Factors influencing market access perception and farm income of smallholder citrus farmers in South Africa.

FACTORS INFLUENCING MARKET ACCESS PERCEPTION AND FARM INCOME OF SMALLHOLDER CITRUS FARMERS IN SOUTH AFRICA

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DECLARATION

I, Sekgoadi Gift Mabala, student no. 216162943, hereby declare that the research dissertation for Master of Science in Agriculture (Agricultural Economics), at Tshwane University of Technology, is my own work. There has been no submission previously for a degree at this or any other university. Complete references duly indicate and acknowledge all sources used or quoted.

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.....	.....
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DEDICATION

I dedicate this research project to my mother, Mabala Ngwanamakgale Agnes, my late father, Mabala Mamonokane Daniel, and my supportive family.

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ABSTRACT

Smallholder farming is increasingly recognised because of its contribution to food security, poverty alleviation, and job creation for rural communities. The contribution of smallholder farming to the improvement of the general welfare can only be achieved if the farmers have access to profitable markets to allow them to earn a fair share of market returns (farm income). However, smallholder farmers in South Africa and other developing countries often have limited access to markets which negatively affects the farm income they earn. Poor infrastructure such as storage facilities, lack of market transport at local areas and inability to conclude contractual agreements are some of the factors limiting smallholder farmers from accessing markets.

The objective of the study was to examine factors influencing market access perception and farm income of smallholder citrus farmers in South Africa. Using 2018/19 secondary cross-sectional data collected by the National Agricultural Marketing Council (NAMC), the study employed principal component analysis (PCA) and multiple linear regression for data analysis. In total, there was a sample of 68 smallholder citrus farmers drawn from the database of the Citrus Growers Association Grower Development Company (CGAGDC), which contains 121 smallholder citrus farmers. A non-probability (convenience) sampling technique was used to select farmers that were conveniently available and willing to participate.

The empirical results showed that education, household size and income, size of the farm, access to loans, access to market information, and access to packhouses had a positively significant influence on farm income. These findings suggest that an improvement in each of the significant variables can significantly improve the farm income of smallholder farmers. Additionally, empirical results showed that land ownership, market information, and access to packhouses positively influenced the market access perception of smallholder farmers.

In conclusion, based on the empirical results of the study, policy recommendations are suggested, including improving access to land, market information, infrastructure, and last of all improving access to packhouses for farmers to practise value adding contributes towards marginalisation of farm income and access to output markets.

Keywords: Smallholder farmers; market access; farm income; multiple linear regression; perception

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List of Acronyms

AGOA	African Growth Opportunity Act
CASP	Comprehensive Agricultural Support Programme
CGAGDC	Citrus Growers Association Grower Development Company
DAFF	Department of Agriculture, Forestry and Fisheries
FAO	Food and Agriculture Organisation
GAIN	Global Agricultural Information Network
GDP	Gross Domestic Product
ICT	Information and Communication Technology
MAFISA	Micro Agricultural Financial Institutional Scheme of South Africa
NAMC	National Agricultural Marketing Council
NFPMs	National Fresh Produce Markets
OLS	Ordinary Least Squares
PCA	Principal Component Analysis
SA	South Africa
Sig	Significance
SMAT	Smallholder Market Access Tracker
SMME's	Small Medium Micro Enterprises
SPSS	Statistical Package for Social Sciences
StatsSA	Statistics South Africa
Std	Standard deviation
TCs	Transactional Costs

CHAPTER 1: INTRODUCTION

1.1 Background of the study

Agriculture is the backbone and an important sector of the South African economy (Rangoato, 2018). According to Mdlalose (2016), "the South African agricultural sector is characterised by a dual economy comprising well-developed commercial farming, of relatively large-scale farming businesses with established supply chains, and smallholder farmers and emerging farmers who are striving to achieve commercial success." Consequentially, the smallholder farmers in South Africa find participation in profitable markets challenging due to limited access to credit, insurance, and markets to sell their produce (Von Loeper et al., 2016). Nevertheless, smallholder farming has the potential to improve agricultural performance, increase rural incomes and purchasing power for many people in South Africa. However, poor access to markets is a major problem in poor rural communities (Machethe, 2004).

The citrus fruit industry is an important contributor to the South African economy. In terms of gross value, it is the third-largest horticultural industry after deciduous fruits and vegetable industries (GAIN, 2017). During the 2011/12 production season, it contributed over R7.7 billion (4.7%) to the total gross value of South African agricultural production. The industry is characterised by distinct heterogeneity of the citrus fruit producers, ranging from large, highly commercial growers to resource poor small-scale growers (Sinngu & Antwi, 2014). The National Agricultural Marketing Council (NAMC) is leading a project to develop a dashboard tool as a measure of progress towards the achievement of "market access for all, smallholder farmers in South Africa. In April 2016, the development of the Smallholder Market Access Tracker (SMAT) tool commenced, with the first pilot conducted in potatoes. These pilots culminated in a citrus baseline in April 2018 (NAMC, 2019).

According to a baseline report compiled by NAMC (2019), the SMAT tool consists of indicators sourced primarily through a survey designed to collect primary data on smallholder citrus farmers market access. Identifying the indicators was with some key market access variables, gathered from empirical research, which are the heart of the SMAT tool, and could have positive, negative, or neutral effects on the smallholder farmers' likelihood to access the

market. Categorised into two groups, the first group tracks the progress from the supply perspective (farmers' perspective) and the second group tracks the progress from the demand side (market's perspective). These indicators are meant to inform the policymakers of the situation per industry tracked, thereby enabling the formation and continuation of more effective programmes or interventions towards the achievement of market access.

Farmers perspective or perception is an issue that reflect the amount of knowledge possessed and have a strong influence on decisions made regarding that issue (Nesamvuni et al., 2017). In this view, and is, an important aspect to evaluate the perception of smallholder citrus farmers regarding market access. According to Kirsten and Van Zyl (1998), in South Africa, the perception is that smallholder farmers are non-productive, backward, non-commercial, subsistence farmers located in the former homeland areas. One cannot understand the complexity of rural life properly through a single theoretical perspective, as perception varies with the socio-economic, cultural, gender, environmental and historical context, and to some extent, personal experiences of the risks are also important in influencing perception (Mudombi, 2011).

1.2. Problem statement

Recently, the main concerns of agricultural economists and policymakers are poverty reduction, farmers' income and welfare increase, marketing improvements, and sustainable development (Hoang, 2021). Several smallholder farmers live in rural areas and their incomes are very low such that they are experiencing poor market access (Rangoato, 2018). Accessing output markets, ranging from small village-level markets to sophisticated exports processors, is the key for smallholder citrus farmers to earn more from the sale of produce (Senyolo et al., 2009). However, previous studies indicate that smallholder farmers find it difficult to participate in markets due to a range of constraints such as market information and high transactional costs (Makhura, 2002).

Although it is easy to link farmers to markets, it is difficult for smallholder farmers to seize the available profitable market.. The view is that access to emerging high-income agricultural markets (e.g., supermarkets) is seen to be skewed in favour of large-scale suppliers (Omiti et

al., 2007). There are several challenges in emerging smallholder farmers, which include the identification of output markets that may enable large numbers of smallholders to improve their incomes, and the identification of constraints and interventions that are important for improving access to markets by the poor (Mdlalose, 2016).

In addition, factors such as credit availability, product availability, attributes, prices, efficiency, costs of these processes and market information determine market access. Moreover, limited access to market information is contributed by the lack of understanding of important factors that influence the market environment (Mukwevho and Anim, 2014). Farmers' farm income depends on various economic, regulatory, and human incentives, such as reducing production costs, maximising profit, increasing capital estimation of farm assets, reducing risks, community development, responsibility rules, and enhancing farmers' skills (Kassem et al., 2021). As result smallholder farmers are less likely to implement these changes under domestic and international market standards, hence they face exclusion from access to high-value markets worldwide (Ayele et al., 2021).

To fully facilitate and improve the farm income of smallholder farmers, there is a need for positive steps undertaken, such as the development of rural infrastructure and establishing good quality access to markets (Ahmed, 2012). The essence of the problem lies in identifying factors that are currently preventing smallholder citrus farmers to earn farm income and benefit from reliable accessible markets. For these reasons, the study strives to determine factors influencing market access perception and farm income of smallholder citrus farmers in South Africa.

1.3 Research objectives

1.3.1 Main objective

The main research objectives of the study were to examine the factors influencing market access perception and farm income of smallholder citrus farmers in South Africa.

1.3.2 Specific objectives

Specifically, the study sought to:

i) Investigate the determinants of farm income among smallholder citrus farmers;
ii) To determine factors that influence smallholder citrus farmer's perception regarding access to output markets in South Africa.

1.4 Hypothesis of the study

The study sought to test the null hypothesis that:

i) Factors such as demographics, infrastructural, and institutional do not influence market access perception and farm income of smallholder citrus farmers.

1.5 Justification of the study

Access to markets is important for selling produce, and economic welfare. By accessing markets, farmers can sell their produce, earn an income, and therefore improve their economic welfare. Smallholder farmers' market access makes a substantial contribution to rural income growth and creates income diversification (Ramoroka, 2012). The ability of smallholder farmers to gain access to markets and serve these effectively is crucial for rural income and development (Mdlalose, 2016). Citrus fruit is one of the important horticultural cash crops and South Africa is the largest citrus fruit producer in Africa (Makorere, 2014). The citrus industry is an important foreign exchange earner. Citrus is one of the high-value products in South Africa that is mainly destined for the export market. It comprises five broad categories, namely oranges, easy peelers (soft citrus), grapefruit, lemons, and limes (NAMC, 2019).

As an important earner of foreign exchange, citrus in South Africa is mainly aimed at the export market, with local markets being the National Fresh Produce Markets (NFPMs), processors and the informal market (e.g., street hawkers and bakkie traders); the fruits are also sold directly to wholesalers and retailers through direct supply contracts. According to GAIN (2017), the expectation is that South African citrus exports to the United States will continue to grow, spurred by the continued market access through the African Growth Opportunity Act (AGOA).

Furthermore, export markets for South African fresh fruit are also increasing, as new markets open, such as China (NAMC, 2019).

Sustainable access to markets is necessary to guarantee smallholder farms income and poverty alleviation. Consequently, this opportunity allow the farmers to improve their livelihood. Similarly, the conclusions and recommendations of the study will be useful for the development of techniques to improve farm income and market access of smallholder citrus farmers and help policymakers improve policies toward farmers.

1.6 Definition of key concepts

1.6.1 Perception

In this study, perception is the amount of knowledge possessed and its strong influence on the decision regarding market access. It is an expression of how smallholder farmers think about market access and the impression they have about it; this also includes the economic benefits of awareness of market access.

1.6.2 Market Access

According to NAMC (2016), the definition of market access, in the context of smallholder farmers, is the ability of these farmers to seize available market opportunities. Furthermore, Van Tilburg et al. (2012) outlined that market access exists in three dimensions, viz., physical access to markets (distances, costs, etc.), structure of the markets (asymmetry of power relations between farmers, market intermediaries and consumers), and the level of producers' human capital (e.g., understanding of market forces, prices, bargaining, etc.). Therefore, in this study the physical access to markets is adopted.

1.6.3 Farm income

Farm income in this study is the total farm income from farming activities on individual farms per season. Farm income is the sum contribution of income from different markets such as income from the export market, supermarket, fresh produce market, institutional market and local market.

1.7 Organisation of the dissertation

The study comprises of six chapters. Chapter 1 provides the background information of the study. Chapter 2 consists of the literature review, where the previous studies, both locally and internationally, related to the study were conducted. Chapter 3 presents the research methodology, and consists of the study area, data collection and techniques used for data analysis. Chapter 4 and 5 comprise the empirical results of the dissertation. Chapter 4: Determinants of total farm income among smallholder citrus farmers in South Africa; Chapter 5: Determinants of smallholder citrus farmers' perceptions towards access to output markets in South Africa. Of note is that there were efforts made to minimise repetitions, however, the nature of the dissertation presentation is such that repetition is inevitable. Chapter 6 presents the overview, conclusion, and policy recommendations.

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CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

This chapter reviews the relevant literature that deals with current knowledge, substantive findings of market access and farm income, as well as theoretical and methodological contributions. The issues reviewed include factors that influence farm income and perception among smallholder farmers regarding market access. The chapter begins by defining smallholder farmers and their importance, and further identifies the farmer's demographics, infrastructural and institutional factors that influence perception and farm income among smallholder farmers. The chapter ends by reviewing marketing channels available.

2.2. Concept of smallholder farmers

The concept smallholder farmers refers to disadvantaged farmers who do not have enough resources and technologies but still manage to produce (Mathagu, 2016). Dixon et al. (2004) defined the concept smallholder farmers as those with limited resource endowments, relative to other farmers in the sector. In Latin America, there are three categories of smallholders, asset-poor smallholders, those with limited assets and asset-rich smallholders. In other words, the basis of the international definition of smallholder farmers is asset portfolios, whereby farmers with limited assets are regarded as smallholders.

According to DAFF (2012), farmers differ in individual characteristics, such as farm size, resource distribution between food and cash crops, livestock and off-farm activities, their use of external inputs and hired labour, and the proportion of food crops sold and household expenditure patterns. According to Hlongwane et al. (2014), South African agriculture has two main categories of farmers, the subsistence farmers in the former homeland areas and the larger-scale commercial farmer.

According to Ortmann and King (2006), smallholder farming is usually associated with Black farmers found mainly in the "former homelands" of the country. There is a perception that the size of the land available usually defines smallholder farmers. Rangoato (2018) defined

smallholder farmers as those with less than 2 hectares, limited resources and a need for external support so they can farm successfully.

However, Kirsten and Van Zyl (1998) argue that size is not a good criterion for defining small farms. They further defined smallholder farmers as farmers associated with backward, non-productive, and non-commercial subsistence agriculture found in the former homelands. Smallholder farmers work on small plots or gardens and rely on additional forms of income, such as social grants (Mdlalose, 2016; Sinyolo, 2016).

2.3 Importance of market access towards smallholder farmers

The proponents of smallholder farming argue that with enhanced market access, smallholder agriculture has the potential to commercialise and contribute towards food security and poverty alleviation through food price reduction and employment creation (Jari & Fraser, 2012). According to NAMC (2016), "market access, in the context of smallholder farmers, can be defined as the ability of these farmers to seize available market opportunities. This may serve as a profit incentive and may encourage farmers to increase production, thus contribute to household income and food security".

Markets are important because they act as a mechanism for exchange, derive benefits such as income and open opportunities for rural employment (Machethe, 2004). Marketing activities, such as processing, transportation and selling, can employ those willing to exit the farming sector. Smallholder farmers in markets contribute to poverty alleviation, which is important for sustainable agriculture and economic growth. Food price reduction, employment creation and farm income generation reduce poverty. Farmers' abilities to plough back their farm profits into the farm business result in sustainable agriculture and economic growth (Jari & Fraser, 2012).

Investment in agriculture is widely recognised as a key precondition in achieving goals related to improving food security, creating jobs, creating wealth, and thereby reducing poverty (Wiese, 2020). Smallholder farming has the potential to increase the Gross Domestic Product of South Africa, but this can only happen if the smallholder farmers have access to markets and

have resources to produce high-quality products. Integration in the agricultural sector will only be successful when smallholder farmers fully participate in the market (Makhura, 2001).

Consequently, there is a common argument that reducing barriers to market access may accommodate smallholder farmers into the mainstream economy, thus improving household food security, reducing poverty, enhancing agricultural development, and improving economy-wide growth (NAMC, 2016). Marketing activities, such as processing, transportation and selling, can employ those willing to exit the farming sector (Jari & Fraser, 2012).

2.3.1 Poverty alleviation

Empirical studies have exclusively focused on the question of smallholder farmers' contribution to supplying high value chains, and have failed to measure the welfare and poverty effects (Sikwela, 2013). Marketing plays an important role in income generation that helps reduce poverty and improves the standard of living for smallholder farmers. Market access is a process of creating a lucrative path for smallholder farmers, however poor infrastructure and high transactional costs reduce the chances of getting high incentives for market participation (Ahmed et al., 2016). According to Machethe (2004), poverty is more pervasive in rural areas, particularly in the former homelands.

According to Mdlalose (2016), South Africa ranks among the countries with the highest rate of income inequality in the world. A report by the National Treasury (2019) stated that South Africa's current economic trajectory is unsustainable, hence economic growth has stagnated, unemployment is rising, and inequality remains high. Therefore, to escape poverty, many rural communities participate in smallholder farming as their main livelihood activity, which serves as a source of food and income.

According to Du Toit (2017), rural poverty and inequality in South Africa is "extreme and exceptional." Agriculture contributes to poverty alleviation at rural, urban, and national levels in three ways, namely (i) reducing food prices, (ii) employment creation, (iii) increasing real wages and improving farm income. It was estimated that approximately 240 000 Black farmers

in South Africa provided livelihoods for more than a million family members, as well as temporary employment for 500 000 people (DAFF, 2011; Ntshephe, 2012).

A strong economy ensures established markets, both input and output markets, to the farmers helping them overcome the vicious circle of 'grow-eat-grow' that will eventually help the economy become stronger in international trade (Ahmed et al., 2016, citing IFAD, 2013). The consequences of the difficulties that smallholders face can be explained by the distinctive ‘poverty trap’ (Figure 2.1), as described. The ‘poverty trap’ is a typical, self-enforcing cycle in which the poverty-stricken are inescapably caught. This trap is due to a weak institutional and infrastructural environment, where smallholder farmers’ strategies result in low economic activity, thin markets, high transaction costs and risks and high unit costs that limit access to markets and development, which in turn result in the constrained economic development of those farmers.

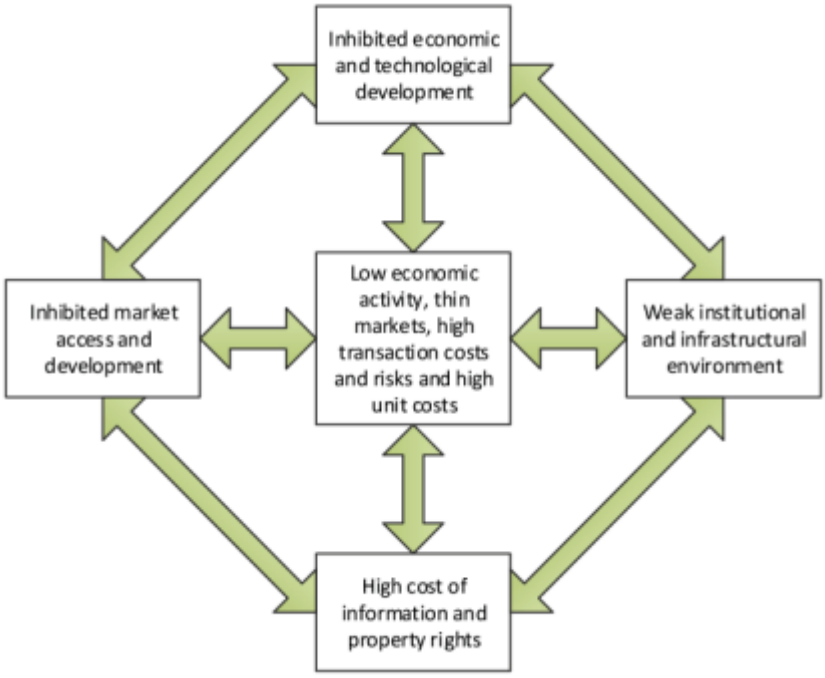

Figure 2.1: The classic poverty trap

Source: adapted from Louw and Jordaan (2016)

The premise is that a change in smallholder farmers’ risk-bearing or management capability is critical to escaping from the poverty trap. The belief is that the central ‘market access’ theme, as an obstacle to the development of smallholder farmers, is the result of farmers’ inability to

endure or manage risks rather than a superficial view of market access independently (Louw & Jordaan, 2016).

2.3.2 Food security

According to Beharielal (2017), citing The World Bank (2014), the estimate is that 30-40% of South African households have food insecurity; this inadequacy stems mainly from the lack of physical availability of food in rural areas or in terms of not having assured access to adequate diets. Approximately one-third of South Africans are involved in smallholder farming, even though it contributes less than 5% of their total income (Mdluli et al., 2013). Increased smallholder production has the potential to improve the food security of poor households both in rural and urban areas by increasing food supply, and reducing dependence on purchasing food in a context of high food price inflation (Mdlalose, 2016).

Regardless of the low contribution of smallholder farming to South African agricultural production output, it does contribute directly to household food security (Pienaar & Traub, 2015). These contributions can be in terms of making food available through direct supply as well as through income generation from the sale of produce and diverted to purchasing food from retail stores and meeting other requirements of the household, such as utility bills. Engaging in smallholder farming has the potential to lead to greater availability of food, and consequently increase economic growth and stability (Beharielal, 2017).

Market access for smallholder farmers remains a crucial aspect; enhancing the livelihood of smallholder farmers is important to alleviate poverty and food insecurity (Asare-Nuama & Mandaza, 2020). The basic definition of food security is that it refers to the ability of individuals to obtain sufficient food on a day-to-day basis (Du Toit, 2017). According to Du Toit (2017) "food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life." Food security means that everybody can get enough healthy food to be well and active. "Food security means that all people at all times have both physical and economic access to enough food for an active, healthy life" (Bajagai et al., 2016; Mdlalose, 2016). According to World Food Program (2016), food security has four main elements: "Food

availability (Food must be available in sufficient quantities and on a consistent basis), Food access (people must be able to acquire adequate quantities of food regularly through purchase, home production, barter, gifts, borrowing or food aid), Food utilisation (consumed food must have a positive nutritional impact on people; it entails cooking, storage, and hygiene practices) and Food stability (the supply of food must always be in access regardless of the challenges such as weather variability, price fluctuation, political factors and economic factors).

2.4 Constraints to smallholder agriculture

researchers believe that most smallholder farmers aim to reap economic benefits alongside the fulfilment of subsistence goals. However, for smallholder farmers, the environment for economic growth is constrained by challenges of production, infrastructure and lack of access to the markets (Thamaga-Chitja & Morojele, 2014). Smallholder farmers often lack resources and access to market infrastructure to trade their produce in time at different markets (Senyolo et al., 2009); this reduces their incomes, which simultaneously reduces their living standards and causes food insecurity. Smallholder farming households usually protect or hold their produce as a form of security against food insecurity through their production (Ahmed et al., 2016). Adequate access to relevant marketing information that is user-friendly and relevant remains a problem for the smallholder sector. This challenge limits adequate access to markets by smallholder farmers resulting in limited growth and less income realised by these farmers (Ntshephe, 2012).

Smallholders, especially in less developed countries, have encountered several challenges in gaining access to markets, such as constraints on production, high transaction costs, lack of information on markets, grades and standards, the organisation in markets, legal environment, storage facilities, market transport and value adding (Hassan, 2015).

Despite heavy investment in research and development for the agricultural sector, the benefits do not translate into the improved livelihood of smallholder farmers. In rural areas, the main activity is farming and related activities; despite the decent growth in the South African agricultural sector and improvement of policies towards smallholder farming, reduction of rural poverty is still a problem.

Constraints limiting smallholder farmers from greater access to food markets are associated primarily with under-developed infrastructure, ranging from the non-existence of local market spaces to unreliable sources of market information. Poor infrastructure, lack of market transport, and inability to conclude contractual agreements are some of the factors limiting rural farmers from accessing formal markets (Mdlalose, 2016).

2.5 Factors influencing market access perception and farm income of smallholder farmers

2.5.1 Infrastructural factors in agriculture

In terms of marketing infrastructure in South Africa and other developing countries, it is common knowledge that rural roads are generally of poor quality and in poor condition (Groenewald & Jooste, 2012). According to Senyolo (2007), infrastructure directly affects human welfare and equity across community and income groups. Urban and rural households in South Africa experience widely different access to basic infrastructure services. Infrastructure is one of the keys to profitable development (Sikwela, 2013).

The availability and access to infrastructural services such as electricity, serviceable roads, and telecommunications influence the marketing decision of citrus fruits. The lack of properly maintained roads, telephones, fencing water and electricity makes it very difficult for smallholder farmers to run farming operations. In addition, Government's efforts to provide marketing infrastructure have reportedly neglected the participation of communities, farmers, and traders (Groenewald & Jooste, 2012).

Smallholder farmers in rural areas face numerous technical constraints, including poor infrastructural development and limited access to markets (Mdlalose, 2016). High transaction costs are one of the major factors constraining the growth of smallholder agriculture in African countries, which is largely attributable to poor infrastructure (Chaminuka et al., 2006; Senyolo, 2007). Poor management and technical capacity of co-operatives are problematic for

smallholder farmers' institutions, thus hindering market access (Thamaga-Chitja & Morojele, 2014).

Transaction costs include the costs resulting from relative distance from markets, poor infrastructure, high marketing margins, imperfect information, supervision, and incentive costs (Machethe, 2004). The improved infrastructure reduces the cost of transactions for participants in the economy and can improve overall development outcomes and economic competitiveness (Senyolo et al., 2009); however, smallholder farmers are located in remote areas and experience lack of infrastructure such as roads, telecommunication, and electricity.

2.5.2 Physical infrastructure

Good physical infrastructure is a requirement for smallholder farmers to achieve higher levels of productivity and profitability (Mdlalose 2016). Senyolo (2007) describes infrastructure as the capital stock that provides public goods and services. According to Machete (2004), citing Kirsten et al. (1998), in South Africa there is inadequate physical infrastructure in rural areas, particularly former homeland areas, which remain a major obstacle to smallholder agricultural growth. Deficiencies in rural physical infrastructural services result in poor functioning of domestic markets due to reduced market participation, little spatial integration, low price transmission and weak international competitiveness (Mthembu, 2008).

Moreover, inadequate physical infrastructure in rural areas, particularly in the former homelands, remains a major obstacle to such growth in South Africa. Despite government initiatives to improve the quality of infrastructure in the rural areas through programmes, such as the Community-Based Public Works Programme, the Consolidated Municipal Infrastructure Programme, and the Poverty Relief and Infrastructure Investment Fund, there is little impact on the improvement of the livelihoods of many rural people (Senyolo et al., 2009).

South African urban areas are generally well-serviced in terms of electricity, water and sanitation, information and communication technology (ICT), and transportation, while their rural counterparts fall significantly short in these respects (Gnade, 2015). Several studies, for example, have used aggregate data to link the levels of infrastructure investment with indicators

of smallholder productivity growth and related outcomes (Senyolo et al., 2009; Jari & Fraser, 2012; Chamberlin & Jayne, 2013; Mdlalose, 2016).

Consequently, Pinstrup-Anderson and Shimokawa (2006) presented a sketch with several channels by which physical infrastructure has an impact on production and market decisions (Figure 2.2). Physical infrastructure, such as irrigation and transport and road systems, together with institutions such as banks and markets make possible a range of production options, which translate to higher agriculture productivity through technology adoption (Senyolo, 2007). In this view , smallholder farmers need to locate themselves where there is a good physical infrastructure to achieve high levels of agricultural productivity.

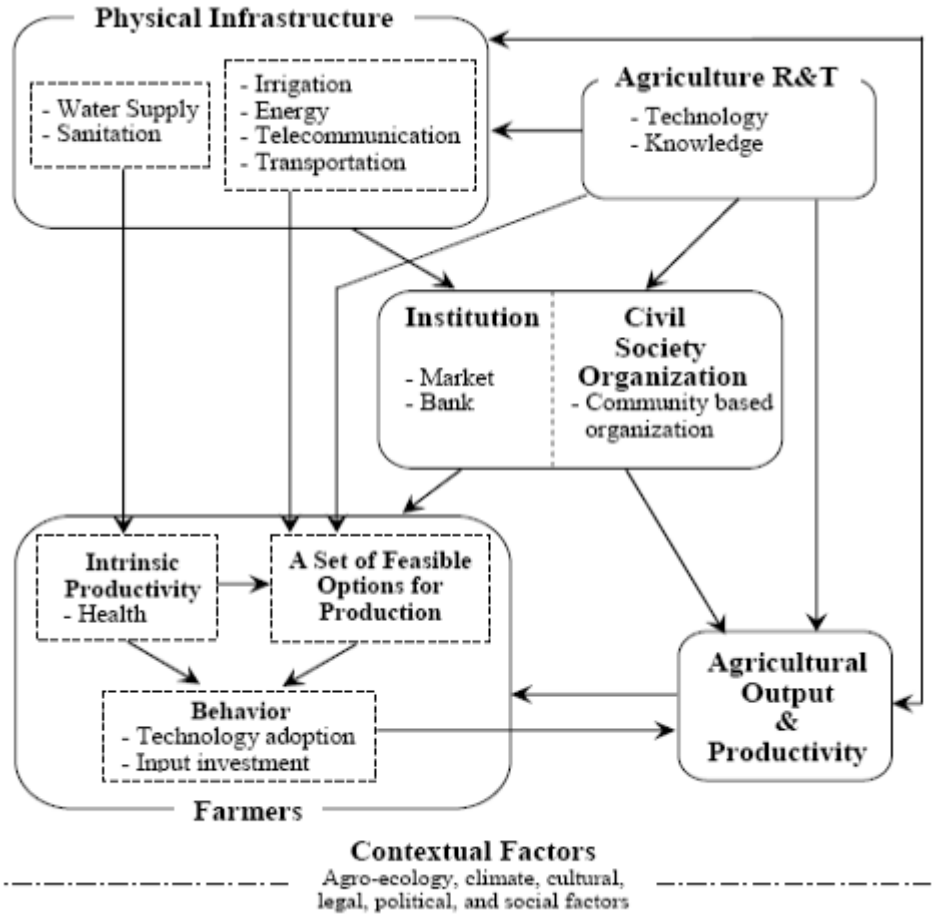

Figure 2.2: How infrastructure promotes agricultural development
Source: adapted from Pinstrup-Anderson and Shinokawa (2006)

2.5.3 Storage facilities

Storage is an important marketing and income-saving infrastructure , which preserves goods until final disposal. Thus, storage facilities ensures a continuous flow of goods to the market.

Harvest usually occurs at the same time for all farmers producing the same product, leading to a glut of produce that cannot be consumed immediately (Randela et al., 2008). Therefore, through proper storage facilities, some products may be stored and sold when required (Mdlalose, 2016).

Citrus fruits tend to have a limited shelf life, and proper storage facilities are vital in ensuring quality maintenance for perishable agricultural produce. The quality of citrus fruits may be compromised due to lack of suitable storage facilities. Therefore, the absence of proper storage facilities puts farmers at risk earn lower final consumer price (Mdlalose, 2016; GAIN, 2017). Therefore, farmers who can maintain the quality of produce should be able to expand their marketing opportunities to compete in the profitable markets place (Mdlalose, 2016).

According to Baloyi (2010), smallholder farmers do not have on-farm infrastructures such as storerooms and cold rooms to keep their produce in good condition after harvesting. Lack of such post-harvest facilities is, therefore, as a barrier to entry into formal agricultural markets (Kekana, 2017). Farmers in n rural areas do not have storage facilities. s. Such being the case, most smallholder producers sell their produce at lower prices immediately after harvest. (Jari & Fraser, 2012).

The foregoing suggests that with better storage facilities has control over their produce as they have options to sell or store their produce until when market prices are high. It is, therefore, evident that infrastructure plays a pivotal role in farmers' decisions to utilise formal marketing channels and sell their produce in the distant future. Any development towards encouraging smallholder farmers to utilise both formal and informal markets should, nonetheless, address the issue of infrastructure. (Kekana, 2017).

2.5.4 Access to credit

Access to agricultural credit is a crucial element in the empowerment process, and credit is one of the accelerators of agricultural development. Credit is an important institutional factor that can help farmers obtain or afford factors of production. Two problems that smallholder farmers

face are insufficient access to credit and high-interest rates (Machete, 2004). The conditions set by the formal credit providers make it difficult for smallholder farmers to obtain credit (Moloi, 2008). Due to a lack of access to credit smallholder farmers and other entrepreneurs encounter problems to finance their operations (Groenewald and Jordaan, 2012). Examples of such operations include the production of surplus and venturing in commercial production. .

According to Groenewald and Jordaan (2012), smallholder farmers from rural areas in many parts of the world have lived in a vicious cycle of poverty: low rates of capital investment, coupled with low incomes, inevitably led to low savings, low productivity and ultimately poverty and low investment. Improving access to credit is often one of the key elements in raising agricultural productivity (Machethe, 2004); the poverty cycle can be broken with the more effective functioning of the financial market, including credit institutions. The main functions of this market are: the generation and/or increase of incomes through investment and production/ marketing credit, stabilisation of income and consumption through savings/dissaving and consumption credit, and security of income by providing potential access to finance.

In the stage of enterprise establishment, smallholder farmers may depend on government grants, their own resources and/or those of friends and relatives. The challenge will arise when there is a need for more capital for their business expansion. In most cases, profits accumulated by the business are often not adequate to meet the expansion needs (Mdlalose, 2016). Poorer communities have been unable to access sufficient credit; due to lack of collateral, formal credit institutions, such as banks, have not been willing to supply credit to poor entrepreneurs or SMME's (Groenewald & Jordaan, 2012). Creditworthiness involves the lender's evaluation that the borrower will have sufficient debt-servicing reserves to meet the terms of the loan contract, and that the borrower can furnish sufficient collateral to reduce lending risks the loan contract, and that the borrower can furnish sufficient collateral to reduce lending risks to an acceptable level (Mdlalose, 2016).

Several initiatives by both the government and private sector aimed at addressing the issue of credit or financial support to smallholder farmers. The Comprehensive Agricultural Support

Programme (CASP) and the Micro Agricultural Financial Institutional Scheme of South Africa (MAFISA) were the two financial interventions aimed at smallholder farmers (Sikwela, 2013). Smallholder farmers face problems in attracting external finance and other necessary resources to establish and expand their businesses. This implies that smallholder farmers find it difficult to raise capital that can improve the marketing of their produce to earn an income. Access to formal private financial services by smallholder farmers is constrained by high transaction costs, inadequate collateral and poor debt-servicing capacity. A study by Mdlalose (2016) indicated that formal financial institutions are not keen to engage new entrepreneurs, as they view their activities as risky investment areas.

The Comprehensive Agricultural Support Programme (CASP), introduced in 2004, aimed to provide support to smallholder farmers and land reform beneficiaries in the following areas (Department of Agriculture, 2004): information and knowledge management, technical and advisory assistance, regulatory services, training and capacity building, marketing and business development, on-farm and off-farm infrastructure and production inputs, and financial assistance.

Briefly, the South African credit institution tries to integrate smallholder farmers. However, the challenge is that credit institutions fear that smallholder farmers may default in repaying loans. Furthermore, access to credit is not a sufficient condition for the emerging farmers to earn income though is very necessary. Additionally, it is not possible to utilise credit efficiently without other factors of production and if credit is not utilised for its intended purpose, it cannot make a difference on farm income to the smallholder farmers (Moloi, 2008).

2.5.5 Transaction costs (TCs) in smallholder farming

According to Ortmann and King (2006), transaction costs are the costs of organising and transacting exchanges; they include costs of obtaining information about alternatives and costs of negotiating, monitoring, and enforcing contracts. According to Jari and Fraser (2012), transaction costs are observable and non-observable costs associated with enforcing and transferring property rights from one person to another. These include the costs of searching for a trading partner with whom to exchange, the costs of screening partners, bargaining, monitoring, enforcement and, eventually, transferring the product to its destination.

Furthermore, identified high transaction costs as the embodiment of market access barriers among resource-poor smallholders. These high transaction costs result from individual produce transportation and selling, difficulties in getting trading partners and poor bargaining power (Makhura, 2001; Jari & Fraser, 2012; Hassan, 2015).

High transaction costs are largely attributable to poor infrastructure and are one of the major factors constraining the growth of smallholder agriculture in African countries (Machethe, 2004). When transaction costs are high, smallholder farmers may cease produce marketing; in other words, with high transaction costs, markets fail in their role of allocating scarce resources to alternative ends. In South Africa, Makhura (2001) explained that high transaction costs prevail among the smallholder farmers. Such farmers are located in remote areas, thus geographically dispersed and far away from lucrative markets. There is no doubt that high transaction costs tend to discourage commercialisation (Hassan, 2015).

Transaction costs have significant negative effects on market participation. High transaction costs, including the costs of information and the costs associated with the distance to formal markets and contract enforcement, are detrimental to the efficient operation of markets for inputs and products. Improved information and transport infrastructure, and promotion of institutional innovations, such as production and marketing cooperatives, could reduce transaction costs of acquiring inputs and selling farm output (Senyolo 2007; Mdlalose 2016). Smallholders would be in a better position to reduce transaction costs for their market exchanges, obtain necessary market information, secure access to new technologies, and tap into high-value markets, allowing them to compete more effectively with large farmers and agribusinesses.

Distance to the market, together with poor infrastructure and poor access to assets and information results in business costs (Senyolo et al., 2009). Since smallholders are poor, they find it difficult to compete in lucrative markets due to the high transaction costs. Traders with higher social capital are better able to enter more capital-intensive marketing activities such as wholesaling and long-distance transport, whereas traders with poor social networks face major barriers to entering the more lucrative market segments (Hassan, 2015).

Of importance is that farmers' ability to sell is largely determined by the 'cost' of selling, normally referred to as transaction costs. The higher the transaction costs the less likely it becomes for farmers to engage in profitable and competitive agricultural marketing activities. Some of the public interventions can go a long way in reducing some of these costs as well as reducing marketing risks. High unit costs (or transaction costs) of getting products to the market lead to low farm prices and are caused by low volumes, long distances to the markets, poor infrastructure, poor product quality, marketing at the wrong time, poor contacts, etc. All of these could inhibit market access. Investigating the causes of poor market access is one thing, but structuring government programmes to address the root causes behind the symptoms is another broad challenge (Department of Agriculture, 2004).

Briefly, lowering transactional costs would be of great benefit to farmers. Studies indicate that improved infrastructure reduces the cost of transactions for participants in the economy (Makhura, 2001; Mdlalose 2016).

2.5.6 Transportation

Road infrastructure and transport availability influence smallholder accessibility of the output market, especially if they are located distant from the consumption locations. Transportation plays a role in farmers' perspective when it comes to market access. It is difficult to transport produce to the market in time (produce spoilage and losses) if there is no reliable private form of transport since public vehicles tend to be limited in rural areas. In addition, the unavailability of reliable transport will increase transport costs, which in turn increases transaction costs amongst smallholder farmers (Jari & Fraser, 2012).

Transportation is of vital importance to business activities as it connects businesses to customers, transports produce to markets, and inputs to farms. Some researchers do not consider transportation costs as a transaction cost component (Mdlalose, 2016). According to Senyolo (2007), poor road conditions, high transport costs and distant markets are factors that hamper improved market access for smallholder farmers in South Africa. Citrus fruits are

extremely sensitive to any physical changes during transportation and handling, which can cause various forms of bruises and cuts on the fresh fruit, which compromises its quality, and aesthetic appeal and reduces its economic value to the farmer and retailer.

The poor state of transport infrastructure in many countries meant that smallholders faced high transport costs, especially during the rainy season when rural roads become barely usable, preventing farmers from seeking alternatives to farm-gate sales (Kekana, 2017). Low-income earners dominate rural areas, forcing farmers to pursue larger and more developed markets, which are usually further away. Smallholders usually need to rely on public transport to take their output to the market because transport contractors are reluctant to service smallholders due to the poor quality of feeder roads in rural villages. Although public transport may be available, it is not always adequate for transporting crops to markets (Mdlalose, 2016).

2.6 Institutional factors in agriculture

Several factors add to the perception and fundamental agricultural knowledge of smallholder farmers (Maila, 2019). Institutional constraints may arise directly or indirectly from a perceived lack of either government or private sector support (Mdlalose, 2016). Smallholder agricultural growth is not achievable without farmer support services. In South Africa, institutions play an important role in promoting or hindering economic performance in general, and market access in particular (Obi et al., 2012). Furthermore, the view of institutions can be in terms of their 'market-creating' or 'market-inhibiting' attributes, to the extent that such issues as property rights and rule of law influence the participation of persons and groups in the economic lives of their societies.

In defining institutions, Mdlalose (2016), citing North (2000), states that institutions are the rules, norms and procedures that guide how people within societies live, work and interact with each other. Institutions are divided into formal and informal institutions. The government usually enforces formal institutions, which refers to legal rules such as laws, contracts, and constitutions. Informal institutions refer to non-legal rules enforced by peers, and these include norms of behaviour, self-imposed codes of conduct, customs, and religions. Generally, both formal and informal institutions govern societies.

From numerous studies on the subject of institutional economics, it is clear that institutions, defined broadly as 'rules of the game' and encompassing such elements as transaction costs and risks, information flows, property rights, etc., can enhance or inhibit market access and market development (Obi et al., 2012).

In a study by Kassem et al. (2021), institutional support barriers were deemed more important than the farming experience by smallholder farmers. Institutional factors play a vital role in smallholder farm income and marketing. Accordingly, members of marketing organisations get specific information that enables them to develop their export-oriented businesses. In the same vein, farmers who did not join marketing or export organisations tended to consider institutional support barriers more important than those who had joined marketing organisations. Farmers' organisations help mobilise collective action; they link farmers with other organisations in the agricultural value chain.

2.6.1 Access to marketing information

Market information is vital to the market participation behaviour of smallholder farmers. A study by Ruijs (2002) outlined that market information allows farmers to take informed marketing decisions related to supplying necessary goods, searching for potential buyers, negotiating, enforcing contracts and monitoring. Necessary information includes information on consumer preferences, quantity demanded, prices, produce quality, market requirements and opportunities of equal importance is the source of market information because it determines the accuracy of the information (Jari & Fraser, 2012).

Access to market information is vital for a farmer to make a sound marketing decision. In most cases, smallholder farmers do not have access to such vital information. This information refers to current price information, forecasts of market trends, sales timing and other information (Tshuma, 2014). Asymmetric information reigns in the market; auctioneers and speculators normally have better information about marketing conditions; this leads to frustrations during

negotiations at auction sales and with private speculators. In turn, low rates of price acceptance reduce the number of buyers willing to deal with the farmers (Groenewald & Jooste, 2012).

Lack of specific market information, and knowledge of how the market functions, is a critical matter for smallholder farmers that could improve livelihoods. Researchers argue that it is the poor understanding of rural peoples' way of communal life that also tends to influence 'group' projects that may need to be unpacked and well understood for business-oriented interventions and investment in smallholder agriculture to be successful (Thamaga-Chitja & Morojele, 2014). Additionally, market information tends to influence market access (Sehar, 2018).

Smallholder farmers have difficulties in accessing market information, exposing them to a marketing disadvantage (Mdlalose, 2016. According to Jari and Fraser (2012), citing FAO (2004), smallholder farmers normally rely on informal networks (traders, friends and relatives) for market information due to weak public information systems. However, such individuals may not have up-to-date and reliable market information, making the usefulness of the information doubtful. Additionally, farmers relying on informal networks for market information are at risk of getting biased information due to the opportunistic behaviour of the more informed groups. For instance, smallholders usually accept low prices for their crops when the broker informs them that their produce is of poor quality. Smallholder farmers accept these low prices mainly because they are unable to negotiate from a well-informed position. (Jari & Fraser, 2012).

Local people in the communal areas have developed mechanisms that allow them to cope with situations of relative scarcity and shortages of necessities (Obi et al., 2012). The fact of communal 'sharing and working' clashes or mismatches the profit-oriented way of business, and this in turn adversely affects market access for smallholder farmers. The researchers believe it is possible to harness the communal spirit to strengthen volumes and yield targets for market access, as long as extensive capacity-building programmes that are sensitive to the smallholder farmers' needs accompany this (Thamaga-Chitja & Morojele, 2014). Furthermore, access to institutions that provide relevant information is important for market access.

Access to information among smallholders is generally poor and compounded by the lack of reliable and efficient means of disseminating information (Mdlalose, 2016). Insufficient market information is common due to a large number of smallholder producers, inefficient communication systems and low levels of literacy, as well as information administration. The lack of access to information puts smallholder farmers at a marketing disadvantage in that they may not know what commodities to produce, the relative quantities to produce, and the most economical way to produce them with the resources available. In remote rural areas, the lack of reliable information is a major constraint (Omiti et al., 2007).

Despite their poor functioning, there was evidence to suggest that access to market information does make a difference to smallholders' income. Smallholder farmers with better access to market information, through the use of information and communications technology (ICT), tend to sell a lot more and receive relatively better prices than other farmers (Kekana, 2017). According to Sehar (2018), smallholder farmers who do not have all the relevant information are not able to contract and enforce terms of exchange, which might result in them being exploited by well-informed buyers. Considering the situation in South Africa, the shortage of valid market information is critical since information since most farmers depend on farm income to maintain their livelihood.

In nutshell, there is a need for sources of information to provide a reliable in terms of supplying information on time and efficiently. Consequently, agricultural production knowledge is important, and improvement in knowledge and information on the market side is equally important. In developing countries, however, such information is not always obtainable and may not always be reliable, so there is an increased risk of poor market performance and failures (Mdlalose, 2016).

2.7 Smallholder farmers' demographics

A study by Moloi (2008) showed that the demographic factors, infrastructural factors and institutional factors in an entrepreneur's environment directly affect the success and economic development of the enterprise. As a result, the farmer's income often varies due to demographic factors such as education level, age of household head and gender. In addition to this, Wye

(2003), as cited by Moloi (2008), refers to relevant training, socioeconomic conditions, level of organisation and availability of extension services as determinants of smallholder farmers' market access. In most instances, these factors have a direct positive or negative impact on the level of farm income.

Age is an important factor that can determine the farming experience of a farmer. According to Kekana (2017), older people tend to have more dependents and more subsistence activities, hence low market participation. In line with Mdlalose (2016) and Rangoato (2018), market participation declines with age, indicating that such characteristics of older farmers are risk aversion and reluctance to adopt technology, and hence inability to produce for the market. This implied that older people are accustomed to their subsistence way of farming and are not willing to adopt new ideas of commercialisation.

However, according to Maponya and Moja (2012), age increases the chances of farmers and households selling produce to the markets. The study stressed that any age category can participate and sell their produce to markets, and indicated that older and younger generations can learn from each other's experiences to participate in markets. Makhura, in 2001, outlined that older farmers were more likely to participate in horticultural markets, but tended to sell significantly less compared to younger farmers.

According to Kekana (2017), citing FAO (1995), in rural areas females are more likely to participate in subsistence crop farming compared to males, which may suggest that males were more likely to migrate to the cities to search for jobs to diversify sources of income. Women remained at home to take care of agricultural activities, such as crop production for survival, as well as to attain food security for the household. Makhura (2001) found the female gender to be more market-oriented than males; it was evident that for any development in improving market participation, gender should not be a determinant criterion as it would exclude many deserving farmers from lucrative opportunities.

In developing countries, women make up the majority of the agricultural sector and integrating agricultural training with enterprise training can help these smallholder women to manage and market their products more effectively and take advantage of new agricultural opportunities. A high level of education amongst the farmers may assist them to understand and interpret market information correctly, can network and communicate their business ideas, have better general farm management principles and marketing skills, and developing financial intelligence (Moloi, 2008).

Education is one of the most important factors that may contribute to a better livelihood of an individual or community. Education can optimise smallholder farmers to be business and profit-oriented. Mdlalose (2016) stated that South Africa, like other countries, would find it difficult to develop without well-educated people with a strong agricultural base among all population groups to provide food security for improved nutrition and health.

Education is essential to farmers as it determines the ability of a farmer to adjust to innovations (Gidi, 2013). Ortmann and King (2007) indicated that poor management, lack of training, conflict among members (due mainly to poor service delivery), and lack of funds were important contributory factors to the smallholder cooperative failures in Limpopo Province. Furthermore, farmers were constrained by relatively poor education, lack of access to information, and infrequent contacts with their local extension officers, who also may not understand the cooperative concept because of limited exposure to it.

Human knowledge can improve through formal and informal education systems. Formal agricultural education training (e.g., at universities or agricultural colleges) is needed for the production of skilled manpower to serve the agricultural sector through extension, research, entrepreneurship, and commerce, while non-formal agricultural education is particularly needed for training of farmers, farm households and workers, and for capacity building in a wide range of community based organisations and groups (Mdlalose, 2016).

2.8 Theoretical perceptions about market access

Market access of smallholders implies that smallholders can have access to either spot markets or a supply chain that delivers the required market services. The coordination of economic activities between primary producers and consumers in the supply chain can be characterised by its type of governance structure, for example, ownership, contractual or trust-based (Tilburg & Schalkwyk, 2012).

The spatial expression of smallholder farmers is remote place or area, whereby there is less production and less integrated input and output markets**.** Physical access has been the principal definition for remoteness characteristics, captured largely if not exclusively through physical mediation of roads, along with the costs of transportation, travel time to urban markets, and other transactions costs (TCs) attached to market access (Chemberlin & Jayne, 2019). An implicit assumption in most Land Reform Programmes in developing countries is that small farm sizes, which characterise traditional agriculture, contribute to low farm income and inadequate return for labour (Moloi, 2008). Market access is a major constraint that restricts rural development, and furthermore, both market access conditions, border measures and domestic support measures, such as subsidies, vitiate the capacity of African countries to develop their agricultural sectors.

According to Chemberlin and Jayne (2013), poor market access is an important explanatory factor for continuing underdevelopment in Sub-Saharan Africa, from explicitly theorised microeconomic studies and macroeconomic perspectives to more generalised perspectives on the costs and consequences of remoteness. The emphasis on “lucrative markets” is because smallholder farmers have always had access to markets, but the markets they participate in do not produce ideal profit margins for these farmers to grow the scale of production. Hence, the South African agriculture sector has adopted smallholder farmers’ commercialisation as a strategy to integrate these farmers into the mainstream economy, which is achievable through market access (Randela et al., 2008). Therefore, commercialisation is a process that entails market access, which in turn entails market orientation and market participation (NAMC, 2016).

2.9 Marketing channels available to small-scale farmers

There are five types of marketing channels available for smallholder citrus farmers in South Africa. These markets are:

i) **Local Community** – consists of any marketing practice that targets a specific community or area.

ii) **Institutional Markets** - consist of non-government organisations that buy goods and services.

iii) **Fresh Produce Market** – consists of physical market systems that allow smallholder farmers to sell their produce to consumers directly.

iv) **Supermarket** – consists of a self-service shop offering a wide variety of food organized into sections.

v) **Export Market** - consists of foreign buyers including consumers, producers, resellers, and the government.

Smallholder farmers have the potential to participate in all of the above markets.

2.10 Summary

The chapter outlined the importance of smallholder farming by highlighting its contribution to food security and poverty alleviation. Furthermore, it discussed some of the demographic factors, infrastructural and institutional factors, and examined marketing channels that smallholder farmers can utilise to their advantage. Smallholder marketing is important for South Africa due to its potential of income generation, rural development, food security and poverty reduction. The chapter reviewed the literature on constraints to smallholder agriculture and market access. Several studies effectively outlined the constraints faced by smallholder framers in South Africa, which are:

- A lack of access to land for farming
- Limited access to productive land
- Lack of provision of and access to water
- Lack of access to markets
- Illiteracy and related problems

- Minimal access to financial assistance
- High transaction costs
- Poor infrastructure, such as roads
- Minimal access to cooperatives and marketing organisations
- Lack of knowledge about existing farmer organisations or unions
- Lack of access to appropriate information, technology, and extension services
- Lack of access to agricultural education and institutions (Ortmann & King, 2007; Senyolo, 2007; Mthembu, 2008; Von Loeper, 2016)

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CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

Chapter 3 presents the methodology followed in conducting the study. A description of the study area, the methods used for the sampling techniques and data collection methods, and the analytical techniques used for the study are reported and discussed. The chapter outlines the techniques used to filter factors influencing market access perception and farm income of smallholder citrus farmers in South Africa. Furthermore, the variables used in the multiple regression analysis and their expected signs are then defined.

3.2 Description of the study area

The study was conducted in South Africa, which is located at the southernmost tip of Africa (30.5595° S, 22.9375° E), covering an area of approximately 1.22 million km². Figure 3.1 shows that the total area under citrus production in 2017/18 was 77 708 hectares. Out of these 7321 hectares were registered under Black citrus growers in South Africa. The largest production areas of citrus in South Africa are Limpopo (42%), Eastern Cape (25%), Western Cape (18%) and Mpumalanga (8%), with the remaining distributed between Kwa Zulu-Natal, North West and Northern Cape. The citrus industry directly employs about 60,000 workers. . It is estimated that about 1 million South Africans earn their livelihoods through the citrus industry (NAMC, 2019).

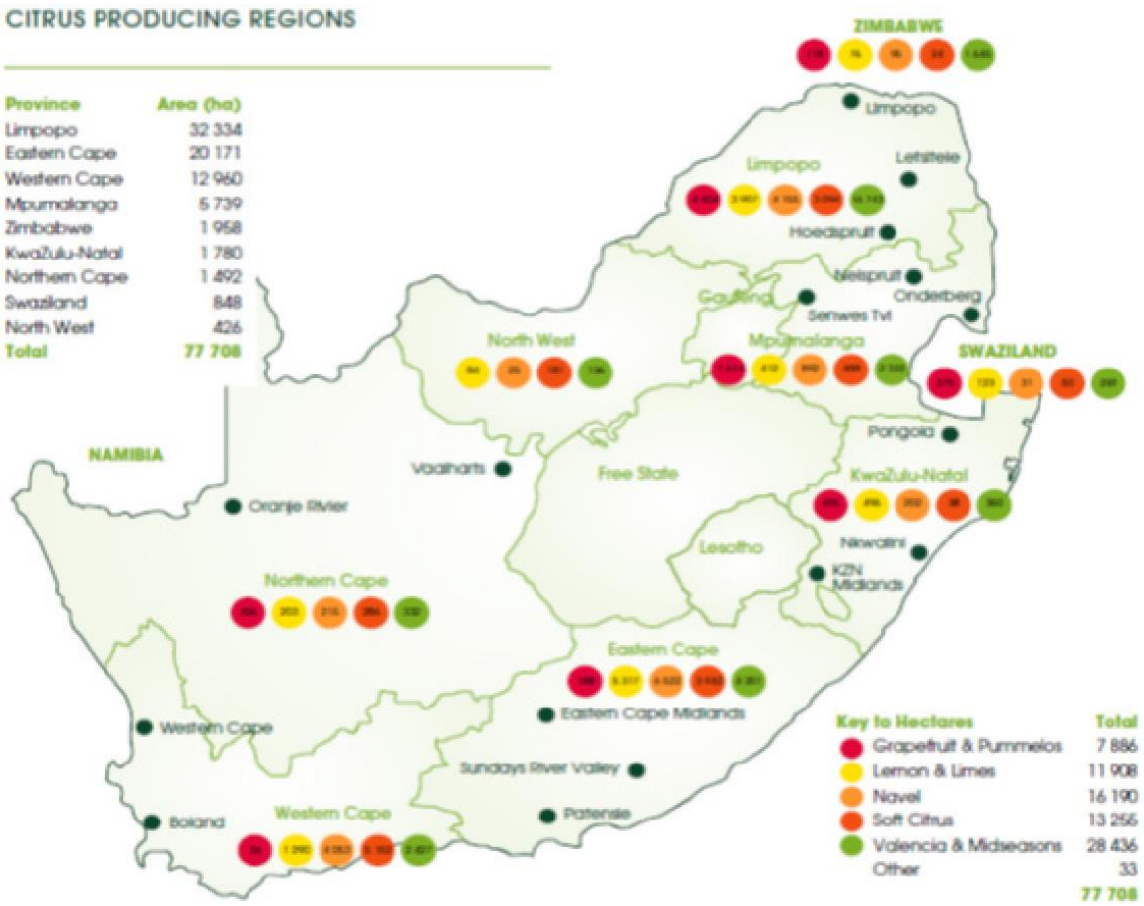

Figure 3.1: Map of citrus producing regions in South Africa

Source: NAMC (2019)

3.3 Sampling and data collection

This study used 2018/19 secondary cross-sectional data collected by the National Agricultural Marketing Council (NAMC). A sample of 68 smallholder citrus farmers was drawn from the database of the Citrus Growers Association Grower Development Company (CGAGDC), which contains 121 smallholder citrus farmers. This sample was drawn from five provinces of the country as shown in Table 3.1. A non-probability (convenience) sampling technique selected a group of farmers conveniently available and willing to participate. The basis for the collected data was the Smallholder Market Access Tracker (SMAT) of smallholder citrus farmers in South Africa

Table 3.1: Data drawn from five provinces from the CGAGDC smallholder producer's database

Province	Total population (CGAGDC database)	Sample Size	Percentage of the Total Sample
Limpopo	45	38	84%
Eastern cape	44	15	34%
KwaZulu-Natal	16	2	13%
Mpumalanga	10	9	90%
North West	4	4	100%
Gauteng	2	0	0%
Total	121	68	56%

Source: NAMC (2019)

3.4 Methods used for data analysis

3.4.1 Statistical analytical software's used

Statistical Software for Data Science (STATA 15), and Statistical Package for Social Science (SPSS 27) were used for data to analysis. These statistical software's are widely used for data analysis in social sciences. The first objective was addressed using STATA 15 and SPSS27, Additionally objective two was addressed using SPSS 27 only.

3.4.2 Descriptive statistics

The descriptive statistics which included means, percentage and frequencies, gave an overview of the characteristics of the smallholder citrus farmers.

3.4.3 Multiple linear regression model

A multiple regression analysis was used to determine the factors influencing market access perception and farm income of smallholder citrus farmers.

3.4.4 Data analysis techniques

This study used the ordinary least squares (OLS) linear multiple regression method. The multiple regression model identified and analysed determinants of farm income. Multiple regression model is a model where there is more than one explanatory variable and shows how the method of OLS can extend to estimate the parameters of such a model (Teshome et al., 2020). The technique allows appropriately coded multiple explanatory variables on a single continuous dependent variable (Melembe et al., 2020). The functional form of the multiple liner regression model is specified in equations (1) and (2) as follows;

$Y = f(X_1, X_2, \ldots\ldots, X_n, e)$ ……1

Model Specification

$$Y_i = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots\ldots + \beta_n x_n + \varepsilon_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$$

where Y_i denotes the farm income in Rands. β_0 is a constant, $\beta_1, \ldots, \beta_n$ are parameters to be estimated, $x_1, \ldots, x_n$ are the vector of explanatory variables and ε_i is an error term. OLS measured the significance of the economic relationship between the dependent variables (farm income), and a set of independent variables.

Table 3.2: Definition of variables included in the regression analysis (Objective 1)

	Variables	Description	Measurement	Hypothesised sign
Dependent				
Y_i	FARMINC	Farm income of smallholder citrus farmers	Rands	
Independent Variables				
x_1	GEND	1 if the farmer is male,0 otherwise	Binary	+/-
x_2	AGE	Age of the farmer	Years	+/-
x_3	EDUC	1 if a farmer has tertiary education,0 otherwise	Binary	+
x_4	HHSZ	Number of members in the household	Number	-
x_5	HHIN	Total household income	Rands	+
x_6	FMSZ	Total farm size	hectares	
x_7	LDOS	1 if farmer has land ownership,0 otherwise	Binary	+/-
x_8	FMEX	Years of farming experience	Years	+
x_9	LABO	1 if a farmer uses both hired and family labour, 0 otherwise	Binary	+
x_{10}	LOAN	1 if a famer has access to loan, 0 otherwise	Binary	+
x_{11}	VOMT	Total volume to the markets	Tonnes	+
x_{12}	SELLA	1 if a farmer is a contractor, 0 otherwise	Binary	+/-
x_{13}	DSMK	Distance from farm to the nearest market	Km	-
x_{14}	MKIF	1 if farmer has access to market information, 0 otherwise	Binary	+
x_{15}	STFC	1 if farmer has access to storage facilities, 0 otherwise	Binary	+
x_{16}	PKFC	1 if farmer has packaging facilities,0 otherwise	Binary	+
x_{17}	INMT	Total income from the markets	Rands	+

Source: Researcher's computation (2022)

3.4.5 Principal component analysis (PCA) and multiple regression analysis

This study used both the principal component analysis (PCA) and the ordinary least squares (OLS) regression to investigate that variables that influence the perception of smallholder citrus farmers towards accessibility of output markets.

The analysis consisted of two steps. The first step of the regression analysis involved generating the farmers' perception index using principal component analysis (PCA). Secondly, the computed farmers' perception index became a dependent variable in a linear regression. The reduction of these explanatory variables, correlated with each other, to a single variable (latent variable), is called the first component (Sinyolo, 2016; Sevinç, 2021).

The principal component is a new variable (an eigenvector, represented by an axis), resulting from the combination of the original variables, which contribute differently (in terms of the proportions of the variance brought by each one of them) to form this new axis. Variance and eigenvalue values are checked for the first component to be used safely. If these values are reliable, the first component can be a dependent variable in the analysis. This is principal component analysis, which is a method that allows the researcher to reveal and predict relationships not previously revealed. In this study, the principal component analysis was first applied to the data, and then multiple regression analyses (Sevinç, 2021).

The principal component analysis is a technique of creating new variables, which means that the linear combination of original variables. It is therefore a data reduction method, calculated as follows (1):

$$PC_1 = a_1'X = a_{11}X_1 + a_{12}X_2 + \cdots + a_{1p}X_p$$

$$PC_2 = a_2'X = a_{21}X_1 + a_{22}X_2 + \cdots + a_{2p}X_p$$

$$PC_p = a_p'X = a_{p1}X_1 + a_{p2}X_2 + \cdots + a_{pp}X_p \quad (1)$$

PC_1, PC_2, … PCp shows the main components, and $a$pp pth in the main component pth represents the importance of the variable. The first main component is the component that explains the variance at the highest level in the analysis (2).

$$Var(PC_1) = a_1' \sum a_1 \quad (2)$$

It is the component which maximises equality. First principal component, linear combination $a_1' X$ that maximises (3);

$$Var(a_1' X) \; subject \; to \; a_1' a_1 = 1 \quad (3)$$

Regression analyses are a set of statistical techniques that allow one to assess the relationship between one dependent and several independent variables, formulated as follows:

$$Y_i = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots\ldots + \beta_{17} x_{17} + \varepsilon_i \quad \ldots\ldots\ldots\ldots \quad (4)$$

where Y_i denotes the perception index. β_0 is a constant, $\beta_1, \ldots, \beta_{17}$ are parameters to be estimated, $x_1, \ldots, x_{17}$ are the vector of explanatory variables and ε_i is an error term. OLS was used to measure the significance of the economic relationship between the dependent variables (perception index), and a set of independent variables. The research aimed to determine the variables that contribute to perception regarding market access. The conversion of these given variables to one variable through the first component became the dependent variable (PCA) scores). Therefore, PC_1 generated the perception index because it explained the highest variation and it was the only component economically generated.

In the study, multiple regression analysis applied to the index values (the scores of the first component created based on five variables).

Table 3.3: Definition of variables included in the regression analysis for perception index (Objective 2)

	Variables	Description	Measurement	Hypothesised sign
Dependent				
Y_i	PERCEPTION INDEX	Index from PCA	Continuous	
Independent Variables				
x_1	GEND	1 if the farmer is male,0 otherwise	Binary	+/-
x_2	AGE	Age of the farmer	Years	+/-
x_3	EDUC	1 if a farmer has tertiary education,0 otherwise	Binary	+
x_4	HHSZ	Number of members in the household	Number	-
x_5	FMSZ	Total farm size	hectares	-
x_6	LDOS	1 if farmer has land ownership,0 otherwise	Binary	+/-
x_7	FMEX	Years of farming experience	Years	+
x_8	LOAN	1 if a famer has access to loan, 0 otherwise	Binary	+
x_9	MKIF	1 if farmer has access to market information,0 otherwise	Binary	+
x_{10}	STFC	1 if farmer has access to storage facilities,0 otherwise	Binary	+
x_{11}	PKFC	1 if farmer has packaging facilities,0 otherwise	Binary	+

Source: Researcher's computation (2022)

3.6 Summary

The chapter described the study areas, type of data used and analytical procedures and the models adopted in the study. A multiple regression analysis was used to investigate the determinants of farm income among smallholder citrus farmers. Furthermore, principal component analysis were and multiple regression model were used to determine the factors that influence smallholder citrus farmers' perception regarding access to output markets in South Africa.

3.7 References

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CHAPTER 4

DETERMINANTS OF TOTAL FARM INCOME AMONG SMALLHOLDER CITRUS FARMERS IN SOUTH AFRICA

4.0 Abstract

The aim of the study is to investigate the determinants of farm income among smallholder citrus farmers, using a multiple linear regression. This study used secondary data from the National Agricultural Research Council (NAMC), with a sample of 68 smallholder citrus farmers drawn from the database of the Citrus Growers Association Grower Development Company (CGAGDC). Results from the regression model confirmed that factors such as education, household size, household income, farm size, access to loan, access to market information, and access to packhouse were positive and significant in determining farm income of smallholder citrus farmers. On the other hand, while other variables, such as selling arrangements and access to storage facilities, were negatively significant. Descriptive statistics revealed that the majority of the smallholder citrus farmers were men (60%), with a typical farmer aged 45 years. The implication of this study is crucial to the focus group to improve their farm income.

Keywords: Multiple linear regression; smallholder citrus farmers; farm income

4.1 Introduction

Agriculture has been considered as one of the important sectors that could help and improve the inequality in income distribution, high unemployment, and poverty levels in South Africa (Ibekwe et al., 2010). Even after 20 years of democracy, this sector continues to be characterised by inequality in terms of the distribution of economic assets, support services, market access, infrastructure, and income (Pienaar & Traub, 2015). Low farm income among smallholder farmers in South Africa is still a major concern for policy makers in the agricultural industry (Senyolo, 2007; Moloi, 2008). Smallholder farmers require improved access to agricultural markets to raise their farm productivity and farm income (Chamberlin & Jayne, 2013).

According to NAMC (2016), smallholder farmers usually consume a larger proportion of their produce and/or sell the surplus to the local communities. Furthermore, smallholder farmers are excluded from most lucrative channels, such as direct sales to institutional market, fresh produce markets, supermarkets, and exports, mainly due to lack of management skills, small quantities produced, low quality of the produce, lack of suitable storage facilities, little value addition to their products, transport constraints and ineffective dissemination of information.

According to Mabe et al. (2010), agriculture contributes of to (indicate the statistics here) of South Africa's economy and over 13% to employment. in South Africa. . Poverty in rural areas is associated with agricultural policies which marginalises smallholder farmers in their access to production resources, such as land, credit and technical knowledge.

Generation of rural employment and farm income occurs when the smallholder citrus farmers produce for the market or become market-orientated. The smallholder farmers contribute positively to economic growth, rural development, agricultural development, increase in rural income and food security (Moloi, 2008). Institutional uncertainty creates an environment that discourages smallholder farmers from investing in new and productive inputs or practices because of the absence of secure expectations over possible gains.

According to NAMC (2019), the citrus industry is an important foreign exchange earner. Citrus is one of the high-value products in South Africa that is mainly destined for the export market. It comprises of five broad categories, namely oranges, easy peelers (soft citrus), grapefruit, lemons, and limes. The main association responsible for the development of the citrus industry in South Africa is the Citrus Growers Association of Southern Africa (CGA). According to GAIN (2017), the expectation is that the South Africa citrus exports to the United States will continue growing, spurred by the continued market access through the African Growth Opportunity Act (AGOA). The objective of this paper is to investigate the determinants of farm income among smallholder citrus farmers in South Africa.

4.2 The importance of farm income on smallholder farmers

As agriculture remains a major source of income and employment, agricultural growth is likely to remain crucial for alleviating poverty, particularly in the poorest countries (Ymeri et al., 2020). Most of the world's poor live in rural areas, thus rural poverty is acute in Sub-Saharan Africa and South Asia. Poverty among smallholder farmers is widespread and, in most countries, much higher than the national poverty headcount rate, the percentage of population that lies below the national poverty threshold (George, 2015). According to Ngqangweni (2000), citrus is among the crop that has potential to contribute to growth and rural poverty alleviation.

Gneiting and Sonenshine (2018) highlighted that perpetually low income levels are one of the key reasons why farmers remain stuck in poverty and under-invest in their farms. For many small-scale farmers, gaps exist between their actual income and income levels sufficient to ensure a decent standard of living. Low cash incomes implies that farmers have difficulties in purchasing farm inputs and making necessary improvements and investments on their lands. However, household demographics and socio-economic variables may affect -farm investment and - productivity among smallholder farmers (Zwelendaba, 2014). Value-added agriculture has drawn significant attention in recent years as a way to increase and stabilise incomes of farms, and rejuvenate primary agriculture and rural economy (Melembe et al, 2020).

Figure 4.1: Total distribution of citrus

Source: NAMC (2019)

Figure 4.1: The gross revenue generated from citrus markets is increasing over years, showing a lucrative potential for smallholder citrus farmer to earn farm income. According to NAMC (2019), South Africa exported 76% of its citrus in 2018 and the main markets were Europe, the United Kingdom, the Middle East, South East Asia, Russia and North America (CGA, 2018). In 2018, South Africa exported 1.64 million pallets of citrus. The value of citrus fruit in 2018 was about R19.3 billion, making it the third largest horticultural industry after deciduous fruit. The highest produced and exported citrus in South Africa are oranges, having the largest area planted and being the largest contributors to the gross value in citrus, followed by soft citrus, lemons, and limes and lastly, grapefruit in terms of area planted and gross revenue. The citrus industry also contributes to the creation of over 100 000 jobs within the agricultural industry.

4.3 Methodology

"See Chapter 3"

4.4 Results and discussion

4.4.1 Characteristics of smallholder farmers in South Africa

Table 4.1 reports continuous variables for smallholder citrus farmers in South Africa. A typical South African smallholder citrus farmer is 45 years old, with a household size of seven members. The household income of a typical smallholder grower, including income generated from farming, is R19 538.24, and the average farm size ranges around 180.76 hectares. The mean value of the farming experience for a typical smallholder citrus farmer is 18 years, while the average total volume supplied to markets is 83628.28 tons, with a total income generated from the markets being approximately R5547508. Lastly, farmers travel on average 686.14km to reach markets.

Table 4.1: Continuous variables for smallholder citrus farmers (N=68)

Variables	Mean	Std. Dev.	Min	Max
AGE	45.66	11.15	24	82
HHSZ	7.20	3.06	2	14
HHIN	19538.24	47092.52	0	390000
FMSZ	180.76	172.18	2	600
FMEX	18.16	9.57	3	50
VOMT	83628.28	175299.80	0	1400230
INMT	5547508	1.32e+07	0	1.05e+08
DSMK	686.14	1677.57	0	13332

Source: NAMC (2019)

Table 4.3 shows the descriptive statistics of categorical variables used in the study. Men play a dominant role in citrus production, as shown by the figure of 60%, with tertiary education (57%) and private land ownership (69%). According to Mabe et al. (2010), education is a basic human need, essential for meeting other basic needs and acceleration of overall development through training skilled workers and enable farmers to make fruitful use of existing resources and accurate assessment of new ones. The findings revealed that smallholder citrus farmers use both hired and family labour (66%), with a slight advantage for farmers who acquired loans from different sources (53%). Most of the farmers had access to market information (81%), and farmers preferred contractual selling arrangements (70%). The results shows that 67% of the smallholder citrus farmers could access storage facilities and lastly, access to packhouse

was at 71%. The results show a great difference between farmers who are better off than those not in terms of infrastructural factors and institutional factors.

Table 4.2: Categorical variable for smallholder citrus farmers (N=68)

Variables	Category	Frequency	Percent (%)
GEND	Male	41	60.29
	Female	27	39.71
EDUC	Primary	3	4.41
	Secondary	8	11.76
	Completed high school	18	26.47
	Tertiary	39	57.35
LDOS	Yes	47	69.12
	No	21	30.88
LABO	Family	20	29.41
	Hired	3	4.41
	Both	45	66.18
LOAN	Yes	36	52.94
	No	32	47.06
SELLA	Contract	48	70.59
	Spot selling	8	14.71
	Other	2	2.94
	No	10	14.71
MKIF	Yes	55	80.88
	No	13	19.12
STFC	Yes	46	67.65
	No	22	32.35
PKFC	Yes	48	70.59
	No	20	29.41

Source: NAMC (2019)

Figure 4.2 shows average turnover from each market channel. As expected, the export market earns the farmers the highest turnover (a combined average of R6, 5 million), and the institutional market produces the second highest turnover. Male farmers receive a higher than average income in the export market, followed by the institutional market, supermarket, and informal market; conversely, female farmers receive a higher than average income from the supermarket (NAMC, 2019).

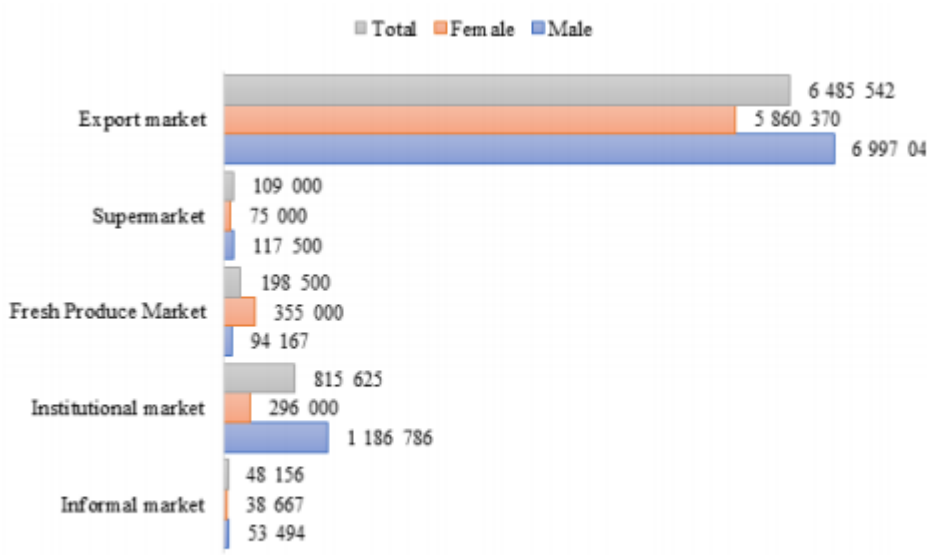

Figure 4.2: Turnover per marketing channel

Source: NAMC (2019)

4.4.2 Determinants of total farm income among smallholder citrus farmers

Table 4.4 shows the determinants of total farm income among smallholder citrus farmers. The results show that the adjusted R^2 was 95.4, meaning only 95.4% of the changes that occurred in the farm income of farmers were explained by the selected independent variables. A multicollinearity diagnostic test checked whether the assumption of OLS for multicollinearity held, or was violated. There is no high degree of correlation between explanatory variables. The VIF test result reported that the mean Variance Inflation Factor was 2.12, which is less than 10, and the minimum VIF was1.24, with a maximum of 5.79. Hence, based on test results, there was no evidence of the presence of multicollinearity problem on the data set.

Age (AGE) emerged as a significant positive variable (P=5%) in determining farm income of smallholder citrus farmers. The positive estimated coefficient of age means there is a positive association between farm income and age. A unit increase in age resulted in an increase in total farm income by R2612.08. This implies that older citrus farmers are more income-oriented compared to younger farmers. However, this result is not consistent with previous empirical results (Moloi, 2008; Mafimisebi, 2008; Mabe et al. 2010; Sinyolo, 2016). For example, Mabe et al. (2010) found an inverse relationship between age and farm income, which implies that the older the farmer's age, the lower the farm income. This may be because age affects innovation decision making, as young farmers adopt innovation compared to old farmers; also, the older farmers may be more risk averse compared to the younger. However, the findings of the current study suggest that older farmers are established in terms of experience gained over years, which contributes to higher income compared to younger farmers.

Education (EDUC) had a positive significant influence (P=10%) on farm income of smallholder citrus farmers. The positive estimated coefficient of education means there is a positive association between farm income and education. This indicates that smallholder farmers with tertiary education are likely to have an estimated total farm income of R56354.58. This implies that education increases the financial capital level and provides the necessary skills that enable farmers to earn better farm income. This result is consistent with Mabe et al. (2010) who found education to be one of the key determinants of farm income.

Household size (HHSZ) emerged as a positive significant variable (P=10%) towards total farm income. The results also indicate that larger household size are more likely to have more farm income, compared to smaller households. The positive coefficient implies there is a positive association between total farm income and household size, which means when a household size increases by one person, this will result in an increase in farm income by R11761.96. This result means bigger families can provide an additional unit support for farming production and produce an additional unit for the market. This result is consistent with Ibikwe et al. (2010) and Nzabakenga et al. (2013), who found household size to be significant and positively correlated with farm income.

Table 4.3: Regression Analysis of effect of different attributes on total farm income

	Coefficients	Std. Error	t-stats	P-value
(Constant)	-183475.27	46928.80	-3.91	0.006***
GEND	-9855.75	28698.69	-.343	0.741
AGE	2612.08	1030.150	2.53	0.039**
EDUC	56354.58	26667.78	2.11	0.072*
HHSZ	11761.96	5569.70	2.11	0.073*
HHIN	0.34	0.158	2.20	0.064*
FMSZ	1981.59	545.30	3.63	0.008***
LDOS	68077.45	37639.28	1.81	0.113
FMEX	-1008.25	1213.61	-.83	0.434
LABO	-33239.33	29542.39	-1.13	0.298
LOAN	173482.53	42572.87	4.07	0.005***
VOMT	-2.44	1.33	-1.83	0.110
SELLA	-121833.84	37232.28	-3.27	0.014**
DSMK	-36.79	65.69	-.56	0.593
MKIF	278057.44	59835.24	4.65	0.002***
STFC	-536754.48	85843.44	-6.25	0.000***
PKFC	344361.00	80248.70	4.29	0.004***
INMT	-0.304	0.171	-1.78	0.119
Number of observations	**68**			
Adjusted R^2	**0.954**			
Mean VIF	**2.12**			

*****, ** and * denote significance at the 1%, 5% and 10% levels, respectively**

Source: Researcher's computation (2022)

Household income (HHIN) had a positive significant influence (P=10%) in determining the farm income of smallholder farmers. The positive coefficient implies there is a positive relationship between farm income and household income. This infers that a change in household income by R1.00 will result in an increase in farm income by 0.34 cents. This result suggests that off-farm income has a positive effect on the households' efficiency by alleviating financial constraints in terms of timely purchase of farm inputs to maximise farm income. The

current the findings of the study are consistent with Teshome and Edriss (2013), who found a positive association between household income and income from agricultural activities.

Farm size (FMSZ) also had a positive significant influence (P=1%) in determining the farm income of smallholder citrus farmers. The positive coefficient indicates there is a positive association between farm income and farm size. This implies that a unit increase in hectare will result in an increase in the total farm income by R1981.59. This finding is line with other studies (e.g., Makhura, 2001; Senyolo, 2007; Moloi, 2008; Ibikwe et al. 2010 and Nzabakenga et al. 2013). The result in the current study indicates that farmers with larger farm sizes have high turnover compared to their counterparts. Furthermore, a study by Senyolo (2007) indicated that lower turnover farmers occupied small sized land compared to high turnover farmers.

Further results of the current study highlight that access to loans (LOAN) is significant (P=1%) and positively associated with farm income. The results also indicates that an increase in farmers' access to loan will result in an estimated farm income of R173482.53. These findings concur with those of Sinyolo (2016), who found that credit had a potential to increase the overall income or rural households. Access to credit support shapes the ability of smallholder farmers to invest for the long-term and make calculated decisions for risky income flows, thus fostering entrepreneurship development (Sinyolo, 2016).

Selling arrangements (SELLA) emerged as a negative significant variable (P=5%) in determining farm income. The negative coefficient indicates an inverse relationship between farm income and selling arrangements. The result indicates that farmers with contract selling arrangement experience a lower farm income by R121833.84. In contrast, a study by Alobo (2012) found a positive association between selling of farm products on contracts and farm income. However, there was no association between household with marketing contracts and income. This implies that factors associated with contract selling arrangements such as tax, broker levy etc. can decrease farm income of smallholder farmers.

Access to market information (MKIF) is significant (P=1%) and positively associated with farm income. This result indicates that farmers who access relevant market information can increase their estimated farm income by R278057.44. Makhura (2001) found that access to information tends to improve decision-making skills, thus lowering transactional costs of farmers. This implies that less transaction costs have a positive association on farm income. A study by Piabuo et al. (2020) found that farmers with access to information sell their produce at higher prices and make higher profits.

Access to storage (STFC) had a negative significant influence (P=1%) on farm income and the negative coefficient indicates an inverse relationship between farm income and access to storage. The result indicates that farmers with access to storage facilities ran the risk of having a lower farm income of R536754.49. These results are not in line with Mthembu (2008) who found that facilities for storage and handling are important to retain quality so that even when products were off-season consumers could still buy them, thus increase farm income for farmers.

Lastly, access to packhouse emerged as a positive significant variable (P=1%) in determining farm income of farmers. The positive coefficient indicates a positive association between farm income and access to packhouse. This implies that farmers who have access to proper packing and packaging facilities can benefit from increased sales, thus increasing farm income of farmers by R344361.00. El-Ahmed and Nabris (2019) noted that consumers were more likely to buy grapes packed per kilo rather than in bulk.

4.5 Conclusion and recommendation

Farm income plays a critical role in the overall economy of South Africa, food security, and poverty alleviation, particularly among smallholder farmers in rural areas. The objective of the study was to identify the determinants of farm income among smallholder citrus farmers in South Africa. This study used an OLS multiple linear regression model from IBM SPSS 27. The results revealed that men are dominant in citrus production, suggesting that on average, farm income is skewed towards them.

Further results from the study showed that age, education, household size, household income, farm size, access to loan, access to market information and access to packhouse were positively associated with farm income of smallholder citrus farmers. Access to packhouse had the highest positive coefficient suggesting that its contribution to total farm income is significantly high. However, other variables, such as access to storage and selling arrangements, were negatively associated with farm income. The study recommends the promotion of factors such as access to packhouse, access to market information and access to loan for smallholder citrus farmers to increase their farm income.

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CHAPTER 5:

DETERMINANTS OF SMALLHOLDER CITRUS FARMERS PERCEPTION TOWARDS ACCESS TO OUTPUT MARKETS IN SOUTH AFRICA

5.0 Abstract

This chapter investigates the determinants of smallholder citrus farmers' perceptions towards access to output markets in South Africa. Analytical models used are the principal component analysis (PCA) to induce perception index and multiple regression analysis using IMB SPSS 27. This study used data sourced from the National Agricultural Research Council (NAMC) whereby there was a sample of 68 smallholder drawn conveniently from citrus farmers from the database of the Citrus Growers Association Grower Development Company (CGAGDC). Results from the regression model confirmed that variables such as land ownership, market information and access to packhouse positively influenced the perception of farmers regarding access to output markets. The implications of this study are important for policy makers to know which determinants of perceptions are important in improving market accessibility.

Keywords: Perception index; output markets; multiple linear regression; principal component analysis; smallholder citrus farmers

5.1 Introduction

The perceptions of people on an issue reflect the amount of knowledge possessed and has a strong influence on decisions made regarding that issue, and is therefore an important aspect of socio-economic research (Nesamvuni et al., 2014). The acquisition of new knowledge and subsequent development of knowledge-based perceptions is achievable through approaches such as participatory process of social learning. Therefore, understanding farmers' perceptions is important to improve market accessibility of the current and upcoming smallholder farmers. Local based traditional knowledge influence smallholder farmers' perceptions and are critical to respond appropriately to community needs (Tshikolomo et al., 2012).

The query of market access is a decisive concept in developing countries, especially concerning smallholder farmers. There is widespread agreement that smallholder farmers require improved

access to agricultural markets to raise their farm productivity and living standards (Chamberlin & Jayne, 2019). Market access and transport costs are some of the obstacles that inhibit the growth of smallholder farmers in South Africa (Mthembu, 2008). Improvement of smallholder farmers' accessibility to output markets has a potential to reduce poverty, however two of the factors that contribute to farmers' poverty are low producer prices and high input costs (Mukwevho & Anim, 2014).

According to Mthembu (2008), formal market access is difficult for smallholder farmers in rural areas because of a wide range of barriers and constraints. Market access, in the context of smallholder farmers, is the ability of these farmers to seize available market opportunities (NAMC, 2016). Most smallholder farmers are located in rural areas, and experience poor markets access (Rangoato, 2018). They enjoy the benefits of agricultural growth, and participation of smallholder farmers in accessing output markets is invaluable.

For these reasons, most rural communities cannot improve their living standards and face a difficulty of accessing output markets (Mukwevho & Anim, 2014). A major challenge for sustainable agricultural development in South Africa is the limited ability by previously disadvantaged farmers (e.g., smallholder farmers) in accessing viable local and international markets for their produce (Senyolo et al., 2009). Market access includes the ability to obtain necessary farm inputs and farm services, and the ability to deliver farm products to buyers. The objective of this study was to analyse the determinants of smallholder citrus farmers' perception towards accessibility of output markets in South Africa.

5.2 Factors influencing perception and market access of smallholder citrus farmers

The farmer's perspective is important in studying market access because farmers make their production and business decisions based on their perceptions (Sinyolo, 2016). The majority of smallholder farmers operate in a poor environment where it is difficult for farmers to access market due to high marketing costs, poor access to marketing information and supporting services (Chamberlin & Jayne, 2013). Smallholder farmers face a range of barriers that hamper improved market access and market participation (Makhura, 2002). Smallholder farmers

require more improved access to agricultural markets in order for them to improve their productivity.

The majority of smallholder farmers operate in a poor environment, where it is difficult for farmers to access market due to high marketing costs, poor access to marketing information and supporting services. Smallholder farmers operate in the rural areas with few buyers competing for their surplus output, which has resulted in farmers being reluctant to adopt new technologies and produce for the market (Chamberlin & Jayne, 2011). Smallholder farmers often have low market access compared to their large scale farmers colleagues (Sikwela, 2013). Consequently, South African smallholder farmers find it difficult to participate in markets because of challenges in market access (Makhura, 2002).

Examples of these challenges include lack of access to land for farming, limited access to productive land, lack of provision of and access to water, lack of access to markets, illiteracy and related problems, minimal access to financial assistance, high transaction costs, poor infrastructure, such as roads, minimal access to cooperatives and marketing organisations, lack of knowledge about existing farmer organisations or unions, lack of access to appropriate information, technology, and extension services and lack of access to agricultural education and institutions. (Mthembu, 2008;, Mathagu, 2016; Mdlalose, 2016),

Institutional factors also play an important role in hindering smallholder farmers accessing profitable markets for citrus products. Empirical studies show that land tenure, access to training, access to information, and distance to market are the important factors (Khoza et al., 2019). Smallholder citrus farmers are heterogeneous in terms of factor (resource) endowment, production orientation and access to markets. Furthermore, understanding these factors influencing perceptions and market access has a potential of improving the livelihoods of smallholder farmers (Mudombi, 2011).

5.3 Methodology

"See Chapter 3"

5.4 Results and discussion

5.4.1 Descriptive statistic results

Table 5.1 reports continuous variables for smallholder citrus farmers in South Africa. A typical South African smallholder citrus farmer is 45 years old, with a household size of seven members. The average farm size ranges around 180.76 hectares, and on average, a typical smallholder citrus farmers' farming experience is 18 years.

Table 5.1: Continuous variables for Smallholder citrus farmers (N=68)

Variable	Mean	Std. Dev.	Min	Max
AGE	45.66	11.16	24	82
HHSZ	7.21	3.07	2	14
FMSZ	180.76	172.19	2	600
FMEX	18.16	9.58	3	50

Source: NAMC (2019)

Table 5.2 reports the descriptive statistics of categorical variables used in the study. Men play a dominant role in citrus production; 60% of the producers are men with a tertiary education (57%) and private land ownership (69%). Farmers who acquire loans from different sources were about 53%. Approximately 81% of the farmers had access to market information; access to market information is vital because it allows a farmer to have information about the prevailing market conditions and, therefore, is more likely to participate in marketing (Mdlalose, 2016). The results shows that 67% of the smallholder citrus farmers could access storage facilities and lastly, 71% had access to packhouse.

Table 5.2: Categorical variable for smallholder citrus farmers (N=68)

Variables	Category	Frequency	Percent (%)
GEND	Male	41	60.29
	Female	27	39.71
EDUC	Primary	3	4.41
	Secondary	8	11.76
	Completed high school	18	26.47
	Tertiary	39	57.35
LDOS	Yes	47	69.12
	No	21	30.88
LOAN	Yes	36	52.94
	No	32	47.06
MKIF	Yes	55	80.88
	No	13	19.12
STFC	Yes	46	67.65
	No	22	32.35
PKFC	Yes	48	70.59
	No	20	29.41

Source: NAMC (2019)

Results in the Table 5.3 indicate the opinion of respondents with respect to perception toward market access. Most of the attributes partially satisfied the respondents. The results show that a larger proportion of the farmers put a higher rating on safety, followed by market convenience, market flexibility and market accessibility in the regulated market. The reason for poor representation in fairness is due to fact that farmers feel they have no control of their produce once it gets to the packhouse. Due to their lack of participation in grading of their produce, they perceive they could experience cheating on prices (NAMC, 2019). There is an overall positive perception scores for the variables used in the study.

Table 5.3: Opinion of farmers towards market access

Market Access Perception	Frequencies (Percentages)				
	Very poor (%)	**Poor (%)**	**Neutral (%)**	**Good (%)**	**Very good (%)**
Fairness	8.82	5.88	14.71	52.94	17.65
Accessibility	-	2.94	14.71	57.35	25.00
Safety	1.47	2.94	14.71	39.71	41.18
Convenience	-	4.41	14.71	50.00	30.88
Flexibility	1.47	4.41	14.71	45.59	33.82

Notes: 1 = very poor, 2 = poor, 3 = good, 4 = excellent (Likert Scale)

Source: NAMC (2019)

The rating is based on convenience (whether the farmers are able to move their produce on time and in line with their harvesting season to avoid delays that may cause spoilage), safety (whether there are challenges such as losses due to theft or poor storage or packaging on route to the market), accessibility (whether the transaction costs do not outweigh the gains from supplying the market), fairness (whether the market offers a reasonable price according to the farmers' perception), flexibility (whether the market allows for discrepancies in terms of the timing, which may be due to weather events that may affect the timing of planting and quality, or political situations that may disrupt the normal transaction arrangements somehow).

Table 5.4 shows the results from PCA generated using STATA statistician software. There were five correlated perception variables used to generate the perception index. Therefore, the use of PC_1 was to generate the perception index because it explained the highest variation and it was the only component economically generated. The only factor scores generated and used to construct the perception index were PC_1, since the aim was to create a single measure of the perception. Following this, the use of PC_1 was as a dependent variable in the multiple regression analysis.

Table 5.4: Generating the Perception index using principal component analysis

Component Matrix	**PC_1**
Fairness	.914
Accessibility	.976
Safety	.961
Convenience	.983
Flexibility	.975

Source: Researcher's computation (2022)

5.4.2 Determinants of smallholder citrus farmers' perception towards access to output markets

The adjusted R^2 was 65.7 meaning that only 65.7% of the independent variables were predicted correctly, which implies that 34.3% is due to exclusion of relevant variables or inclusion of irrelevant variables. This could have resulted from the fact that some respondents might have provided incomplete if not biased information (Hlongwane et al., 2014). A multicollinearity diagnostic test checks whether the assumption of OLS for multicollinearity is held or violated. There is no high degree of correlation between explanatory variables. The VIF test result reports that the mean Variance Inflation Factor was 2.27, which is less than 10, and the minimum VIF was 1.18, with a maximum of 4.45. Hence, based on test result there was no evidence of the presence of multicollinearity problem on the data set.

Land ownership emerged as significant variable ($P<0.01$) and the estimated coefficient is positive. There is a positive association between perception index and land ownership. The result indicates that farmers with private land ownership are more likely to have a positive perception toward access of domestic and international output markets. This may be probably due to expected returns from the output markets. The result is consistent with Mazibuko et al. (2018) who found a positive association between land ownership and accessibility. This is likely to give the farmer the perception that his/her cost of production is low and the motivation to produce more to sell (Oluwatayo et al., 2016).

Table 5.5: Regression of the multiple regression analysis

	B	Std. Error	Beta	t-value	sig
(Constant)	-1.880	.415		-4.535	.000*
GEND	-.004	.158	-.002	-.026	.980
AGE	-.001	.008	-.015	-.169	.866
EDUC	.023	.174	.011	.131	.896
HHSZ	.034	.031	.103	1.076	.286
FMSZ	-.001	.001	-.120	-1.153	.254
LDOS	.685	.241	.319	2.839	.006**
FMEX	.002	.009	.021	.244	.808
LOAN	.105	.164	.053	.641	.524
MKIF	.956	.296	.379	3.233	.002*
STFC	-.351	.329	-.165	-1.066	.291
PKFC	1.008	.357	.463	2.821	.007**
Number of observations	**68**				
Adjusted R^2	**0.657**				
Mean VIF	**2.27**				

Note: ** and * denotes significant at 5% and 1% respectively

Source: Researcher's computation (2022)

Regarding access to market information variable, the results show that it is positively significant (P<0.01), and farmers who have access to market information have a perception index of 0.956. The positive estimated coefficient of market information means there is a positive association between the perception and market information. The results concur with Maila (2019), who reports a positive effect between perception and market information towards market access. This implies that access to market information by farmers has a positive significant impact on how farmers perceive access to output markets. Market information encourages farmers to be aware of the possible markets they can utilise.

Lastly, access to packhouse emerged as a significant variable ($P<0.01$) and the estimated coefficient is positive. There is a positive association between perception index and access to packhouse. The result indicates that farmers who have access to packhouse are likely to have a perception of 1.008 or more regarding access to output markets. These findings concur with those of Rehman and Selvaraj (2013), who found packhouse, has a strong statistically significant relationship with perception regarding market regulations. This implies that farmers with access to packhouses are able to standardise their produce to be sold in different markets.

5.5 Conclusion and recommendation

The study is an approach towards bringing awareness to the public about the perception a farmer has developed towards output market access. The objective of this study was to find the determinants of smallholder citrus farmers' perceptions towards access to output markets. The study used five market access perception indicators, which are market fairness, market accessibility, and market safety, market convenience, and market flexibility to the perception index score (dependent variable); the results indicated that the overall perception is positive. Results from multiple regression analysis showed that three variables were statistically significant, which are access to private land ownership, access to market information and lastly access to packhouse. Moreover, the statistically significant variables contributes to the perception of smallholder farmers regarding output markets/

The study is necessary as it reveals the potential to contribute more towards enhancing the performance of these markets in future by strengthening access to output markets by smallholder farmers in South Africa. The government must also examine its policies and regulations with view to strengthening market access network and ensuring that prices are being on a competitive basis. Perception of smallholder farmers is vital for the reason that it reflect the amount of knowledge they possess.

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CHAPTER 6: OVERVIEW, CONCLUSIONS AND RECOMMENDATIONS

6.1 Overview

Smallholder agriculture is a key livelihood activity for most rural households in South Africa, as well as in many other parts of the developing world. Smallholder market accessibility plays a vital role in the economic development of a country and in the alleviation of poverty. In some rural households, agricultural production and marketing serve as a main source of income. However, a number of constraints confront smallholder farmers, which limits their growth to a commercial level. South Africa is currently unable to assess the potential of income generation from farming fully due to limited market access and low farm income that farmers get from markets.

The main objective of the study was to examine the factors influencing market access perception and farm income of smallholder citrus farmers in South Africa. This study is important because the recommendations can be beneficial to smallholder farmers in linking them to potential markets and improving their farm income generation. The study examined the overall smallholder citrus farmers from database of the Citrus Growers Association Grower Development Company (CGAGDC) in South Africa.

6.2 Conclusion

The study hypothesis was factors such as demographics, infrastructural, and institutional do not influence market access perception and farm income of smallholder citrus farmers. The study had two specific objectives to articulate; the first objective was to investigate the determinants of farm income among smallholder citrus farmers, and the second objective was to determine factors that influence smallholder citrus farmers' perception regarding access to output markets in South Africa. Results from the regression analysis showed there are factors attributing to farm income and market perception of smallholder farmers. Therefore, the rejection of the study's null hypothesis is in favour of the objectives.

The factors that matter most from the first objective were age, education, household size and income, size of farm, access to loan, access to market information, and access to packhouse. For the second objective, the factors were private land ownership, access to market information and lastly access to packhouse.

6.3 Policy recommendations

Based on the empirical results this study recommends that farmers receive support with market infrastructure and market information services. This will benefit farmers in such a way that transactional costs will be minimised and farm income improved.

- **Improved access to land**

From the empirical results, access to private land ownership was significant in both income generation and access to market. Government should improve land access for smallholder farmers by establishing a proper, consistent and equitable distribution of land to rural household (land reform policy). By so doing, smallholder farmers will have enough land to increase their production, maximise profits and venture in different marketing channels.

- **Improve access to market information**

Smallholder farmers can marginalise their farm income with relevant information available for them. For farmers to avoid lower prices and exploitation from buyer's relevant market information is necessary. The study found that market information influences farmers' perceptions about market access and farm income. From the study survey by NAMC, 81% of the farmers had access to market information. Of note is that the contribution of extension officers in disseminating information is better in South Africa; however, those farmers were registered to the database of the Citrus Growers Association Grower Development Company (CGAGDC). Providing better extension services to farmers by improving marketing knowledge of extension workers could be an important policy option to influence smallholder farmers to participate in markets. In modern days, smallholder farmers can easily own a cell phone, and such technology can disseminate information such as market prices and produce market demand. For those who do not own smart phones, they can receive information through a sms, while those with smart phones can download market information applications.

- **Improvement of Infrastructure**

From the literature review, it is evident that infrastructure in rural areas is still a challenge and distress for smallholder farmers to be competitive in markets. The government, working in partnership with the private sector, should help to invest in both on-farm and off-farm infrastructure, such as roads to support smallholder farmers to access markets.

- **Promoting value adding and access to packhouses for smallholder citrus farmers**

The recommendation is that government departments and private entities build packhouses to support smallholder farmers in South Africa in areas where these are lacking. Farmers often fail to participate in formal markets due to the strict requirements demanded by formal markets. These restrictions include quality standards of citrus fruits, packaging standards and licensing. In meeting these requirements, value-adding activities, such as packaging, are critical as they increase the shelf life of produce and promotes profitability. Optimising access to packhouses is important for value addition, but these are often lacking or not accessible to smallholder farmers in South Africa.