodes, fungi and viruses cause significant losses of tomato in West Africa. Furthermore, farmers are constrained by many factors during production, such as soil fertility, small lands areas and lack of access to modem inputs (seed, lime and fertilisers). Moreover, land degradation in the form of soil erosion, soil acidity and nutrients depletion undermine soil productivity which leads to poor crop yields (Bizoza, 2005).

Arah (2015) indicates that there are on-farm and off-farm post-harvest challenges that are faced by producers, processors, distributors, retailers as well as exporters of tomato. These challenges affect tomato production and the consequent profitability. On-farm challenges include improper harvesting stages and or periods, excessive field heat, improper harvesting containers, poor farm sanitation and improper packaging materials. Off-farm challenges can include lack of access or bad roads leading to production fields, inappropriate transportation systems, lack of processing factories, lack of effective storage facilities, lack of market information and reliable markets.

Tomato Market Structure

In developing countries, markets are the main drivers of smallholder farmers since they allow the farmers to participate in local, national, and international economics to generate economic development and reduce poverty through income generated from sales (Oni et al., 2018). In South Africa, the National Fresh Produce Markets (NFPMs) remains an important market channel for the sale of tomato and their prices are used in all national tomato sales (DAFF, 2017). The major markets of tomato include the Johannesburg Fresh Produce Market, which is the biggest, followed by Tshwane, Cape Town and Durban markets, respectively. South Africa is not the major exporter of tomato. In fact, South Africa is ranked number 40 at 0.1% in global tomato exports (DAFF, 2017) even though tomato is produced in all South African provinces. The table below indicates the supply and market prices of tomato in South Africa.

Table 2.1: The estimated supply and market prices of tomato in South Africa from 2007 until 2016.

Year	Supply(tons)	Price(ton/rand)
2007	250 000	2 200
2008	255 000	3 500
2009	250 000	4 400
2010	255 000	4 400
2011	255 000	4 410
2012	270 000	4 450
2013	265 000	5 000
2014	255 000	6 000
2015	260 000	6 200
2016	275 000	6 000

Source: DAFF (2017).

Market Participation for Smallholder Farmers

Market participation is a major pathway for rural people to generate better income and improve food security (Kyaw et al., 2018). Higher market participation by smallholder farmers can promote yield by providing incentive, information and money for purchasing inputs (Brian and Barret, 2014). However, smallholder farmers in South Africa are unable to participate in markets because they produce a small surplus that cannot be marketed in local markets and cannot attract international markets (Ngemntu, 2010). Moyo (2010) indicates that market participation for smallholder farmers is the generation of marketable surplus which in turn depends on their productivity and further maintained that, those farmers are participating in local markets or both local and international markets.

According to Segage et al. (2018), smallholder farmers in rural communities lack sufficient resources and information that are necessary in enhancing their production while incurring less costs. As a result, these farmers become reluctant to participate in the market. Furthermore, it is also noted that the degree of market participation by smallholder farmers depends on many factors, including the age of household heads, food security and the benefits derived from participation (Chirwa and Matita, 2012).

Smallholder farmers with a low level of market participation often possess small agricultural harvests and are also the poorest (Mathenge et al., 2010). Low levels of market participation result from barriers to market information, since most smallholder farmers are located far from the market with poor road infrastructure (Makhura, 2001). Jari and Fraser (2009) indicate that smallholder farmers find it difficult to participate in commercial markets due to technical and institutional constraints such as poor infrastructure, transport and scarcity of market information.

Stockbridge et al. (2003) assert that if smallholder farmers act collectively, they may be in a better position to reduce transaction costs of accessing inputs and output, obtain market information, secure access to new technologies and tap into high-value markets, allowing them to compete with larger farmers and agribusinesses. Moyo (2010) supports this view by indicating that collective action offers smallholder farmers a way to participate in the market more effectively. According to Reardon and Timmer (2005) market participation is both a function and outcome of economic development (Reardon and Timmer, 2005). Market participation promotes the linkage between the input and output aspects of agricultural markets (Gebremedhin and Jeleta, 2010).

Factors Influencing Market Participation

The major factors affecting market participation among smallholder farmers are grouped into the conceptual framework as household and household head characteristics (age, gender, education level and marital status), household endowment of crop production factors (land size), market factors (distance to nearest market, market infrastructure, and market information) and institutional services (access to extension and credit services) (Hlongwane et al., 2014; Mango et al., 2018; Selowa et al., 2015; Segage et al., 2018).

Mango et al. (2018) indicate that the important factors that influence the farmers' decision to participate or not to participate in selling their produce in the market are the level of education and age of the household head. This may be due to the fact that older people are more risk averse, slow to adopt technology and less physically fit to transport the production to the market (Mbitsemunda and Karangwai, 2017).

Moyo (2010) indicates that transaction costs are the important components of marketing that determine the extent of market participation of smallholder farmers and

are the embodiment of barriers to market participation access by resource-poor smallholder farmers. However, the extent to which farmers participate in the market is influenced by the selling price of their produce since price is the crucial instrument in marketing because lower price is a disincentive to market participation (Mbitsemunda and Karangwai, 2017).

Farmers in peri-urban areas are able to sell higher proportions of their output than farmers in rural areas due to the distance that exists from the point of production to the market (Omiti et al., 2009). This is because as the distance to the market increases, transportation costs increase as well. Thus, a positive relationship that exists between the distance and the transportation cost is the major factor influencing the intensity of market participation. According to Moyo (2010), transaction costs affect prices which in turn affects the quantity of output traded. Thus, transaction costs tend to reduce the net benefits of exchange which causes smallholder farmers to stop participating in the market.

Moyo (2010) states that households that have adequate assets and infrastructure engage in the markets while those who do not have adequate household assets and infrastructure do not actively engage in the markets. Omiti et al. (2006) support this view by indicating that livestock ownership and household endowment for crop production (land, oxen, farm equipment and family labour) are the major factors influencing market participation among farmers.

Abbott (1987) indicates that the transformation of subsistence agriculture to a more commercialised system based on well-developed markets is essential to the promotion of economic growth and poverty reduction. Kyaw et al. (2018) concur by indicating that the existence of markets and improved market access are important for smallholder farmers since it can draw agricultural and economic development. Makhura (2001) indicated that physical facilities, proximity to market, shortage of resources such as transport and market information are the main limitations to the farmers' marketing activities and the World Bank Agriculture for Development (2008) emphasised that improved access to markets has paramount importance in increasing smallholder market participation and the extent of their participation, *ceteris paribus*.

Summary of Literature Review

The literature review reveals that smallholder farmers are significant in South Africa's economy as they play an important role in improving agricultural productivity. However, because of the constraints that they face, their significance goes unnoticed (Ngemntu, 2010). Farmers are constrained by institutional, technical, and socio-economic factors that influence their production output and market participation in the country, hence their contribution to the GGP and GDP is small compared to other smallholder farmers in other African countries (DAFF, 2012).

Smallholder farmers are the drivers of agricultural development in South Africa because they strive to alleviate poverty, hunger and ensure food security. Lack of full participation in the markets prevents farmers from transiting into commercial farming. Several studies have highlighted that smallholder farmers are inefficient and contribute a minimum amount to the gross domestic production. This may be due to poor resource endowment at their disposal and market information to compete with commercial farmers and transition from smallholder farmers to commercial farmers.

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Introduction

This chapter describes the area in which the study was conducted and the way the research was carried out. The chapter comprises three sub-sections, namely; the study area, data collection process, and the analytical techniques.

3.2. Study Area

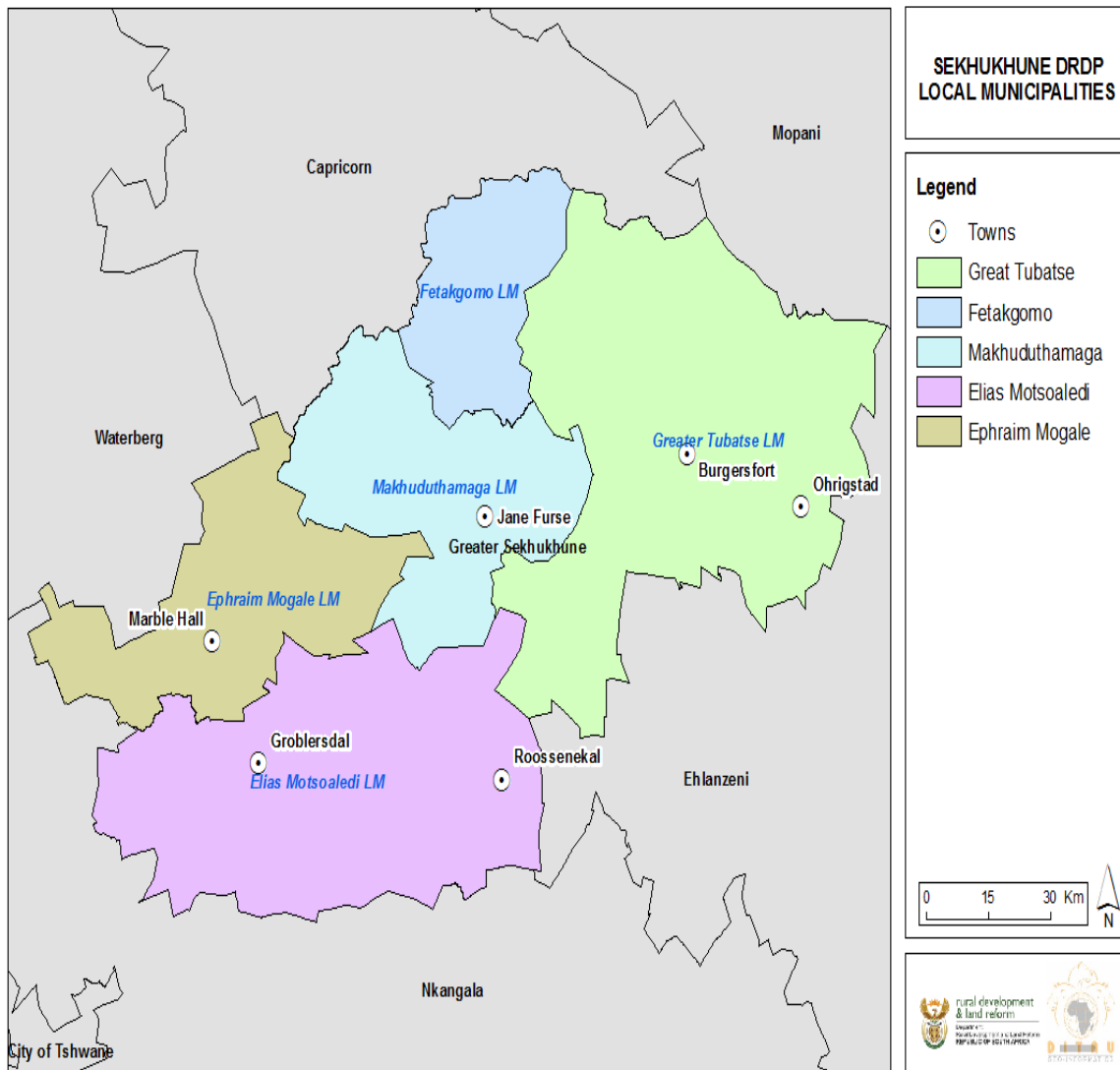Figure 3.1: Greater Sekhukhune District map

Source: District Rural Development Plan (2016).

The study was conducted at Madibong and Manganeng Villages of Makhuduthamaga Municipality in the Greater Sekhukhune District, Limpopo Province. Limpopo Province is South Africa's northernmost province which shares borders with Mozambique, Zimbabwe, and Botswana, making it the ideal entrance to Africa (Frith, 2011).

According to the Limpopo Provincial Government Overview (2014), the province is named after the Great Limpopo River that flows along its northern border. The province is rich in wildlife, spectacular scenery, and a wealth of historical and cultural treasures. The name "Limpopo" has its etymological origin in the Ndebele language, meaning "strong gushing waterfalls" (Frith, 2011).

The Greater Sekhukhune District lies in the South-eastern part of the province. The district is rural and is characterised by high levels of poverty and lack of social and economic development opportunities (Monyela, 2007). The reasons behind the lack of social and economic development amongst others are, lack of basic infrastructures such as water, sanitation, roads, public transport, electricity, and telecommunication (District Rural Development Plan of Sekhukhune, 2016).

According to Maponya (2013), the average annual rainfall in the Sekhukhune District is less than 600 mm. The district is situated in semi-arid areas and always experiences water shortages. This is a serious problem, particularly for an area that has farming as the main activity and source of livelihood for its residents. For instance, smallholder agriculture accounts for 70% of the farming activities in the district whilst 30% is commercial agriculture (Mpandleli et al., 2015).

Makhuduthamaga Local Municipality is one of the five local municipalities that are found in the Sekhukhune District(Figure 3.1). The local municipality is situated in the Lowveld region approximately 100km south of Polokwane. The municipality is made up of four components of the former transitional local councils, namely; Ngwaritsi-Makhuduthamaga, Greater Nebo North, Tubatse Steelpoort, and Noko-tlou Makhuduthamaga (K.M. Associates Town Planners, 2002).

The municipality encompasses 170 villages and is divided into 31 wards with a geographical area of 2,090,60km^2. The municipality has a population of 274 358 and a total of 65 217 households with an average household size of 6 people per household (Census, 2011). The Makhuduthamaga Local Municipality is the most populated with high rates of unemployment, illiteracy, and poverty among the five local municipalities found in the Greater Sekhukhune District (Monyela, 2007).

3.3. Data Collection

The study used primary data where purposive sampling integrated with a simple random sampling technique were used to collect data from 100 smallholder tomato farmers in Madibong and Manganeng Villages, respectively. The study used a purposive simple random sampling technique to select the respondents in the two selected villages of Madibong and Manganeng. The purposive simple random sampling technique was appropriate since it gave the smallholder tomato farmers an equal opportunity to be selected. Only smallholder tomato farmers that are residing in Madibong and Manganeng Villages were selected for the purpose of this study since they share common cropping patterns and social characteristics. The researcher used structured questionnaire and face-to-face interviews to gather data from the respondents.

3.3.1. Sampling procedure

According to the Greater Sekhukhune District Municipality (2020), the sample frame of smallholder tomato farmers in Manganeng and Madibong Villages is 240, with 79 smallholder tomato farmers in Madibong and 161 smallholder tomato farmers in Manganeng, respectively. For this study, a sample size of 100 smallholder tomato farmers was used.

3.3.1.1. <u>The formula used to determine the sample size per village:</u>

$$\frac{sample\ frame\ per\ village}{total\ sample\ frame} \times 100$$

3.3.1.2. <u>The sample sizes per village</u>

Village	Sample frame	Sample size determined	The sample size used in the study
Madibong	79	32.9	33
Manganeng	161	67.0	67

3.4. Analytical Technique

The first objective was addressed using descriptive statistics which described the basic features of the data in the study area. Thus, descriptive statistics provided simple reviews about the sample and the measures.

For the second objective, the Multiple Regression Model determined the factors influencing the tomato production of smallholder farmers in the study area. In the model, the dependent variable was predicted by multiple explanatory independent variables. The form of the Multiple Linear Regression Model was as follows: $Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots\ldots\ldots\ldots + \beta_n X_n + U$ (1)

Where Y was the total amount of tomato produced (in kg) and α indicated the value of the dependent variables when all the values of the independent variable are zero and each β estimate indicates the average change in Y in relation with a unit of change in X, while controlling other explanatory variables in the model.

The third objective was addressed by looking at the socio-economic factors determining the market participation of smallholder tomato farmers in the study area. These factors were analysed using Logistic Regression since the Logistic Regression Model is useful in explaining the relationship between the dependent binary variable and nominal, ordinal, and interval or ratio-level independent variables. According to Oni et al. (2018), the Logit Model is used in the prediction of a dichotomous outcome, because the dependent variable is not continuous; it takes the value of 0 or 1. The Logit Model does not assume the distribution of the independent variable; therefore, the independent variables in the Logit Model can take any form.

According to Archera et al. (2007), the Logistic Regression Model is used to estimate the effect that the behavioural and risk factor variables have on a dichotomous outcome, which in this case, is market participation. The Logistic Regression Model is used to model the probability of the event in which the dependent variable has two possible outcomes, where the probability of the event lies between 0 and 1, that is if the smallholder farmers participate in markets or not (Kontogeorgos et al., 2008).

The general model:

$$L_i = \text{Ln}\left(\frac{P_i}{1 - P_i}\right) = Y_i = B_0 + B_i X_i + \cdots\ldots\ldots\ldots\ldots\ldots\ldots + B_n X_n + e \qquad (2)$$

Where Y_i = market participation of smallholder tomato farmers.

P_i = Probability that a farmer is participating in the market.

$1 - P_i$ = probability that a farmer is not participating in the market.

Table 3.4.1: Description of variables for tomato production (Multiple Linear Regression Model)

Variables	Description of variables	Measurement	Expected outcomes
Dependent variable			
Tomato production yield	Amount of tomato produced per production cycle	Kg	
Independent variables			
Labour	Number of labours utilised in the production	Numbers	+
Land size	Size of land utilised for tomato production	Hectares	+
Source of labour	1 if labour is hired, 0 if otherwise	Dummy	+
Fertilisers application	1 if the farmer uses fertilisers, 0 if otherwise	Dummy	+
Farming experience	Number of years a farmer has been producing	Years	+
Agricultural equipment	1 if a farmer is using power tools, 0 if otherwise	Dummy	+
Extension service	Extension accessibility by the respondent,1- if accessible, 0 if otherwise	Dummy	+
Education	1 if the farmer has formal education,0 if otherwise	Dummy	+
Age	Age of the smallholder farmer	Years	+
Marital status	1 if the farmer is married, 0 if otherwise	Dummy	-
Total household income	Farmers total household income	Rand	+
Total production income	Amount of income obtained from tomato production sales per production cycle	Rand	+
Size of the household	Number of household members	Numbers	+

Table 3.4.2: Description of variables for market participation (Logistic Regression Model)

Variables	Description of variables	Measurement	Expected outcomes
Dependent variable			
Market participation	1-If the farmer participates, 0- if otherwise	Dummy	
Independent variables			
Distance to the market	Distance to the market	Kilometres	-
Access to credit	1-if the farmer has access to credit, 0-if otherwise	Dummy	+
Transportation	1-if the farmer use transport to the market, 0- if otherwise	Dummy	-
Total production income	The amount of income obtained from the sale of production per production cycle	Rand	+
Occupation	1-If the farmer is a pensioner, 0-if otherwise	Dummy	-
Extension service	Extension accessibility by the respondent,1-if accessible or 0-if otherwise	Dummy	+
Education	1-if the farmer has formal education, 0-if otherwise	Dummy	+
Access to market information	1-If the farmer has access to market information, 0-if otherwise	Dummy	+
Tomato production yield	Amount of tomato produced per cycle	Kg	+
Fertiliser application	1 if the farmer uses fertilisers, 0 if otherwise	Kg	+
Farming experience	Number of years a farmer has been producing	Numbers	+
Age	Age of the smallholder farmer	Years	+
Gender	1 if the farmer is male, 0- if otherwise	Dummy	+
Marital status	1 if the farmer is married, 0-if otherwise	Dummy	+
Size of the household	Number of household members	Numbers	+

3.5. Ethical Considerations

The study was conducted in line with the requirements prescribed by the University of Limpopo Turfloop Research Ethics Committee (TREC). Ethical clearance was requested from the aforementioned committee and was granted (see Appendix 1). The study did not harm any human being, animal and plant either socially, economically, or emotionally. Smallholder farmers were not forced to participate, instead, they participated freely without any threats. The ethic that was mostly considered was to ensure accurate findings from this study which was undergirded by the need to ensure honesty, objectivity, integrity, respect for intellectual property, confidentiality, respect for the respondents, social responsibility, informed consent, ownership of data risk assessment, non-discrimination, legality and the protection of human subjects.

3.6. Chapter summary

The chapter introduced revealed where the study was conducted. The study areas were described in detail to indicate its location and population size. The study employed purposive simple random technique to choose the relevant farmers to participate. 100 smallholder farmers were selected using probability proportionate to sample size. The smallholder farmers were interviewed face to face using a structured questionnaire that had both closed and open-ended questions. The data collected was analysed using SPPS version 25.0 and the logistic regression and multiple linear regression model were employed to address the two objectives.

CHAPTER 4: RESULTS AND DISCUSSION

4.1. Introduction

This chapter presents the descriptive results, where data on socio-economic characteristics collected from the sampled smallholder tomato farmers in Madibong and Manganeng Villages are described. The descriptive results in this chapter address the first objective of the study and are presented in graphs, figures and tabular forms. Results from Multiple Linear and Logistic Regression Models are also presented. The Multiple Linear Regression Model addresses the second objective of factors influencing tomato production among smallholder tomato farmers while the Logistic Regression Model addresses the third objective of socio-economic factors influencing market participation among smallholder tomato farmers in Madibong and Manganeng Villages.
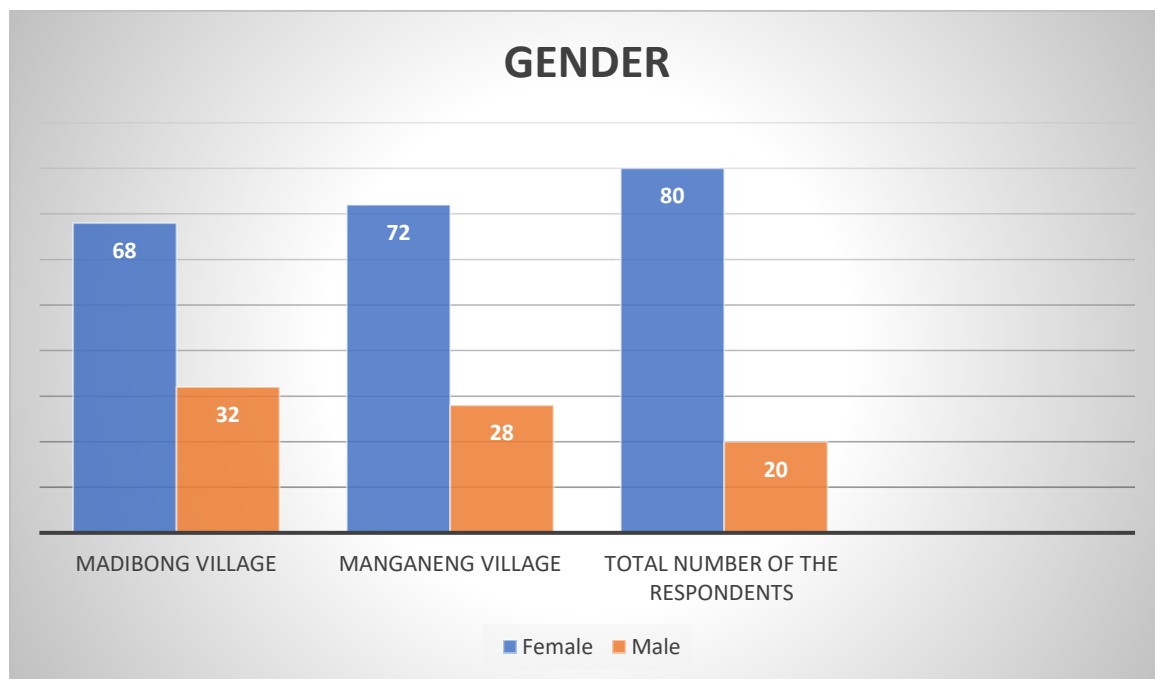
4.2. Descriptive Statistics

Figure 4.1. Gender of the Smallholder Tomato Farmers.

Source: Field Survey (2020).

Figure 4.1 indicates that 80% of female smallholder farmers were engaged in the production and market participation of tomato as compared to 20% of male smallholder farmers. According to Jacobi et al. (2001), women tend to dominate in certain forms of cultivation such as backyard gardens and smallholder animal husbandry while men dominate in commercial food production.
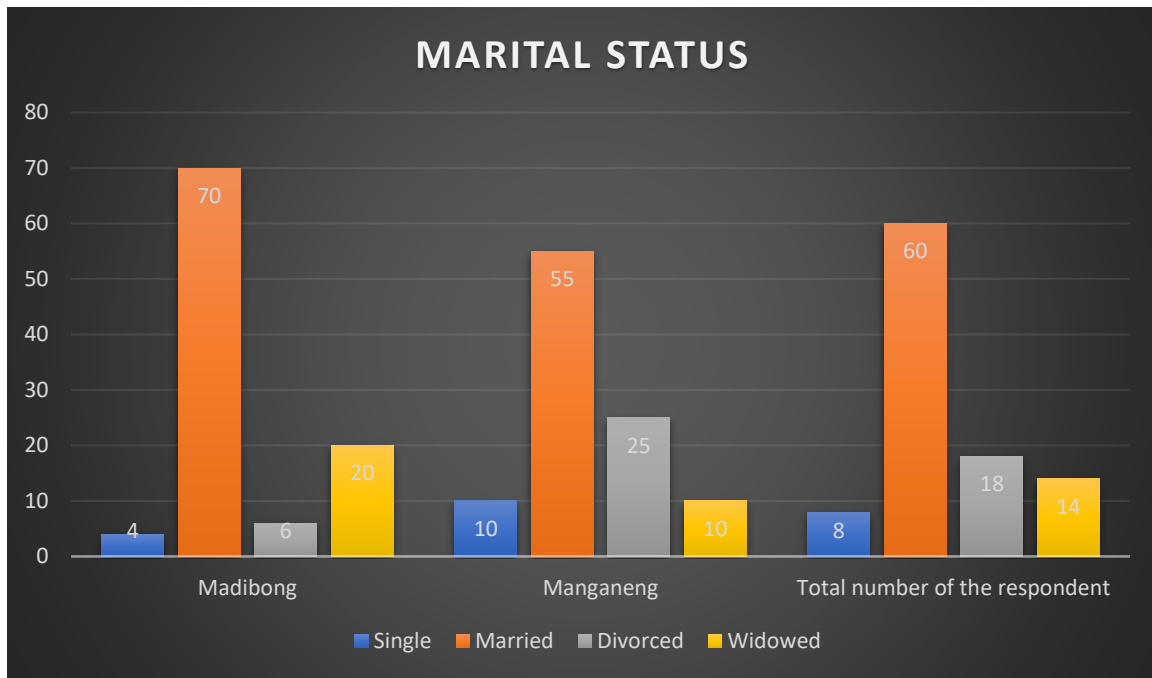
Figure 4.2. Marital Status of the Smallholder Tomato Farmers.

Source: Field survey (2020).

The result of this study indicates that a majority of smallholder farmers (60%) in the study area were married while a few (8%) were unmarried (see Figure 4.2). Masunga (2014) indicates that tomato production is more attractive to married couples who are engaged in various social and economic commitments such as ensuring food availability for family members and better housing, while Musemwa et al. (2008) note that married farmers are more stable in farming activities than single farmers. Thus, marital status influences the production and marketing patterns of the farmer.
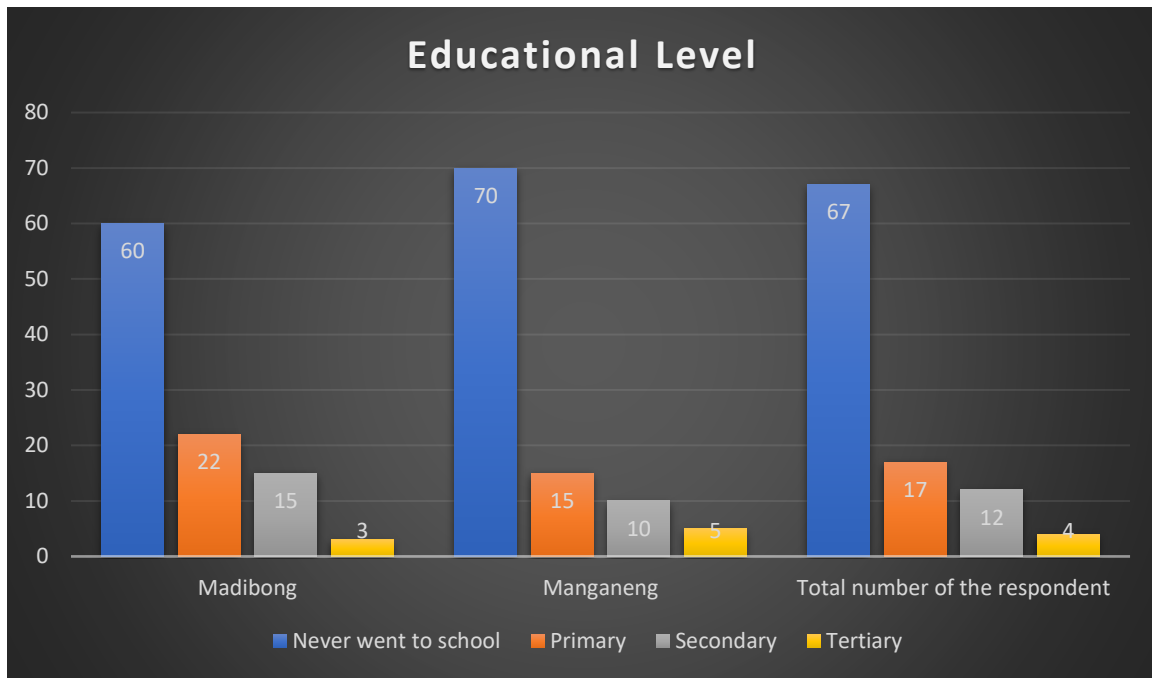
Figure 4.3. Educational Level of the Smallholder Tomato Farmers.

Source: Field Survey (2020).

Figure 4.3 indicates that a majority of smallholder farmers (67%) in the study area never went to school while few (4%) of them have tertiary education. Low education level is the major contributing factor towards limited adoption of advanced and productive farming practices in South Africa's smallholder agricultural systems (Mdlozini, 2017). Marenya and Barrett (2007) indicate that farmers who are educated can utilise important agricultural production and marketing information which consequently improves farmers' access to proper farm services such as improved agricultural inputs and effective extension support.
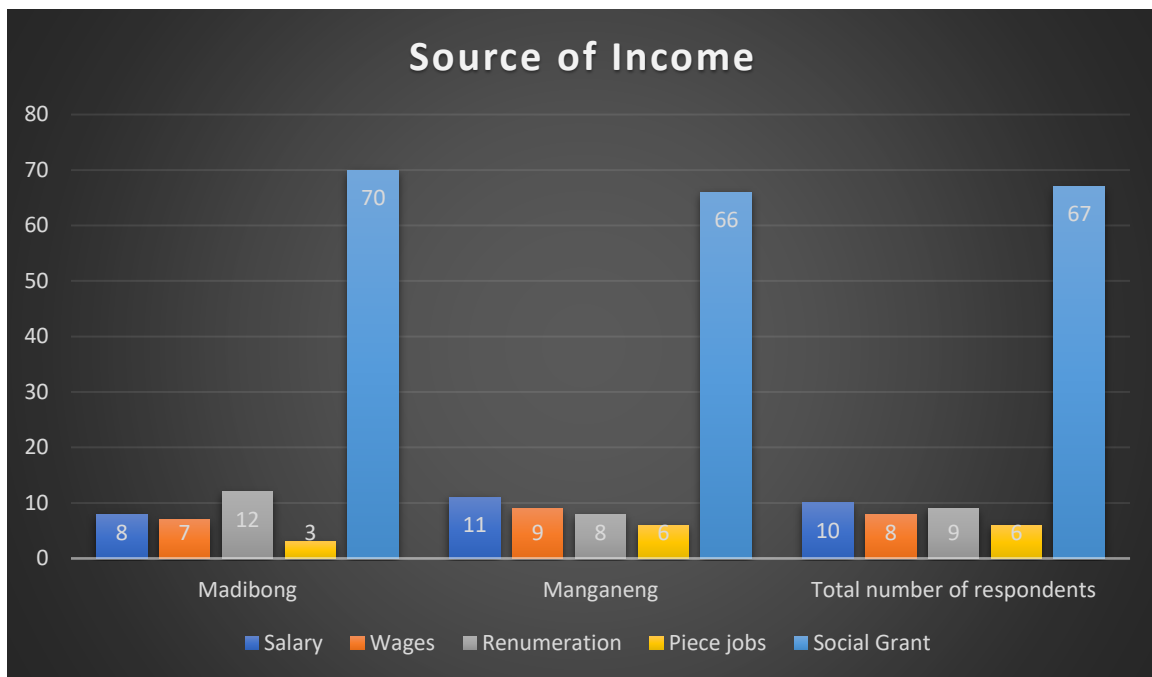
Figure 4.4: Smallholder tomato farmers' source of income.

Source: Field Survey (2020).

The results of the study (Figure 4.4.) indicate that a majority of smallholder farmers (67%) depends on social grants while 6% depends on the income obtained from their piece jobs. Mokone (2016) indicates that households with stable and unstable incomes are often engaged in agriculture compared to those that depend on remittances, investments and other sources of income.
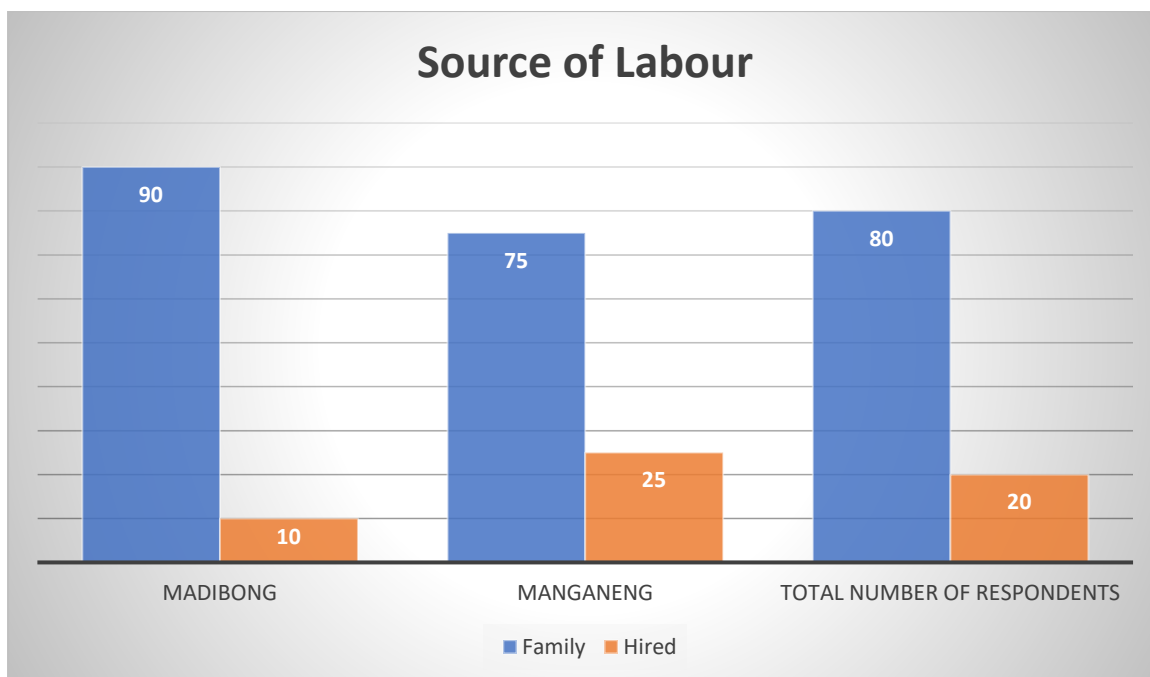
Figure 4.5: Smallholder farmers' Source of Labour

Source: Field Survey (2020).

According to Figure 4.5, a majority of smallholder farmers (80%) used family labour during production while the remaining 20% used hired labour. Labour supply is one of the limiting resources in crop production. Yusuf (2018) indicates that family labour is important in production even though they cannot be utilised to perform all production activities as opposed to hired labour.
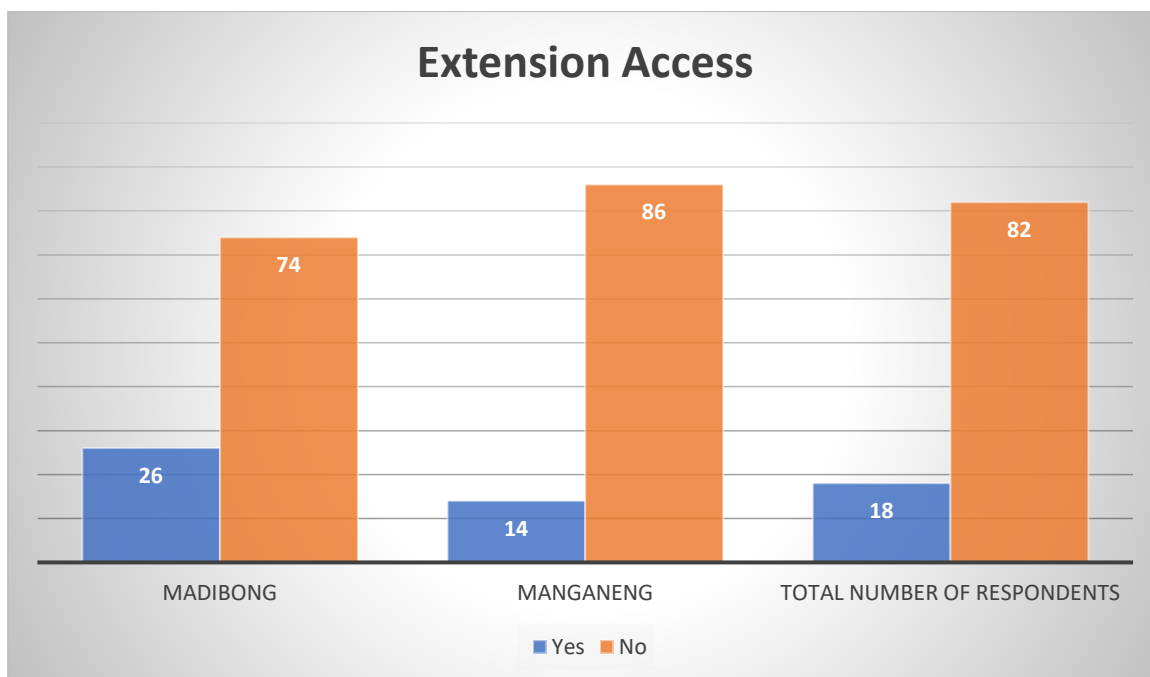
Extension Access

Figure 4.6: Extension Access

Source: Field Survey (2020)

The study shows that 82% of smallholder farmers do not have access to extension services while only 18% have access to extension services (see Figure 4.6). An efficient extension services system is an important institutional factor that influences crop production because it determines how efficient improved production practices will be delivered to the farmers within their locations and how these practices will be adopted by the farming community (Masunga, 2014). Low production output which is evident in the study area might be the result of the farmers' lack of an efficient extension services system since a majority (82%) of the respondents mentioned that they do not have access to extension services.
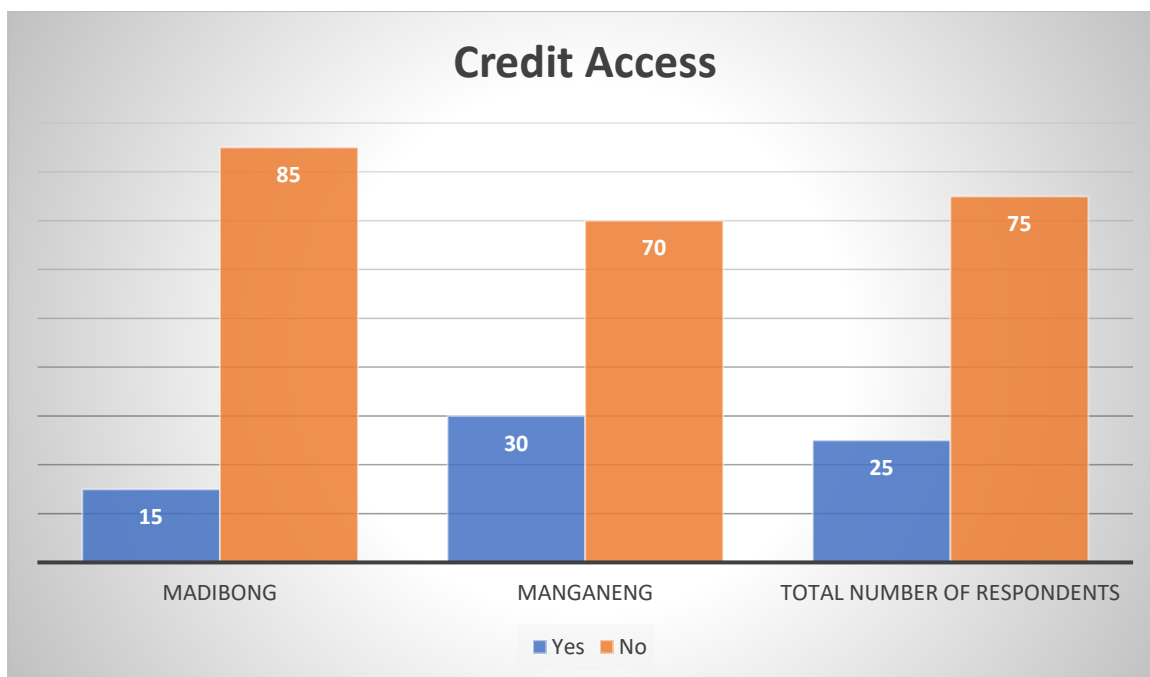
Figure 4.7: Credit Access.

Source: Field Survey (2020).

According to Figure 4.7, a majority of smallholder farmers (75%) do not have access to credit while only 25% of the farmers have access to credit from different financial institutions. Machingura (2007) states that access to credit is an important aspect in farming activities. Sehar (2018) notes that smallholder famers have no ability to bear the risks that come with using credit in their business and are afraid of not being able to pay it back, which limits the development of the agricultural sector.
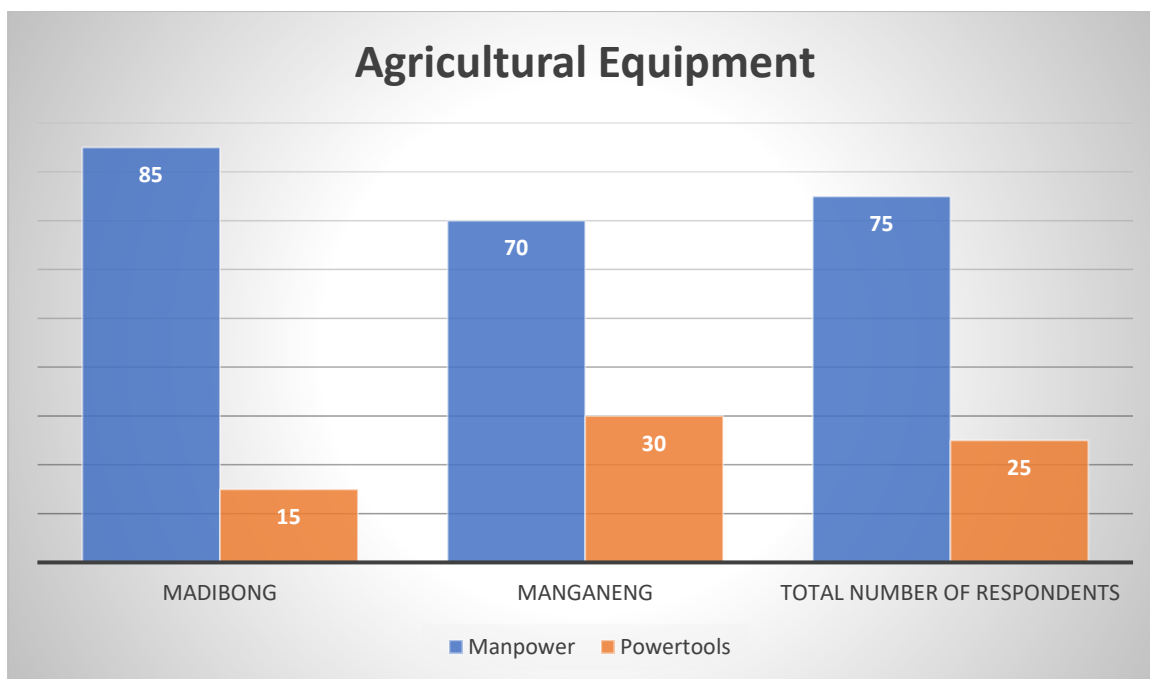
Figure 4.8: Agricultural Equipment.

Source: Field Survey (2020).

In this study, agricultural equipment refers to the use of manpower and power tools during production. The results as indicated by Figure 4.8 revealed that a majority of the respondents (75%) in the study area used manpower tools during production while only 25% used power tools.
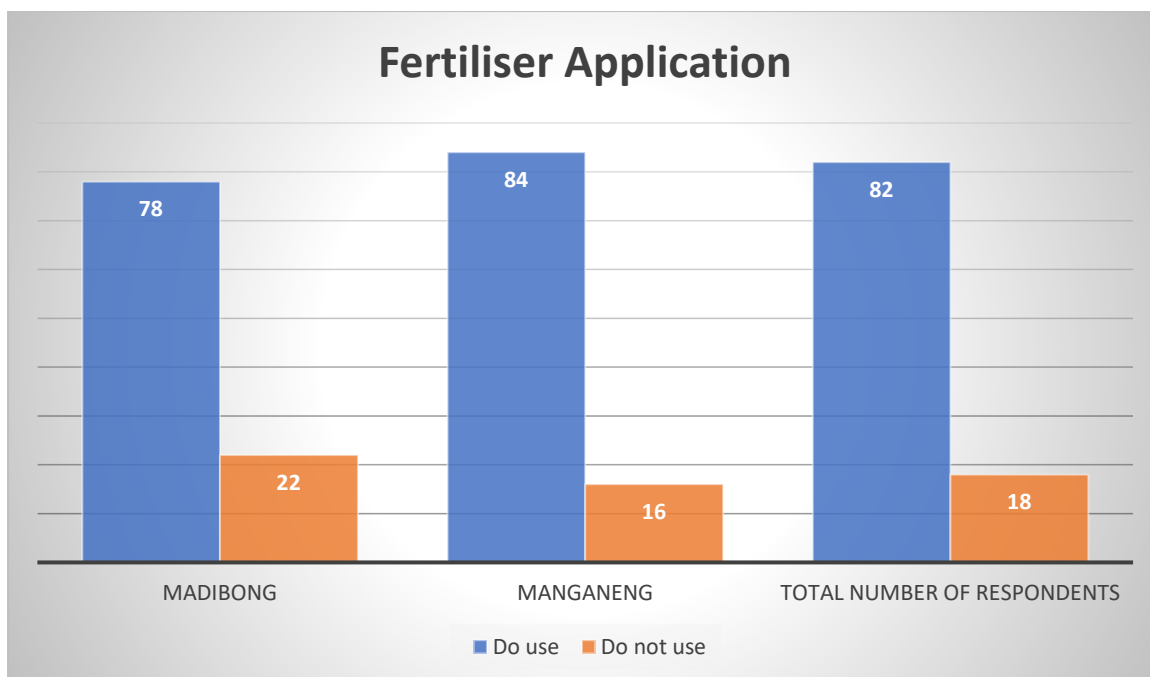
Figure 4.9: Fertiliser Application.

Source: Field Survey (2020).

In this study, fertiliser application refers to the use of chemical and non-chemical applicants that boost soil fertility during production. The results (Figure 4.9) of the study indicate that 82% of the smallholder tomato farmers used fertilisers while 18% did not use fertilisers during production in the study area. Alene (2008) indicates that since crop production is subject to random shocks and farmers are risk-averse, the ability of the farmer to bear risk influences the use of fertiliser during production.
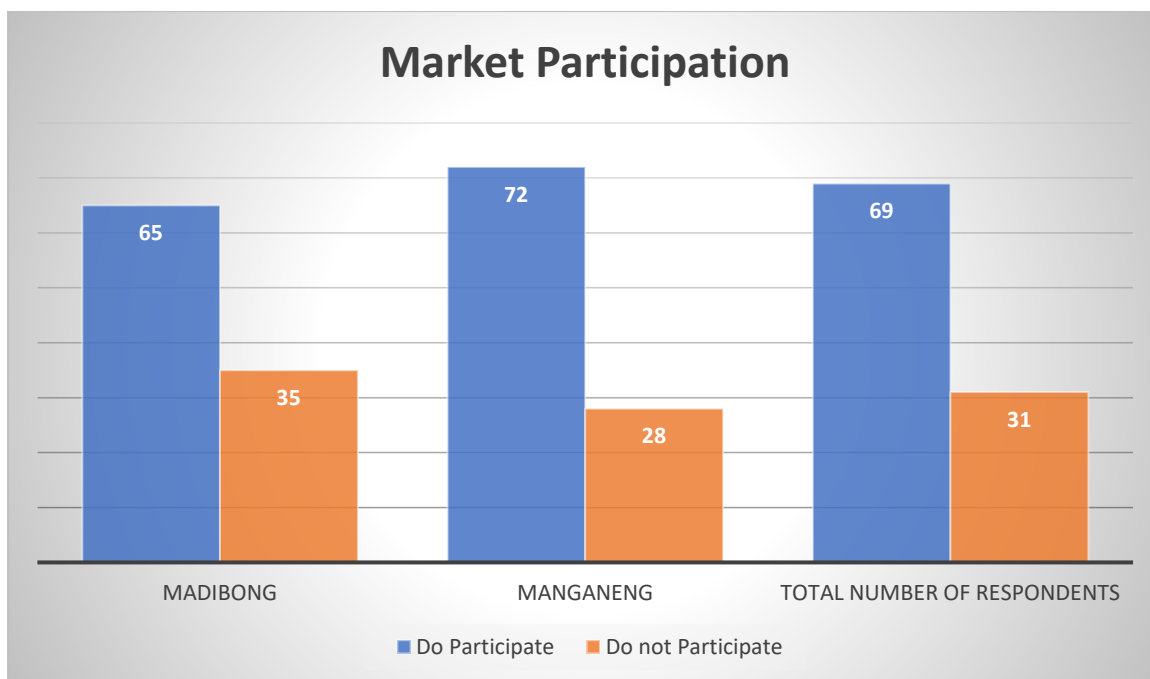
Figure 4.10: Market Participation.

Source: Field Survey (2020).

In this study, market participation was defined as the ability of smallholder tomato farmers to sell 30% of their tomato output in the formal and informal market in 2019/2020. The result (Figure 4.10) indicate that 69% of smallholder tomato farmers participated in the market while 31% did not participate in the market.
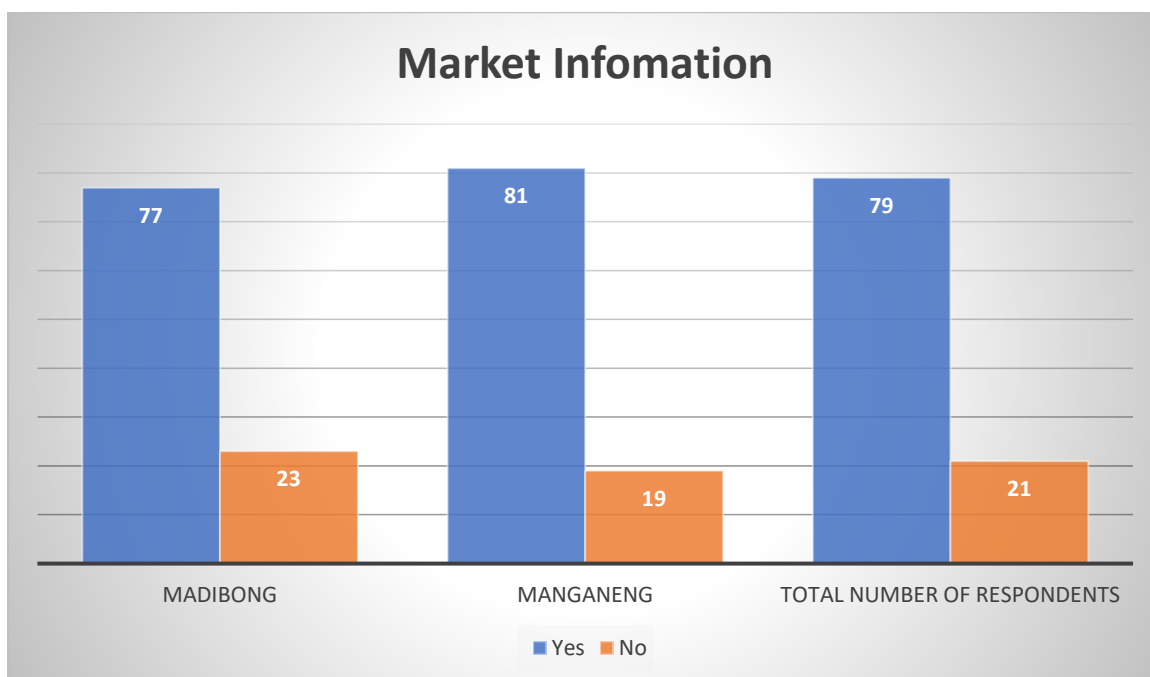
Figure 4.11: Market Information.

Source: Field Survey (2020).

In this study, market information refers to the information on market outlets and prices. Figure 4.11 indicates that 79% of smallholder tomato farmers had access to market information while 21% did not have access to market information. Musemwa (2008) indicates that it is necessary for farmers to be knowledgeable on the market demand and the prices offered because this knowledge is crucial when making decisions pertaining to the sales of their products.
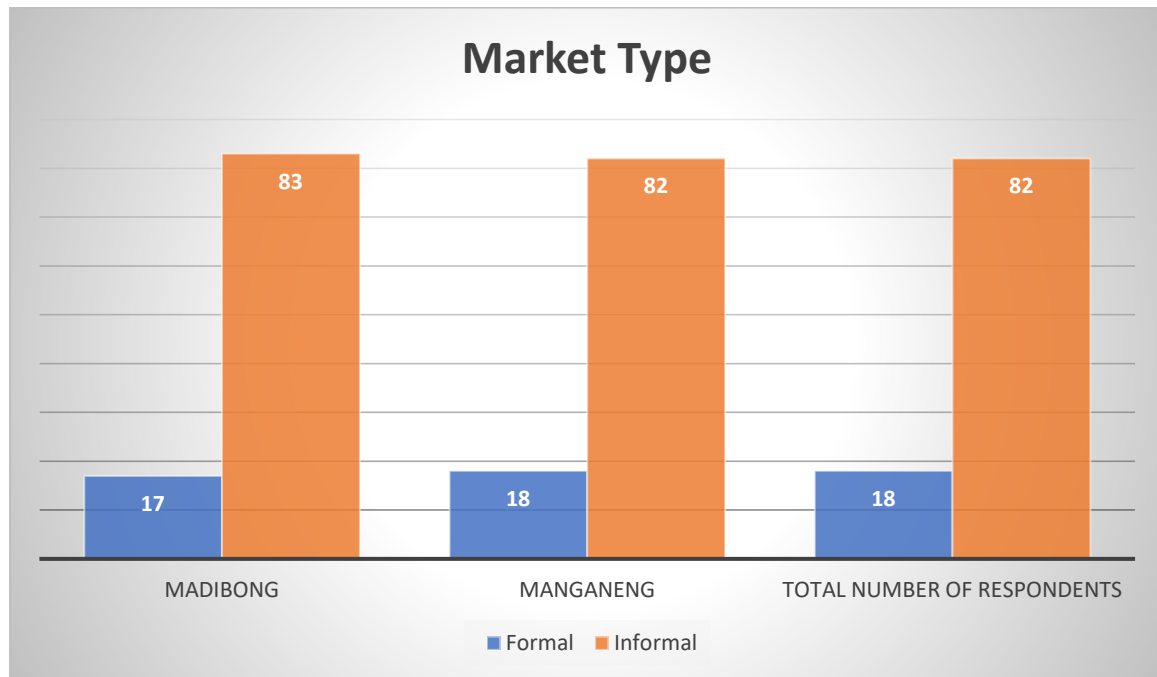
Figure 4.12: Market Type.
Source: Field Survey (2020).

Market type in this study refers to either informal or formal markets. The formal markets are the official markets that are recognised and monitored by the government while the informal markets are non-monitored markets (Anbarci et al., 2012). The results of the study as shown in Figure 4.12 indicate that a majority of the respondents (82%) participated in the informal market while few (18%) of them participated in the formal market.

Table 4.2.1: Frequency Table for Madibong Village

Variable	Mean	Median	Mode	Std. deviation	Minimum	Maximum
Age	52.36	55	55	14.261	32	84
House Size	5.97	7	8	2.311	3	11
Production Output (Kg)	97.70	52.00	36	22.866	30	1320
Number of labour used during production	2.52	2	2	0.870	1	6
Income from production(R)	764.54	320	320	203.420	100	12050
Market Distance (Km)	2.22	3.00	3	1.074	1	5
Land Size(ha)	1.303	1	0.5	0.976	0.5	4
Experience	5.91	5	5	5.216	2	27

Source: Field Survey (2020)

The results of the study indicate that the age of the smallholder farmers in Madibong Village ranges between 32 and 84 with 5 years' experience in the production of tomato on average (see Table 4.2.1). The average land size that smallholder farmers utilized during production is 1 hectare, and that most farmers were able to produce 36kgs of tomato per production cycle. The minimum amount of income generated by the farmers from the sale of output was 100 rands and the maximum amount was 12050 rands. On average, smallholder tomato farmers in Madibong were able to generate 320 rands per production cycle.

Table 4.2.2: Frequency Table for Manganeng Village

Variable	Mean	Median	Mode	Std. deviation	Minimum	Maximum
Age	46.66	45	38	13.920	29	81
Household Size	6.15	6	4	2.426	1	8
Production Output (Kg)	116.72	50	50	38.839	33	2980
Number of Labour used during production	3.33	4	4	1.120	1	8
Income from production(R)	975.746	450	450	330.061	200	25000
Market distance (Km)	5.91	6	3	2.607	3	10
Land size(ha)	1.701	2	2	0.866	0.5	5
Experience	4.81	4	4	3.031	2	20

Source: Field survey (2020)

Table 4.2.2 indicates that most smallholder farmers in Manganeng Village were 32 years and had 4 years' experience in the production of tomato on average. The land size that farmers utilised during production ranges between 0.5ha and 5ha. Thus, they were able to produce 50kgs of tomato per production cycle on average. The minimum amount of income generated by the farmers from the sale of output was 200 rands and the maximum amount was 25000 rands and on average, the smallholder tomato farmers in Manganeng were able to generate 450 rands per production cycle.

Table 4.2.3: The Multiple Linear Regression Results

Variable	Standard error	Standardized Co-efficient	T-ratio	Significance level
Constant	19.041	-	1.995	0.291
Age of the farmer	0.374	0.259	0.693	0.493
Marital Status	0.009	-0.028	-3.111	0.009***
Household Size	1.091	0.539	0.494	0.709
Fertiliser Application	1.214	5.973	4.920	0.049**
Farmers Experience	1.506	-1.632	-1.084	0.594
Educational Level	11.058	12.109	1.095	2.034
Sources of labour	0.054	0.096	1.777	0.359
Number of labour used during production	0.622	-0.493	-0.793	0.372
Agricultural Equipment (Machinery)	0.667	3.070	4.603	0.005***
Extension Access	1.677	6.332	3.776	0.060*
Income from Production	0.009	0.087	9.666	0.001***
Adjusted R-square: 68%				
Dependent Variable: Output of tomato per production cycle				
***, **, * represent 1% level of significance, 5% level of significance and 10% level of significance respectively.				

Source: SPSS and Field Survey (2020)

Table 4.2.3 shows the results from the Multiple Linear Regression Model and the coefficients of factors influencing tomato production of smallholder farmers in Madibong and Manganeng Villages, the significance level, t-ratio and the standard error of the estimates.

The adjusted R^2 obtained from the model result was 68% and the adjusted R^2 indicates that the model fit is good since about 68% of the variation in the dependent variable was explained by the independent variables and the remaining 32% was explained by the unknown variables. The significance level shows the amount of change on the dependent variable when an independent variable positively or negatively changes.

The t-ratio is a ratio of the departure of an estimated parameter from its notional value. T-ratios and standard error and were used in testing the hypothesis.

The marital status of smallholder farmers in Madibong and Manganeng was found to be negatively and statistically significant at 1%. There is a negative relationship between the marital status and production output of smallholder farmers. The negative relationship indicates that when the smallholder farmers get married, their production yield might decrease by 0.028kgs. This is in line with Ekong's (2000) findings, where it was found that the farmer's marital status affects farming activities because of the change in responsibilities. The results of this study, however, are not in line with Masunga (2014) who found that the farmer's marital status was positively significant at P=0.004, and further implied that married farmers were more involved in tomato production due to family responsibilities that force them to engage in the production of tomatoes to subsidise income obtained from other enterprises.

The agricultural equipment that smallholder tomato farmers in Madibong and Manganeng utilised during production was found to be positively and statistically significant at 1%. Therefore, there is a positive relationship between the machinery utilised and the amount of tomato produced by smallholder farmers per production cycle. The positive relationship indicates that when farmers use agricultural equipment during production, the production yield might increase by 3.070 kgs.

Income obtained from production output sold by the smallholder tomato farmers was found to be positively and statistically significant at 1%, indicating a positive relationship between income from the sales of tomatoes and the production yield. The findings of this study are in line with Selopyane's (2014) findings, who found that income from the sales of crops that farmers are producing is important since it determines whether the farmers must continue with production or not. The positive relationship between income obtained from production output sold and production yield indicates that as the income obtained from production output is sold, the production yield might increase by 0.087kgs.

Fertilisers that smallholder farmers in Madibong and Manganeng used during production (fertiliser application) was found to be positively and statistically significant at 5%, indicating a positive relationship between fertiliser application and tomato production yield. An increase in the quantity of fertiliser applied during production

might result in an increase of 5.973kgs of tomato production yield. The findings of this study are in line with Lefophane's (2012) results, where fertiliser was found to be positively and statistically significant to the productivity of smallholder farmers, meaning an increase in fertiliser application increases agricultural productivity.

Access to extension services refers to the number of extension contacts either through farm visits made to farmers or training sessions received during the production season (Anyiro and Oriaku, 2011). Access to extension services by smallholder tomato farmers in Madibong and Manganeng was found to be positively and statistically significant at 10%, indicating a positive relationship between the farmers' access to extension services and their production yield. The results of this study are in line with the study conducted by Machete (2004) who indicated that smallholder agricultural growth cannot be achieved without access to farmers' support services, and that adequate farmers' support services for smallholder farmers can significantly increase agricultural productivity.

Table 4.2.4: The Logistic Regression Model Results

Variables	B	Standard Error	Wald	Significance level
Educational Level	1.849	0.876	3.593	0.053*
Age of the Farmer	-1.439	1.645	0.361	0.270
Occupation of the farmer	0.065	2.411	-1.219	0.248
Household size	0.197	2.005	1.003	0.124
Marital Status	10.415	3.687	3.728	0.061*
Market Distance	-1.564	0.626	6.249	0.034**
Farming Experience	2.528	0.523	4.834	0.033**
Source of income	-0.006	0.004	2.439	0.118
Gender	7.322	3.563	3.413	0.053*
Farm size	4.078	2.0130	3.498	0.072*
-2 log likelihood: 20.856				
Chi-squared: 23.159				
Cox & Snell R- square: 67.7%				
% cases correctly predicted: 70.1%				
***, **, * represent 1% level of significance, 5% level of significance and 10% level of significance respectively.				

Source: SPSS and field survey (2020)

Table 4.2.4 indicates that six variables (educational level, gender, farming experience, market distance, farm size and marital status) out of ten variables that were regressed were significant in influencing market participation among smallholder tomato farmers in Madibong and Manganeng villages. The Cox and Snell R square of the model is 67.7%. The Cox and Snell R square shows that the model fit is good since about 67.7% of the variation in the dependent variable was explained by the independent variables and the remaining 32.3% was explained by the unknown variables. The likelihood of the model is 20.856, and indicates that there is a 21% chance of the variables in the model to be incorrectly predicted.

4.2.4.1. Educational Level

Educational level was found to have a positive coefficient of 1.849 and was statistically significant at 10% level. The positive coefficient indicates that there is a high probability

that educated tomato farmers would participate in tomato marketing than those who are less educated in Madibong and Manganeng villages. The findings of the study contradict Machethe's (2016) findings, where the educational level of the farmer was found to be negatively and statistically insignificant towards market participation. According to Sikwela (2013), smallholder farmers who are educated are more likely to find marketing information and utilise the information better to integrate their product market.

4.2.4.2. Gender of the Farmer

The gender of the farmer was statistically significant at 10% level and was found to have a positive effect on the likelihood of smallholder tomato farmers participating in the market in Madibong and Manganeng Villages. The findings of this study are in line with the findings of Hlongwane et al. (2014) who also found gender to be positively and statistically significant towards market participation.

Reyes et al. (2012) concur with the findings of this study by suggesting that households that are headed by males are more likely to participate in the market as opposed to female-headed households in Madibong and Manganeng Villages. Mathangu (2016) also notes the relationship between gender and market participation by indicating that men are more likely to participate in the market compared to their female counterparts since men are the ones who are mostly engaged in agricultural activities while female counterparts are engaged in off-farm activities. However, Hlomendlini (2015) indicates that females are the main participants in the market than males.

4.2.4.3. Marital Status

Marital status was statistically significant at 10% level and was found to have a positive effect on the likelihood of smallholder tomato farmers participating in the market in Madibong and Manganeng Villages. This implies that increase in the level of market participation depends on the marital status of the smallholder tomato farmer. This finding is in line with Hlongwane et al. (2014) who also found marital status to be positively and statistically significant towards influencing the participation of smallholder farmers in the market. According to Nkadimeng (2019), the farmers' marital status determines the capability of the farm households to allocate all their resources efficiently on both farm and non-farm activities to boost the household income.

4.2.4.4. Farm Size

Farm size was statistically significant at 10% level with a positive coefficient of 4.078 and was found to have a positive effect on the likelihood of smallholder tomato farmers participating in the market in Madibong and Manganeng Villages. This implies that the level of market participation would increase as the land size utilised during production by smallholder tomato farmers' increases. The findings of this study are in line Baloyi (2011) who also found farm size to be positively and statistically significant towards the participation of smallholder farmers in the market. According to Raghbendra et al. (2005) as cited by Mathangu (2016), there is a positive correlation between land size and production level in smallholder agriculture, which may lead to increased market participation.

4.2.4.5. Farming Experience

The farming experience of the smallholder farmers was statistically significant at 5% and was found to have a positive effect on the likelihood of smallholder tomato farmers participating in the market in Madibong and Manganeng Villages. This implies that market participation would increase with the number of years the smallholder farmers have been involved in farming. The findings of this study are not in line with Abeykoon et al. (2013) who indicate that as the experience of the farmer in production increases, the probability of the farmer to participate in the market declines. The findings of this study are in line with Baloyi (2011)'s findings that farmers' experience in production is positively and statistically significant towards influencing the market participation of smallholder farmers.

4.2.4.6. Market Distance

The distance that smallholder tomato farmers have to travel in order to reach the market was statistically significant at 5% and was found to have a negative effect on the likelihood of smallholder tomato farmers to participation in the market in Madibong and Manganeng Villages. This implies that the level of market participation will decrease as more distance is travelled to the market. The findings of the study are in line with Makhura et al. (2001) who found that distance to the market negatively influences both the decision to participate in markets and the proportion of output sold. Hlongwane et al. (2014) also mentioned that distance plays an important role in determining whether the farmer is able to participate in the market or not.

4.2.4.7. **Insignificant variables**

The results from the Logistic Regression Model indicate that four out of ten variables were insignificant. The insignificant variables of the model include source of income, household size, occupation and age of farmers. These variables are not as important as the significant variable in the study but that does not mean the variables are irrelevant. The variables are insignificant in the study because there is no evidence that supports their impact on the market participation of smallholder tomato farmers in Madibong and Manganeng Villages.

4.2.4.8. **Chapter summary**

This chapter revealed the factors influencing production and market participation among smallholder tomato farmers in Madibong and Manganeng Villages, at Makhuduthamaga Municipality in Greater Sekhukhune District, using the descriptive statistics, the Multiple Linear and the Logistic Regression Models. The descriptive results for the demographic characteristics also showed that in Manganeng Village, most smallholder tomato farmers were 38 years and the majority (72%) of the farmers were female with 55% married and 10% single. While the result of the Multiple Linear and Logistic Regression models provided the outcomes that were expected in Chapter 3.

CHAPTER 5: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Introduction

This chapter reviews the main findings of the study, summarises the discussion on the findings and makes a conclusion based on the findings from the descriptive and empirical analyses of the study. This chapter also makes recommendations in light of the findings of the study.

5.2. Summary

The study was conducted at Madibong and Manganeng Villages, situated under the Makhuduthamaga Municipality in the Greater Sekhukhune District. The purpose of the study was to analyse the factors influencing production and market participation among smallholder tomato farmers in the study area. The study had two hypotheses where the first hypothesis held that socio-economic factors do not influence production of tomato among farmers in the study area. The second hypothesis posited that socio-economic factors do not influence market participation among smallholder tomato farmers in the study area.

Descriptive statistics was used to identify and describe the socio-economic characteristics of smallholder tomato farmers in Madibong and Manganeng Villages. The descriptive results for the demographic characteristics showed that in Madibong Village, most smallholder tomato farmers were 55 years and the majority (68%) of farmers were female with 70% of them married while 4% of them were single. The land size that the farmers utilised during production ranges between 0.5ha and 5ha. Most smallholder tomato farmers were able to produce 36kgs of tomato and generate 320 rands on average from the sales of tomato output per production cycle. Thus, majority (65%) of the farmers participated in the market.

The descriptive results for the demographic characteristics also showed that in Manganeng Village, most smallholder tomato farmers were 38 years and the majority (72%) of the farmers were female with 55% married and 10% single. The average years of experience that the farmers had in the production of tomato was 4 years and the farmers were able to produce 50kgs and generated 450 rands on average from the sales of tomato output per production cycle. Moreover, the majority (72%) of the farmers participated in the market.

The Multiple Linear Regression Model was used to analyse the factors influencing tomato production among smallholder tomato farmers in the study area. The Multiple Linear Regression results indicated that extension access, fertiliser application, marital status, use of agricultural equipment and income from production output influence tomato production among smallholder farmers.

The Logistic Regression Model was used to analyse the socio-economic factors influencing market participation among smallholder tomato farmers in the study area. The Logistic Regression results indicated that factors such as educational level, marital status, farm size, gender, farming experience and market distance influence market participation among smallholder tomato farmers in the study area.

5.3. Conclusion

The study proposed two hypotheses to predict the outcome. The first hypothesis was that socio-economic factors do not influence tomato production among smallholder farmers in the study area. The hypothesis was rejected because the Multiple-Linear Regression results indicated that factors such as marital status, agricultural equipment, income from production, fertiliser application, and extension services influence the production output of smallholder tomato farmers in the study area.

The second hypothesis was that socio-economic factors do not influence market participation among smallholder tomato farmers in the study area. The hypothesis was rejected because the Logistic Regression results indicate that factors such as educational level, gender of the farmer, farming experience, marital status, and farm size positively influence market participation. However, market distance as one of the identified factors, negatively influenced the market participation of smallholder tomato farmers in Madibong and Manganeng Villages, which are situated under Makhuduthamaga Municipality in the Greater Sekhukhune District.

5.4. Recommendations

The following recommendations were made as part of the corrective measures in relation to the findings of the study to improve production and market participation among smallholder tomato farmers:

The South African government should implement a comprehensive producer support that focuses primarily on subsidies to smallholder farmers when purchasing production

input such as fertilisers and pesticides. The majority (82%) of smallholder farmers had no access to extension services. Hence, this study recommends an improvement in the provision of extension services since extension services provide farmers with training on production and marketing strategies that enable them to increase their production output and participation in the market. In tandem with this, extension officers have to make frequent visits to the smallholder tomato farmers in order to prepare them for the production and participation in the market by providing them with technical and market information, marketing skills and pricing strategies.

An improvement in the level of education for smallholder tomato farmers is required since the study revealed that more than 50% of the smallholder tomato farmers in the study area never went to school. Thus, it is recommended that the local municipality invest more in rural adult education in order for the farmers to adopt new farming skills and utilise the market information provided. Moreover, adult education will lead to rural development and job creation in the study area which will help in the fight against hunger, food insecurity and poverty alleviation.

5.4. Area for further study

There are other relevant issues that are not addressed in this study. Hence, there are areas for further research that need to be considered in the future:

- Since, the focus of this study was on the production and market participation of smallholder tomato farmers, there is a need for research into the profitability of smallholder tomato farmers in Makhuduthamaga Municipality.
- A similar study should also be conducted in the municipality which focuses on cabbage and maize since their production is also dominant in the municipality.

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APPENDIX 1: Ethical Clearance

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TURFLOOP RESEARCH ETHICS COMMITTEE
ETHICS CLEARANCE CERTIFICATE

MEETING: 05 March 2020

PROJECT NUMBER: TREC/42/2020: PG

PROJECT:

Title: Factors Influencing Production and Market Participation Among Smallholder Tomato Farmers in Madibong and Manganeng Villages, Makhuduthamaga Municipality in Greater Sekhukhune District

Researcher: PP Kalauba
Supervisor: Prof A Belete
Co-Supervisor/s: Ms MP Senyolo
School: Agricultural and Environmental Sciences
Degree: Master of Science in Agricultural Economics

PROF P MASOKO
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: **REC-0310111-031**

Note:
i) This Ethics Clearance Certificate will be valid for one (1) year, as from the abovementioned date. Application for annual renewal (or annual review) need to be received by TREC one month before lapse of this period.
ii) Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee, together with the Application for Amendment form.
iii) PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

Finding solutions for Africa

Appendix 2: Editorial Letter

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09 November 2020

TO WHOM IT MAY CONCERN

This letter serves to certify that I have edited and proofread a dissertation titled: **FACTORS INFLUENCING PRODUCTION AND MARKET PARTICIPATION AMONG SMALLHOLDER TOMATO FARMERS IN MADIBONG AND MANGANENG VILLAGES, MAKHUDUTHAMAGA MUNICIPALITY IN GREATER SEKHUKHUNE DISTRICT** by **KALAUBA PUSELETSO PERPETUA**. A copy with the evidence of the editorial work done on the document was sent to the researcher, and is available upon request should you also need a copy.

I trust you will find the editing quality in order.

Best regards

Sebola, M.

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MOFFAT SEBOLA (LANGUAGE EDITOR)