

Effects of Market Access on Income of Cattle Farmers in the Capricorn District of Limpopo Province, South Africa

MC Mothiba



orcid.org 0000-0002-5516-4219

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Supervisor: Prof AS Oyekale

Graduation ceremony: April 2019

Student number: 28403134

DECLARATION

I, Mothiba, Mamaila Cathrine declare that the dissertation submitted for the degree MSc in agricultural economics at North-West University is my work and has not been submitted to any institution and other materials used are acknowledged through in text and list of references.

SIGNED BY.....

DATE.....

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ABSTRACT

Market access plays a crucial role in improving the income of small-scale farmers in rural areas parts of South Africa. Despite this, access to formal markets in the Limpopo Province is low due to a range of constraints. Small scale farmers' involvement in formal markets could lead to increased productivity, income and food security. The aim of the study was to determine the effects of market access on income of small-scale cattle farmers. The objectives were to describe the socio-economic characteristics of small cattle farmers in the Capricorn district and to analyse the factors affecting cattle farmers' access to the formal market as well as, the effect of market access on the gross income of farmers. The study was conducted in the Capricorn District of the Limpopo Province, South Africa. Data was collected from a sample of 159 small-scale cattle farmers with a minimum of 20 cattle in all four municipalities of the District. A proportionate random stratified sampling was used with each municipality covering 59% of the population. Data collected was captured and analysed using SPSS and STATA to obtain descriptive statistics, logistic regression and two stage least squares regression. The descriptive statistics were used to describe the socio-economic characteristics of small-scale cattle farmers. The results of the study show that males constituted 56% of the respondents. Furthermore, the majority of the respondents were married (59%), had at least secondary education (74%) and were farming with mixed livestock (46%). The most used type of market was open market (51%), followed by auctions (29%). It was revealed that farmers used this open market because the buyers were close to business (49%). The logistic regression results show that municipality, educational level, land tenure system, transport availability and total land size had a positive impact on farmers' access to the formal market. Two stage least squares regression was used to determine the effects of market access on the income of small-scale cattle farmers. The results show that transports costs, municipality, educational level, land size and land tenure system had a significant and positive relationship with farmers' income. Furthermore, market access, type of breed, road infrastructure, pricing strategy and gender were found to be negatively related to farmers' income. The study rejected the hypothesis that none of the socio-economic characteristics of small-scale cattle farmers affect access to the formal market based. Similarly, the hypothesis that market access has no effect on income of small-scale cattle farmers was also rejected based on two stage least squares regression results. Based on the findings of the study, several recommendations were made. These include improving access to land, formation of farmer groups and establishment of a one-stop service centre.

Key Words: Cattle farmers, Income, Market access

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ABBREVIATIONS AND ACRONYMS

CDM – Capricorn District Municipality

DAFF – Department of Agriculture, Forestry and Fisheries

DRDLR – Department of Rural Development and Land Reform

FAO – Food and Agricultural Organization

FSP – Farmer Support Programme

GDP – Gross Domestic Product

Ha - Hectares

ILRI – International Livestock Research Institute

KM - Kilometres

LDARD – Limpopo Department of Agriculture and Rural Development

LP – Limpopo Province

OLS – Ordinary Least Squares

PLAS –Proactive Land Acquisition Strategy

R&D – Recapitalization and Development

SA – South Africa

SAGI – South African Government Information

SPSS – Statistical Package of Social Sciences

TSLS – Two stage least squares

UK – United Kingdom

US – United States

CHAPTER ONE

INTRODUCTION

1.1 Introduction and background

Livestock is produced throughout South Africa, with numbers, breeds and species varying according to grazing, environment and production systems. About 38 500 commercial farms and intensive units and an estimated 2 million small-scale/communal farmers are involved with livestock in South Africa (Meissner et al. 2013). About 70% of the agricultural land in South Africa is used for livestock in all the provinces and as a result, farmers combine their crop farming with the breeding of livestock (DAFF 2016).

Keeping livestock is an important risk-reduction strategy for rural communities (Thornton 2010). Generally, livestock in developing countries is kept as precautionary assets and disposed of only when there is a need for immediate cash. Livestock are closely linked to the social and cultural lives of households, for whom animal ownership ensures varying degrees of household economic stability (Lubungu et al. 2012).

In many countries, rural households consider keeping livestock as a store of wealth (Mandleni & Anim 2012). This is similar in the deep rural communal areas of South Africa where livestock is an asset, a store of wealth that can be utilised as collateral for credit in difficult times (DAFF 2010). The Limpopo province is among the top six provinces with the highest production of cattle in South Africa. In South Africa, cattle are the second largest agricultural commodity produced in the Limpopo Province and the main source of red meat.

Livestock production in South Africa is a significant contributor to food security and the hide and skin industry and provides many social and economic attributes to the country. It is part of the tradition of the rural areas in South Africa due to the benefits and role it plays in their daily lives. The majority of these areas consider cattle ownership for slaughter during social and cultural events.

Livestock production contributes to the food security of almost one billion of the world's poorest people (Smith et al. 2013). Livestock products account for 33% (Thornton 2010) to 40%

(Scollan et al. 2010) of world agricultural GDP. Statistics in 2010 indicated 13.6 million beef cattle, 1.4 million dairy cattle, 24.6 million sheep, 7.0 million goats, 3 million game species (farmed), 1.1 million pigs, 113 million broilers and 31.8 million layers (DAFF 2016).

Communal farming appears to possess a rich profile in the promotion of livelihoods in the disadvantaged parts of developing countries throughout the world (Becker 2015). Furthermore, approximately 40% of the country's cattle belong to communal farmers and only 5% of these are sold through formal marketing channels (DAFF 2013). This presents an area of opportunity for growth for emerging farmers with relevant information to enhance their ability to market their products commercially.

The concept of market access or market linkages has many definitions and can be used interchangeably. Market access is the sum of all skills acquired through experience or training that enables farmers to get and maintain regular customers for their products (Sikwela 2013). In other words, it is a long-term marketing relationship between a seller and a buyer (Shepherd 2007). Producing for the market requires utilisation of production resources such as land, labour, water and capital. Poor access to these resources affects the way in which smallholder farmers can benefit from opportunities in agricultural markets.

It is a known fact that small-scale farmers lack consistency in terms of producing for the markets due to insufficient access to production resources. The formal market requires a farmer who will be able to supply the agreed quantities and quality of products per agreed time. Generally, increased income of small-scale cattle sector implies increased participation in the formal markets by farmers. Consumers look for a market (farm gate) that will satisfy their needs, get information about them and evaluate them, then decide on which one to opt for.

Livestock is an investment option for saving and price responsiveness is not very high limiting market supply (Sikwela 2013). Summaries of available national data about small-scale agriculture in South Africa show that in 2006 farmers who undertook farming as their main source of income earned approximately R9,000 (Cousins 2013).

Income is the most important factor which affect profitability in a business, i.e. if is higher than the expenses, there is a chance of higher profits. In addition, the inability to properly market products can affect income of the business negatively. Most farmers are in rural areas where there are no formal agricultural markets or agro-processing industries. They are compelled to market their produce to local communities in their areas, sometimes at lower prices, or to

transport their products to towns at a higher cost. Literature has revealed that there is a relationship between farmer's gross income and the type of market they are selling to.

The supply of appropriate support services could alleviate these constraints, allowing more efficient utilisation of agricultural resources and increasing the opportunities for smallholder farmers to supply agricultural markets (Sikwela 2013). These constraints constitute the greatest barrier for smallholder farmers when it comes to accessing high value markets and overcoming these constraints is important if smallholder farmers are to access lucrative markets (Senyolo et al. 2009). These challenges are having an impact on the ability of small-scale farmers to sell to national markets, and even to local supermarkets, and they are thus further crowded out of the global supply chains.

1.2 Problem statement

In South Africa, agriculture plays a crucial role in the economy of the country with 70% of the agricultural land suitable for livestock and game species. The Limpopo Department of Agriculture and Rural Development have identified livestock as an important driver of rural development and have focused on development production infrastructure (Stroebe et al. 2008). Cattle are the main source of red meat production and the second largest agricultural commodity produced in the Limpopo province. According to the KPMG report of 2012, the Limpopo province is regarded as the country's breadbasket and is one of South Africa's most important agricultural regions and a significant producer of livestock, fruits and vegetables.

In South Africa, smallholder farmers find it difficult to access the formal markets because of a range of constraints preventing them from accessing markets and better incomes. Some of the constraints include: weak institutional support, high transaction costs, poor flow of information, poor livestock input and output markets, standards of disease management, climate change. These may be reflected in hidden costs that make access to markets and productive assets difficult.

Previous studies (Moloi 2008; Smith et al. 2013) have mainly identified factors hindering participation of small-scale farmers in both informal and formal markets and the degree at which participation is affected. The essence of the problem lies in identifying those factors that are currently preventing small scale cattle farmers from accessing reliable markets and determining

how the inability to access the reliable markets affects their gross income. Smallholder farmers are mainly livestock keepers and do not realise the return on investment because of lack of appropriate marketing information which would provide them the opportunity to increase turnover. This means that a certain market does exist, but that smallholder farmers are hindered in selling their products in that market.

Although previous studies (Azam et al. 2012; Ramoroka 2012; DAFF 2011) attributed to the low formal market participation of different challenges even when various efforts to promote small-scale cattle farming was made, there is no literature about the effects of market access on small-scale cattle farmers in the Capricorn district of the Limpopo Province and South Africa as a whole. Despite the role of cattle farming in the rural communities of Limpopo, very little information exists on the relationship between market access and cattle farmers' gross income. Therefore, this study intends to fill the gap by investigating the effect of market access on income of small-scale cattle farmers and factors affecting their ability to access to the formal market.

1.3 Aim

- The aim of the study is to determine the effect of market access on gross income of small-scale cattle farmers in the Capricorn district of the Limpopo Province, South Africa. An understanding of the relationship between market access and farmers' income will lead to recommendations on improved access to markets, thereby increasing farmers' income.

1.4 Objectives

- To describe the socio-economic characteristics of small-scale cattle farmers in the Capricorn district.
- To determine factors affecting small-scale cattle farmers' access to the formal markets.
- To assess the effect of market access on income of small-scale cattle farmers.
- To make recommendations on how small-scale cattle farmers can increase their ability to access markets.

1.5 Research hypothesis

- None of the small-scale cattle farmers' socio-economic characteristics significantly influence access to the formal markets.
- Market access has no significant effect on small-scale cattle farmers' access to the formal market.

1.6 Organisation of the study

The study is organised into six chapters. Chapter one introduces the study, providing background information on cattle production in South Africa. The problem statement, objectives and hypotheses that guided the study are defined. Chapter two reviews literature from previous studies in relation to livestock farming, market access and income related constraint. Chapter three describes methods of investigation used in relation to the study site, data collection and analysis. Chapter four discusses descriptive statistics results whereas chapter five presents the discussion of empirical results of the regression analysis. Lastly, chapter six grants the summary, conclusion and recommendations of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews livestock production and its importance in food security, poverty alleviation, nutrition and contribution to the country's GDP. The chapter also focuses on the general constraints faced in livestock farming. A review of previous studies on market related challenges faced by small-scale cattle farmers, types of markets available for cattle farmers and factors affecting farmers' income are also provided. Furthermore, a conceptual framework of the study is presented in section 2.7.

2.2 Overview of Livestock production

Livestock is globally the mainstay of the agricultural community. Many households earn a living from livestock farming and consider keeping livestock as a store of wealth (Mandleni & Anim 2012). In South Africa, livestock production is a major contributor to food security, poverty alleviation and processing industry. In South Africa the rural dwellers operate on communal land within their areas. According to Barnes et al. (2008) the agricultural land in Botswana is dominated by livestock on natural rangeland dominates the agricultural sector.

Livestock farming is associated with many social, economic and management factors. It is one of the main uses of land because it requires a large expanse of land and efficient management practises (Nyariki et al. 2009). Overgrazing often leads to a loss of vegetation and soil erosion because the available livestock exceeds the land's carrying capacity. Poor land management results in low productivity, poor livestock performance and poor market value. Farmers may sell more stock at a low price, resulting in small herd size and decreased income for selling farmers.

Animal diseases generate a wide range of biophysical and socio-economic impacts that may be both direct and indirect and may vary from localised to global (Perry & Sones 2008). The economic impacts of diseases are increasingly difficult to quantify, largely because of the complexity of the effects that they may have, but they may be enormous. A study by Mudzielwana (2015) found that 49% of farmers in Mutale Municipality, South Africa lost their cattle to diseases.

Van Dijk et al. (2009) showed that climate change has already altered the overall abundance, seasonality and spatial spread of endemic helminths in the UK. The economic impact of climate change will be experienced at farm level due to changes in production which will have an impact on income of farmers and their livelihoods. Flooding and windstorms can cause damage to livestock because acres of grazing land are flooded resulting in decrease in grass silage.

In Malawi, dairy farmers experience challenges associated with access to animal health, poor feeding and breeding, resulting in low productivity (Banda et al. 2012). Additionally, Hailemariam et al. (2013) in Ethiopia found diseases and lack of proper water as constraints faced by sheep farming in the area. Climate change is a major concern in South Africa. Southern Africa will likely suffer negative impacts on several crops important to food security and livestock feed by 2030 (Dobell et al. 2008). It can be concluded that overstocking rates, poor veterinary interventions and drought affect livestock farming in Limpopo (Munyai 2012). Overall, there are many challenges that affect livestock production.

2.4 Market access and market participation: Challenges faced by small-scale farmers

The issue of market access can be considered as physical access to markets, structure of the markets and producers' lack of skills, information and organisation (IFAD 2003). According to Jari (2009), smallholder farmers find it difficult to participate in commercial markets due to a range of technical and institutional constraints. Although new opportunities might have emerged for some farmers, formal markets are difficult to access because of the challenges that smallholder farmers are confronted with (Boughton et al. 2007).

2.4.1 Transaction costs

Transaction costs involve the costs of exchanging goods and services, which can arise when farmers search for marketing and trading partners' contract negotiations (Boughton et al. 2007; Burke 2009). The majority of smallholder farmers are in remote areas with poor transport and market infrastructures, contributing to the high transaction costs. Furthermore, in many instances, the poor do not possess the level of assets required to protect themselves from market and natural shocks (Mmbando et al. 2015).

In South Africa and some other developing countries, smallholder farmers are excluded from high value markets due to poor performance. This is characterised by high production costs and poor quality, making smallholder farmers less competitive (Dorward & Kydd 2005). This is also supported by Louw et al. (2007).

2.4.2 Infrastructure

Road network provides connectivity markets adjacent to rural areas. Research shows that productivity increase in agriculture, which is an effective driver of economic growth and poverty reduction, depends on good rural infrastructure, well-functioning domestic markets, appropriate institutions and access to appropriate technology (Andersen & Shimokawa 2007). Fan et al. (2004) showed that improved roads lead to the rise of small rural non-farm businesses, such as food processing, marketing enterprises, transportation, etc. Previous studies indicate that rural infrastructure promotes better integration of rural and agricultural areas with urban markets, thereby creating easy access.

Manalili & Gonzales (2009) indicated that good road infrastructure and irrigation facilities improve productivity thereby leading to increased profitability. Road structure affects the price of hiring transport as areas with poor roads are associated with higher transportation costs. The above-mentioned study also showed that rural areas that have good road infrastructure and accessibility to electricity experienced higher rates of growth of agricultural productivity than those areas with inadequate roads and energy.

2.4.3 Lack of Assets by smallholder farmers

Poor smallholder farmers are frequently unable to participate in lucrative agricultural markets due to a lack of household specific productive assets (Pote 2008). Production assets such as tractors, machinery and vehicles to transport produce to markets are key requirements to increased productivity and access to markets. Several studies (Boughton et al. 2007; Goetz 1992; Key et al. 2000) found that households that owned transportation assets had lower transportation costs and fewer obstacles to entering the market. Therefore, households with own transport are likely to transport their produce to the market on time, thus a higher level of participation. When farmers own assets, barriers to market entry are reduced.

2.4.4 Lack of farmer organisation

According to Meinzen-Dick et al. (2009), smallholder farmers often sell their agricultural produce directly to the consumers without passing through other intermediaries. Ortmann & King (2006) state that most smallholder farmers fail to register as cooperatives or groups of farmers so that they can access facilities. In South Africa, some smallholder farmers tend to engage in institutions such as cooperatives to take their goods for sale, processing and storage and this strategy has been rewarding in developing the commercial agricultural sector (Makhura 2001). Studies have shown that the formation of cooperatives will help farmers as they are given priority.

2.4.5 Land availability

According to Vink & Van Rooyen (2008), using the General Household Survey data, land access by smallholder farmers has not been that significant. The data reveals that close to 50% of household farms are on less than 20 hectares of land under tribal authority. Aliber & Hall (2011) have found that there were 49% smallholders farmers who use their land in tribal authority land, while 1.8% of the households rent out land. The geographical spread of these farmers is highly uneven in the homelands. Without enough land for increasing production, farmers end up under-producing, thereby failing to meet the demand of their consumers.

2.4.6 Level of education

Benfica et al. (2006) in Mozambique found education to have a positive effect on smallholder farmers' participation in markets. This is because educated household heads are expected to have better skills and better access to information. According to Makhura (2001), household head's formal education increases understanding of market dynamics and influences decision making. In addition, Asfaw et al. (2011) in Tanzania and Ethiopia found that educational level has a positive impact on entry to markets, suggesting that a higher level of education increases productivity and provides a greater opportunity of producing a marketed surplus.

2.4.7 Price

Previous studies show that product characteristics such as output prices play a role in market participation. The findings by Alene et al. (2008) and Komarek (2010) show that output prices have positively impacted market participation by maize and banana farmers in Kenya and Uganda respectively. Irene et al. (2018) have found that price has an important influence on the level of farmers' market participation in cassava markets which is supported by economic theory that price induces increased supply. Sebatta et al. (2014) have also asserted that better output price is a key incentive to increasing sales in the market.

2.4.8 Information dissemination

Access to information among smallholders is generally poor and is compounded by the lack of reliable and efficient means of disseminating information (Bienabe et al. 2004). A study among small-scale sheep farmers in Eastern Cape reveals the need for public support for a reliable market information dissemination mechanism (Jacobs 2009). Bienabe et al. (2004) added that lack of product prices and information about the quality at a local level places smallholder farmers' in a compromising position in relation to market access and getting good prices and times to sell their produce. In addition, Gani & Adeoti (2011) highlighted that market access would be improved with an increase in the flow of market information to the farmer, to broaden the information base of the farmer and reduce dependence on traders for price information.

2.5 Types of cattle markets

2.5.1 Informal market

Informal market is the simplest and most popular option used by small-scale farmers. Through this option, smallholder farmers transact directly from seller to consumer (Nkosi & Kirsten 1993). This method occupies an important position in the cattle marketing arena of the smallholder cattle farmers. Informal sales include customers buying cattle for reasons such as 'lobola', investment, funerals, customary and religious celebrations (Ndhleve et al. 2011).

Due to many socio-cultural functions performed in African societies, a market exists amongst farmers (Nkhori 2004). As a result, informal trading is common to smallholder farmers because they set their own prices for their animals and there are no marketing costs attached to it. Ndhleve et al. (2011) revealed that direct sales offer the greatest profit margin on cattle for the producer because all middle-men and their fees are eliminated.

Researches (FAO 2009; Gulati et al. 2005) have highlighted that informal sales form the second preferred marketing channel for cattle among smallholder farmers. Consumers prefer this channel because prices are negotiated on a willing-buyer-willing-seller relationship and convenience with no added costs like transport or commissions (Fan & Rosegrant 2008; Cotula et al. 2009; Dercon & Zeitlin 2009).

2.5.2 Formal markets

2.5.2.1 Cattle auction market

Cattle auction markets are established places of business where cattle are assembled at regular intervals and sold by public bidding to the buyer who offers the highest price per head (Nkosi & Kirsten 1993). Buyers include individuals, butchers, farmers and speculators. These auctions operate all year-round and mostly on a weekly basis. Facilities to process, weigh and sell are provided at the auction and cattle are brought to auction pens for transactions to take place.

Auctions are the principal sales outlets for live cattle where sales are done on the hoof. The basic functions of the auctioneer are to ensure that an auction takes place and runs smoothly, to classify the stock on the hoof according to type, age, etc., to duly mark with paint the stock that has been sold, to see to the herding and loading of stock, to organise labour to help with selecting and heading off of cattle and to apply the laws governing the sales of live animals at auctions (Gollin & Rogerson 2009; Gulati et al. 2005).

2.5.2.2 Butcheries

Butcheries are another option for farmers to sell their cattle directly to the formal markets. Smallholder cattle farmers can sell their cattle to butcheries that sell natural meat; hence there is need for contractual agreement between parties (Windsor 2008). Butcheries provide basic marketing services to farmers who are unable to market their cattle efficiently and profitably through other existing formal channels (Ndhleve et al. 2011). Butchers enhance the marketability of livestock by acting as buyers in their own right and buyers at auctions. Nkhori (2004) found that farmers having a strong bargaining power in determining the prices of their stock are the main reason for some smallholder farmers' satisfaction with sales to butchers.

2.5.2.3 Abattoirs

Abattoirs are the least used marketing channel because they are normally located far away from the producers, payments are received days after the sale, price is based on the quality of the carcass and many charges that reduce the price of the animal are levied and it is not economical to sell one or two animals as transport costs are very high (Burke 2009; Anriquez & Bonorni 2007).

Farmers are paid according to age, weight and grade of the animal (Nkhori 2004). They tend to sell natural beef at high prices than genetically modified beef and this result in them getting higher than normal returns at the farmers' expense. Farmers can enjoy economies of scale through group marketing, when using this channel. However, group marketing is not always possible since farmers sell their animals at different times (Gollin & Rogerson 2009; Gordon 2008; Gulati et al. 2005).

Researches (Hazell et al. 2007; Harvey 2006) have found that, out of all major formal markets, the smallholder farmers generally prefer to sell their cattle through public auctions. This is because public auctions are normally available at scheduled dates, pay reasonable prices, one can sell in bulk, offer networking opportunities and the farmer has an option of returning his/her cattle without any penalty if not satisfied with the price (Burke 2009; Ponte et al 2007; Anriquez & Bonorni 2007).

2.6 Income related constraints

Markets and improved market access play an important role in improving rural income of smallholder farmers (Mmbando et al. 2015). In South Africa, a significant amount of money is spent on supporting emerging farmers through production inputs, machinery and mentorship. Globally, there is a growing emphasis on helping smallholder farmers' transition from subsistence to market-oriented production (Jayne et al. 2010; Graeub et al. 2015). Better market access can increase household income and has also been linked to increased dietary diversity (Sibhatu et al. 2015; Koppmair et al. 2016).

Improved market access plays a huge role in choosing market type and improving rural small-scale farmers. The choice of market is vital in reducing transaction costs and avoiding market risks of rational decision-making behaviour (Swinnen 2007). Furthermore, Puspitasari (2015) indicated that market choice and the price received by farmers for their produce have great implications for household welfare and poverty alleviation. Increased profitability for farmers from marketing decisions may lead to investment in productive assets and improved household welfare (Courtois & Subervie 2014).

Pender & Dawit (2007) and Escobal & Toreto (2006) have revealed that market participation plays a significant role in increasing household income and in most cases; these increased incomes have led to increased food consumption. Bozzoli & Brück (2009) analysed market participation in Mozambique and found that market participation had positive welfare effects.

Other studies (Maertens & Swinnen, 2009; Maertens et al. 2011) have shown that market participation significantly increases smallholder household income for French beans and tomato in Senegal. In terms of studies on the impact of market channel choice on household welfare, Saigenji & Manfred (2009) found that there is a significant effect of contract participation on income. Similarly, Miyata et al. (2009) found that contract market participation offers a significant income to farmers in both apple and green onion.

Farmers' markets are certainly an important source of income for farmers and some perceive them to offer opportunities for greater financial return than other outlets (Griffin & Frongillo 2003; Hunt 2007). Nonetheless, the income and economic welfare of the farmers are determined by agricultural prices, which in turn influence their farm investment and production decision (Benfica et al. 2006). Similarly, Andreatta & Wickliffe II (2002) found that farmers selling at a farmers' market did so because they could get a better price and also valued the personal interaction with consumers.

Unfortunately, the goal of offering affordable prices to market shoppers frequently conflicts with efforts to provide farmers with a fair price based on their real costs of production (Markowitz 2010; Winne 2008). This development dampens farmer morale to raise production and supply which often steps up food prices to consumers, hence restricting the increase in farm income (Rosegrant et al. 2005).

Waithaka et al. (2007) note that higher incomes mean that a household will be able to satisfy its basic requirements and have a surplus for productive activities. Such incomes may also allow a household to engage in casual labour, thereby releasing household labour to pursue other endeavours such as seeking higher returns from off-farm activities (Waithaka et al. 2007). Several studies have concluded that, for smallholder farmers to increase their incomes and be food secure, there is need for them to form groups and market their produce as producer organisations or cooperatives so that they can overcome these costs associated with searching and negotiations (Mazoyer 2001).

In addition to these challenges, low income and a lack of capital of these smallholder farmers, marketing agricultural products, especially from rural areas, tend to be hampered by market imperfections such as imperfect information asymmetry reinforced by the geographic dispersion of agents and poor infrastructure (Magingxa & Kamar, 2003). Similarly, Sharp et al. (2007)

noted that commercialisation of smallholder farmers can have a higher impact on reducing poverty than promoting few large ventures.

According to Lerman (2004), commercialisation of smallholder farmers has the potential to enhance incomes and welfare outcomes and takes smallholder farmers out of poverty. Smallholder farming and effective market participation are sure pathways of pulling rural people out of poverty, hence improving their income and food security (Rosegrant et al. 2005).

2.7 Conceptual framework

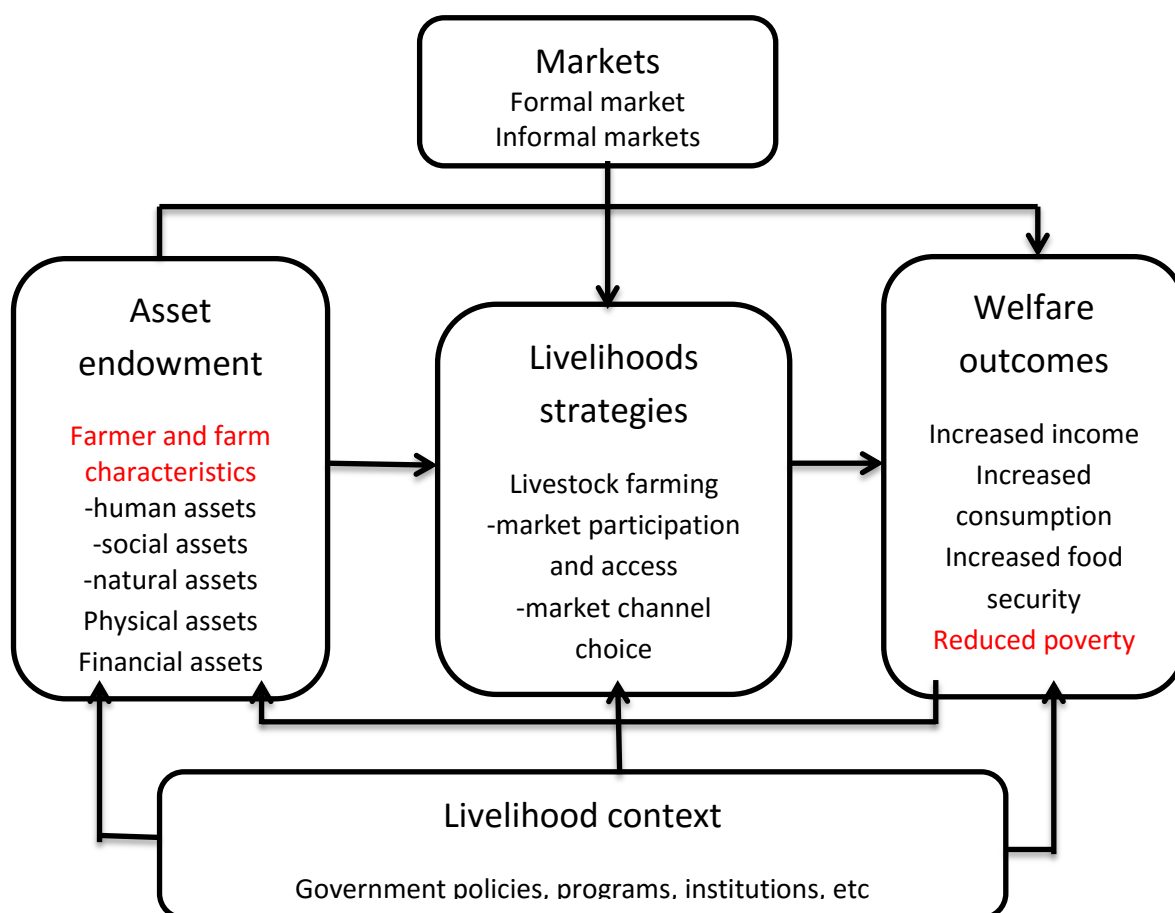


Figure 2.1: Linking market channel and household welfare outcomes

Source: Adopted from Nkala et al. 2011

The conceptual framework used in this study adopts the sustainable livelihood approach. This framework (Figure 1) includes the following components: assets endowments, the context (policies, programs and institutions), markets, household livelihood strategies and outcomes (measures of household welfare). For farm households, consumption expenditure is usually influenced by returns from agricultural production, which depend on asset ownership and capacity to produce and access a profitable market (Rao & Qaim 2011).

The results suggest that livelihood strategies are associated with differences in both biophysical conditions (farm assets) and socio-economic conditions that jointly determine the way in which an individual household puts these assets to use to access better paying markets (Ellis & Mdoe 2003). Household decisions regarding asset use also determine outcomes such as household income, consumption and food security (Barrett et al. 2005). Given asset endowments, households make decisions regarding which livestock to keep and markets to use. These decisions have a direct impact on the level of farm income and household welfare. Therefore, smallholder farmers' participation in sustainable and reliable market channels is one of the important strategies to improve farm household income and welfare (Fafchamps 2004).

The contexts in which households operate help determine the welfare-generating potential of assets. Government policies also affect asset endowments, market access and market channel choice by smallholder farmers. For instance, policies that improve rural infrastructure can result in improved market access and market channel choice and can reduce transaction costs by smallholder farmers. This can have significant implications for household income transactions (Asmah 2011). Institutions such as producer organisations play a big role in farmers' market access and market channel choice by transmitting information, mediating through bargaining with customers, providing inputs and technical assistance (World Bank 2008; Bijman & Wollni 2008).

In determining access to formal markets, a binary logistic regression model was used. This model explains that the probability of a farmer accessing the formal market can be described as follows;

$$\ln\left(\frac{Y}{1-Y}\right) = \beta_0 + \beta_1 X_1 + \dots + \beta_k \mu X_k + e \dots \dots \dots (1)$$

Where, Y= the probability that the farmer is able to access the formal markets, 1-Y = the probability that the farmer does not have access to the formal market, $\beta_0, \dots, \beta_k$ = estimated parameters, $X_1, \dots, X_k$ = independent variables, μ_i = Disturbance term.

As small-scale cattle farmers are choosing a market, self-selection often occurs based on their perceptions about the markets and benefits attached to each market. Therefore, in assessing the effect of market access on farmers' income, unobserved characteristics may play an important role, especially since self-selection often gives rise to endogeneity problems. The implication of this is that the use of OLS to estimate the parameters of the equation would result in biased and inconsistent estimates.

In order to adequately address the problem of endogeneity, the instrumental variables method is used (Bascle 2008; Sargan 1958). The instrumental variables method focuses on variations in X that are uncorrelated with the error term and disregards the variations in X that bias the OLS coefficients.

The structural equation with a single endogenous variable is as follows:

$$Y_i = \beta_0 + \beta_1 X_i + \beta_2 W_{1i} + \beta_{1+r} W_{ri} + \dots + \mu_i \dots \dots (2)$$

Where Y_i is the i^{th} observation on the dependent variable; X_i is the i^{th} observation on the endogenous explanatory variable; $W_{1i} \dots, W_{ri}$ are the i^{th} control variables; and u_i is the disturbance term. The IV solution relies on other variables, called 'instruments' to estimate in a two-step procedure the causal impact of X_i on Y_i , conditional on the covariates $W_{1i} \dots, W_{ri}$. That is the variable that determines market access but does not influence farmers' income. This is formally explained as $COV(Z, \mu) = 0$ and $COV(Z, X) \neq 0$

In the first stage, the endogenous regressor is regressed on the instruments and covariates.

Concretely, the first stage regression is:

$$\hat{X}_i = \pi_0 + \pi_1 Z_{1i} + \pi_m Z_{mi} + \pi_{m+1} W_{1i} + \pi_{m+r} W_{ri} \dots + v_i \dots \dots (3)$$

In the second stage, the regressed variable ($\hat{X}_i$) is then substituted on the structural equation (2).

$$Y_i = \beta_0 + \beta_1 \hat{X}_i + \beta_2 W_{1i} + \beta_{1+r} W_{ri} + \dots + \mu_i \dots \dots (4)$$

Where coefficients of $\beta_0, \beta_1 \dots \beta_{1+r}$ are the 2SLS estimators. Covariates, which are assumed to be uncorrelated with u_i , play an important role in IV estimations as they are responsible to control self-selection bias caused by instruments. They ensure that the instrument is 'as good as randomly assigned' once the analyst conditions on them (Bascle 2008).

Therefore, this study used two-stage least square regression to address the above econometric problems in evaluating the effects of market access on farmers' income. A binary logistic regression was used to determine the factors affecting farmers' access to the formal market.

2.8 Conclusion

Cattle farming remain important in rural areas due to the role it plays in the livelihood of many families and famers. Different characteristics of small-scale farmers and the way in which these characteristics affect their farming decision making in order to facilitate implementation of development strategies should be understood. Access to better markets can only happen if these farmers are supported by both financial and physical infrastructure on these farms to produce well.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methods of data collection and analysis that were considered in determining the relationship between market access and farmers' gross income. The chapter also outlines the study area, data collection and sampling methods as well as regression models used. The way in which the survey data was analysed is also presented in this chapter.

3.2 Description of the study area

The study took place in the Limpopo province of South Africa in the Capricorn district which is the centre of the province. Limpopo is one of the nine provinces of South Africa situated in the Northern part of the country. Its neighbouring provinces are North West, Mpumalanga and Gauteng Provinces and shares borders with Botswana, Zimbabwe and Mozambique. The province consists of five districts, namely Mopani to the east, Vhembe to the north east, Waterberg to the west, Sekhukhune to the south and the Capricorn district at the centre.

The Capricorn district consists of four local municipalities after the disestablishment on Aganang local municipality, which include Polokwane, Blouberg, Lepelle-Nkumpi and Molemole local municipality. The main economic sectors within the district are community services, finance, trade, transport, manufacturing, construction, agriculture and electricity respectively.



Figure 3.1: Map of the Limpopo Province. Source: CDM, 2011

3.2.1 Infrastructure

The Capricorn district has the second highest access to infrastructure amongst all the districts in the province. Regarding water services, about 60% of the population have access to pipe-borne water while the remaining part of the population still have to travel to fetch water at the street taps. Most of the roads are gravelled and rocky, especially in deep rural areas, except provincial and municipal roads. There are 96 clinics, seven hospitals and 931 schools (CDM 2016/17).

3.2.2 Climate

The Limpopo Province has a favourable climate suitable for agricultural production. However, due to the latest drought which affected most of the areas in the province, rainfall shortages have been reported, resulting in dry land. Overall, Capricorn is characterised with a rainy summer season and dry winter season. The summer temperature lies between 21-22°C whereas winter temperature is 11°C. The annual rainfall within the district ranges between 450 and to 500 mm, with December and January being the wettest months.

3.2.3 Agricultural production

The total agricultural land available for production in the province is 11 321 million hectares and the size of the land under irrigation is currently 163 080.20 hectares (SIQ 2011). The total agricultural area in the Capricorn district is 2 146 094.07 hectares. The province is referred to as “the country’s breadbasket”.

Agriculture has shown a fast growth, due to emerging farmers and a large export market and despite a semi-arid climate, potatoes are by far the most produced and important crop produced in the district. Some of the planted crops are tomatoes, eggs and broilers, beef, pork and citrus. The Capricorn district has a thriving livestock farming with most livestock being goats 44%, followed by cattle 38%, pigs 10% and sheep 9 % (CDM 2016/17).

3.3 Data collection and sampling methods

To answer the research objectives and hypotheses, there was a need for data to be collected. However, Saunders et al. (2009) argue that it is impossible to collect all the data available due to time, money or access restrictions.

The study used primary data collected from farmers through a survey in 2017. Data were collected using a semi-structured questionnaire with closed ended and open ended questions. Four enumerators were appointed for the purpose of data collection. All enumerators administered the questionnaire before data collection process could take place. The sample consisted of small-scale cattle farmers in Capricorn district with a minimum of 20 cattle.

Data were collected from four local municipalities in the Capricorn district, namely Polokwane, Blouberg, Molemole and Lepelle-Nkumpi. A proportionate stratified random sampling technique was used whereby the population was divided into strata based on location (municipality). Each of the sample covered 59% of the municipalities’ population. The general sampling frame was acquired from agricultural advisors of the Limpopo Department of Agriculture and Rural Development in the Capricorn district. From the population of 271 cattle farmers with a minimum of 20 cattle in the Capricorn district and five percent confidence interval, a sample of 159 was computed. The sample was distributed across all municipalities based on percentage of farmers in each municipality. In cases where one herd was owned by a household or group of people, only one person was interviewed to avoid data duplication.

Table 3.1: Population and sample

Municipality	Population	Sample
Blouberg	97	57
Molemole	73	43
Lepelle-Nkumpi	64	37
Polokwane	37	22
Total	271	159

Questionnaires were administered through face to face interviews by the enumerator and in some cases with the actual researcher. The interviews took place at the respondents' farms and homes on communal land. Face to face interviews offer more flexibility than a survey done telephonically or via mail because the enumerator can skip observable data and immediate clarity can be given where there are misunderstandings. However, it has also been noted that personal surveys are costly and time consuming.

3.4 Methods used in data analysis

SPSS version 24 of 2016 and STATA 14 were used for better analysis of the results. Data collected was captured and analysed to obtain descriptive statistics, logistic regression and two-stage least squares.

3.4.1 Descriptive statistics

Descriptive statistical analysis reduces data into a simpler sensible form providing summaries about the sample (Jackson 2009). Frequency tables and measures of central tendency were used to analyse the socio-economic characteristics of small-scale cattle farmers in the Capricorn district. Results are presented in the form of tables and bar graphs.

3.4.2 Logistic regression model

The logistic regression model is a predictive form of analysis that uses the binomial probability theory. The dependent variable is binary in nature where 1 denotes the farmer has access to the formal market and 0 the farmer has no access to the formal market. The independent variables are not limited to binary outcome nor are the model restricted to a single independent variable. In this study, the model was used to analyse small-scale cattle farmers' access to the formal market. It makes use of several predictor variables that may be either numerical or categorical (Hilbe 2008).

The logistic model was necessary for this study due to its strength in dealing with the categorical dependent variables and independent variables that are both categorical and continuous. It was used to estimate the probability that there are no socio-economic factors affecting small-scale cattle farmers' access to the formal market in the Capricorn district.

The simple logistic regression model is of the form:

Therefore,

$$\ln\left(\frac{Y}{1-Y}\right) = \beta_0 + \beta_1 X \dots + \beta_k \mu X_K + e \dots \dots \dots (1)$$

Where:

Y= the probability that the farmer has access to formal markets

1-Y = the probability that a farmer does not have access to the formal market

$\beta_0, \dots, \beta_k$ = estimated parameters

$X_1, \dots, X_k$ = independent variables

μ_i = Disturbance term

The $\ln$ symbol refers to a natural logarithm

So, knowing the regression equation, the expected probability that $Y = 1$ for a given value of X is calculated as follows.

$$Y = \frac{\exp(\beta_0 + \beta_1 X)}{1 + \exp(\beta_0 + \beta_1 x)} \dots \dots \dots (2)$$

$$= \frac{e^{\beta_0 + \beta_1 X}}{1 + e^{\beta_0 + \beta_1 X}}$$

Due to the mathematical relationship $e^{\beta_0}/(1 + e^{-\beta_0})$, the logistic function for logistic regression analysis (LRA) is sometimes presented in the form:

$$P(Y = 1|X_1 \dots X_P) = \frac{1}{1 + e^{-\beta_0 - \sum_{j=1}^P \beta_j X_j}} \dots\dots\dots (3)$$

Due to the mathematical relation, $1 - \frac{e^{\beta_0}}{(1 + e^{\beta_0})} = \frac{1}{(1 + e^{\beta_0})}$ the probability for a 0 response is:

$$P(Y = 0|X_1 \dots X_P) = 1 - P(Y = 1|X_1 \dots X_P) \dots\dots\dots (4)$$

$$= \frac{1}{1 + e^{\beta_0 + \sum_{j=1}^P \beta_j X_j}} \dots\dots\dots (5)$$

Therefore, the specific logistic model is written as follows:

Market access = $\beta_0 + \beta_1$ Age + β_2 Sex + β_3 Marital status + β_4 Land size + β_5 Years in cattle farming + β_6 Municipality + β_7 Land tenure + β_8 Pricing strategy + β_9 Income + β_{10} Breed + β_{11} Educational level + β_{12} Type of farming + β_{13} Distance to market + β_{14} Market information + β_{15} Road infrastructure + β_{16} Support services + β_{17} Transport + ... μ_i

3.4.3 Two stage least squares regression

Two stage least squares regression is the extension of the ordinary least squares' regression. Ordinary least squares regression uses the mathematical basis for the best fitting regression line for estimating the unknown parameters in a model with the goal of minimising the differences between the observed responses (Evans 2013). However, the consequences of applying ordinary least squares to a model, despite being unbiased may be inefficient in estimating and contains invalid inference procedures (Johnston 1971). For these reasons, the two-stage least squares approach was used.

The name 2SLS refers to the fact that the analysis incorporates two steps: the first step is where the instrument or instruments are used to estimate the independent variables and the second step uses the estimate of the independent variable to estimate the dependent variable

(Angrist 2001; Wooldridge 2002). The 2SLS estimator uses an instrumental variable that only affects the dependent variable through the effect it has on the independent variable. In this case that would be a variable that affects farmers' income through market access.

2SLS works best under the following conditions:

- There may be no clear correlation between the instrument and the dependent variable (Y), other than the correlation which is explained by the relationship between the instrument and the endogenous regressor (Angrist & Krueger 2001).
- The instrument is not correlated with the error term.
- The dependent variable's error terms are correlated with the independent variables.
- If the instrument is truly exogenous and unrelated to Y and if the relationship between X and Y is very strong, the results can be interpreted as a causal relationship (Antonakis et al. 2010).

Therefore, in this study, the assumption is that the relationship between farmer's ability to access the market and income can be caused by several factors so 2SLS is used to cover these factors. Two stage least squares (2SLS), or instrumental variable regression may give valid and consistent outcomes in the presence of endogeneity (Nannestad 2008).

- First stage regression

The first stage of 2SLS involves identifying the endogenous variable that is causing problems. In the first stage, a new variable is created by regressing the included explanatory variable X. The new variable Z must not be correlated with the error term but be correlated with variable X.

Given the linear equation: $Y = \beta_0 + \beta_1 X_1 + U_1$; (1)

Where Y= Income, X= market access, U= error term (all exogenous variables) we regress variable X_1 on Z_1 . Therefore,

$$\hat{X} = B_0 + \pi_1 Z_1 + n_1 \dots \dots \dots (2)$$

Z_1 = instrumental variable

- Second stage regression

The second stage involves regression of the original equation, with all the variables replaced by the fitted values from the first-stage regressions. Therefore,

$$Y = \beta_0 + \beta_1 \hat{X} + \dots \varepsilon \dots\dots\dots (3)$$

These instrumental variables were subjected to various tests (Durbin-Wu-Hausman endogeneity test, Sargan chi squared over-identification test and joint F-test) to check their relevance and strength. Several instruments were identified but were found to be weak instruments when tested. Therefore, the following instrumental variables for market access were used: farmers' ethnicity, transport ownership and drought risk.

Minot et al. (2000) suggest that ethnicity might capture language barriers, cultural standards and community networks which reduce transaction costs in trade. Consistent with this view, Ha & Shively (2008) provide evidence that ethnicity helps to explain differences in the response to market signals among farmers. Ethnicity affects farmers' income through market access by reducing communication barriers. The communication barriers could be related to market information whereby farmers are unable to interpret information transmitted through other languages that the farmer is not familiar with. Therefore, when there is information asymmetry, farmers will be unable to understand relevant information required to access the formal market which in turn will affect their income.

Transport ownership could affect market participation through market accessibility and transaction costs, especially in communities with limited or no public transportation (Galvez 2008). Likewise, not having own transport limits market access via transaction costs associated with hiring and transporting cattle. Therefore, income of farmers will be affected on the basis that farmers who do not have own transport and cannot afford to hire transport will be excluded from better paying markets, hence lower or no income.

Drought risk refers to the possibility of a danger which might affect grazing, water and other related resources due to the absence of rainfall. According to Barrett (2008), drought stimulates off-take by small-scale cattle farmers, especially in times of stress. Drought affects farmers' income through market access in a sense that there will be very low rainfall and lack of natural

grazing, especially for communal farmers. Droughts may force people and their livestock to move, potentially exposing them to environments with health risks to which they have not previously been exposed (Wreford & Adger 2010). Therefore, farmers may sell more stock at a low price, resulting in small herd size and decreased income for selling farmers.

Endogeneity

Endogeneity arises when a regressor is correlated with the error term, thereby violating the most important OLS estimation assumption, the exogeneity condition, specifying that u has an expected value of 0 given any X (i.e. $E(u|X_1, X_2, \dots, X_1) = 0$) (Bascle 2008).

Solving endogeneity problem

In order to address the problem of endogeneity, the instrumental variables method was used (Sargan 1958). Bascle (2008) indicates that the instrumental variables method is the best method to solve the problem of endogeneity because:

- It can still be used if the measurement error is uncorrelated with e_i and u_i .
- It offers more flexibility.
- It can deal with multiple endogenous regressors.
- It can handle many types of function forms in the first stage equation.
- The first stage regression can be dummy or continuous.

Instrumental variable estimators correct for endogeneity through fitted values. The degree of efficiency loss greatly depends on the validation of two conditions. To produce consistent and efficient estimators, IV methods (and thus 2SLS estimation) require that the relevance and exogeneity conditions are fulfilled (Bascle 2008; Wooldridge 2002).

A report by Stock & Yogo (2004) states that, when there is one endogenous regressor, the first-stage F -statistic of the 2SLS regression should have a value higher than 9.08 with three instruments and 10.83 with five instruments.

Multicollinearity

Multicollinearity is a condition occurring when two or more independent variables in the same regression model contain a high level of the same information (Evans 2013). Because of two coefficients appearing more significantly related than they are, this leads to inaccurate and

unreliable results. In order to test for the severity of multicollinearity, the variance inflation factor (VIF) is calculated. If the calculated value of VIF is greater than 5.0, then multicollinearity is regarded as a problem (Devinyak et al. 2012).

To test for multicollinearity, two steps must be followed:

The first step is to run an OLS regression between all exogenous variables. In the second step, VIF value is calculated. This value can be calculated with the following equation:

$$VIF = 1 / (1 - R^2)$$

Where:

R^2 is the R-squared value from OLS regression between two variables. For the VIF value to be above 5.0, the R-squared must be above 0.8, meaning that there is a higher correlation among those variables.

Table 3.2 List of variables used and their measurement

Variable	Description	Measurement		
Dependent variable				
Y_1 = Income ^{1&2}	Gross income of the farmer	Years		
Independent variable			Expected sign	
X_1 =Age ^{1&2}	The age of the respondent in years	Years	-	Ogunkoya 2014
X_2 =Sex ^{1&2}	1= Male; 0=Otherwise	Dummy	-	Osmani & Hossain 2013
X_3 =Marital status ^{1&2}	1= Married; 0=Otherwise	Dummy	-	Mazibuko 2013
X_4 =Land size ^{1&2}	The total size of land available for production	Hectares	+	Osmani & Hossain 2013
X_5 = Years in cattle farming ^{1&2}	Number of years	Number	+	Egbetokun & Omonona 2012
X_6 =Municipality ^{1&2}	1=Blouberg; 0= Otherwise	Dummy	+	Seo & Mendelsohn 2008
X_7 =Breed	1= mixed breed; 0= Otherwise	Dummy	-	Ogunkoya 2014
X_8 =Land tenure ^{1&2}	1= Communal; 0=Otherwise	Dummy	+	Moloi 2008
X_9 =Pricing strategy ^{1&2}	1=Price per head; 0= Otherwise	Dummy	+	Sikwela 2013

X ₁₀ =level of education ^{1&2}	1= Secondary education; 0=Otherwise	Dummy	+	Olwande & Mathenge 2012
X ₁₁ =Type of farming ^{1&2}	1= Cattle only; 0= Otherwise	Dummy	+	Montshwe 2006
X ₁₂ =Distance to formal market ^{1&2}	Distance that a farmer has to travel to sell cattle in the formal market	Kilometres	+	Onoja et al 2012
X ₁₃ =Market information ^{1&2}	1= farmer has access to market information; 0=Otherwise	Dummy	-	Osmani & Hossain 2013
X ₁₄ =Road Infrastructure ^{1&2}	1= Farmer travels on gravel road; 0=Otherwise	Dummy	-	Olwande & Mathenge 2012
X ₁₅ =Support services ^{1&2}	1= Farmer has access to support services; 0=Otherwise	Dummy	-	Moloi 2008
X ₁₆ =Transport ^{1&2}	1= Farmer has own transport for distribution of cattle; 0=Otherwise	Dummy	+	Khapayi & Celliers 2016
X ₁₇ =Market access ^{1&2}	1= If a farmer has access to the formal market; 0= Otherwise	Dummy	+	Sikwela 2013
INSTRUMENTAL VARIABLES				
X ₁₈ =Transport costs ²	Amount of money paid when hiring a Transport	Continuous		Musemwa 2008
X ₁₉ =Ethnicity ²	1=Pedi; 0=Otherwise	Dummy		Ha & Shively 2008
X ₂₀ =Drought ²	1= if farmer has experienced drought in the past three years; 0=Otherwise	Dummy		Montshwe 2006

The exponent 1 indicate that the variable was used in logit model only, exponent 2 indicate the variable was used in 2SLS only and exponents 1&2 indicate that the variable was used in both models

3.6 Ethical considerations

Saunders et al. (2009), points out that data collection stage is associated with a range of ethical issues. All the participants were fully informed about the importance of the study so that should they wish not to participate, they can withdraw. All the respondents were asked for permission to participate in the study and consent of agreement was signed by both the researcher and the respondent. The respondents were allowed to stop at any time or not answer the questions which were found to be sensitive or making them feels uncomfortable. The information obtained from any sources including the respondents was kept confidential at all levels. Only the researcher and respondent knew about it.

3.7 Conclusion

This chapter explained the study area, the Capricorn District which consists of four local municipalities. The research design, sampling method and data collection method were also analysed. A stratified random sampling technique was used to select the sample. In total, 159 small scale cattle farmers were interviewed at their farms and homes. Data was recorded on SPSS version 24 of 2016 and STATA 14. The study used three methods of analysing data according to the objectives of the study. However, the main models were the logistic regression model and the two stage least squares regression model.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

SOCIO-ECONOMIC CHARACTERISTICS OF SMALL-SCALE FARMERS

4.1 Introduction

This section presents the results of descriptive analyses of the characteristics of small-scale farmers in Capricorn district. The results are presented using frequency distributions, percentages, mean, minimum and maximum values. In this chapter, demographic characteristics, farming and enterprise characteristics, marketing management factors, marketing information, pricing, sales and income and institutional support services are discussed.

Results are presented in tables, cross tabulations and graphs. Cross tabulations were mainly used in cases where there were follow-up questions. Each question was paired with each follow-up question in order to easily analyse their relationships. The total sample size was 159 small-scale cattle farmers but in some cases the sample was depending on the number of respondents from the previous question. Although the questionnaire was structured, in some cases the respondents were able to give more than one answer to a question.

4.2 Descriptive statistics results

Table 4.1: Demographic characteristics

Variable	Frequency	Percentage
Sex		
Male	89	56
Female	70	44
Marital status		
Single	36	22.6
Married	95	59.7
Divorced	07	4.4
Widowed	21	13.2
Municipality		
Blouberg	57	35.8
Molemole	43	27
Lepelle-Nkumpi	37	23.3
Polokwane	22	13.8
Educational level		
Primary school	83	52.2
Secondary school	36	22.6
Matric	19	12
Tertiary level	21	13.2

Table 4.1 indicates that 56% of the respondents were males. The table further shows that 59.7% of the respondents were married, 22.6% were single and 13.2% were widowed while 4.4% were divorced.

The results above show that involvement of women and youth in cattle farming remains a minimal in the Capricorn district. This could be the result of the role played by males in farm decisions as stated by Sikwela (2013). The current study shares the same sentiments as many other studies (Mazibuko 2013; Sikwela 2012; Montshwe 2006), namely that men own more livestock than women. These results confirm Mazibuko's study (2013), which highlighted that men own livestock, even if they are not daily supervising the animals.

Education plays an integral part in human life (Mudzielwana 2015). In farming, education helps farmers to understand farming practices, interpretation and reading financial statement. The results in Table 4.1 show that all the respondents attended school, but the majority never reached tertiary level. The majority of the farmers (52.2%) went to school up to primary level, while 22.6% had some form of secondary education. Tertiary education was attained by 13.25%. Table 4.2 also indicates that, out of the 159 respondents, 35.8% were from Blouberg, 27% were from Molemole, 23.3% were from Lepelle-Nkumpi and 13.8% were from Polokwane. Polokwane had the lowest number of respondents because of low involvement in cattle farming by the residents.

In this study, there were no farmers without education, implying that farmers were able to analyse written information. Although all farmers attended school, they did not have strong educational backgrounds which could limit their ability to adapt to new farming practices and technologies. Education affects market information interpretation and understanding of technical and management skills which are in line with Montshwe (2006) that people with higher educational levels are more able to interpret information.

Table 4.2: Total number of cattle owned by Respondents

Category	Frequency	Percentage
Calves (<1 year)	2281	11.8
Heifers (1-3 years)	1011	26.43
Breeding cows(3-6)	3591	41.59
Old cows(> 6 years)	1554	17.9
Bulls (<3 years)	61	0.7
Bulls(>3 years)	136	1.58
Total	8634	100%

Table 4.2 summarises the results of the total number of cattle. The cattle were divided into six categories, namely calves, heifers, breeding cows, old cows and bulls younger than three years and bulls older than three years. From the six categories of cattle, the largest herd size was from breeding cows (41.59%), followed by heifers (26.43%) and old cows (17.9%). Bulls younger than three years were the lowest with 0.7%. The total number of cattle kept was 8 634.

It is worrying to note that only a small number of smallholder cattle farmers have a large herd size. The farmers with a large herd size have a greater probability of selling their livestock, even in mainstream markets (Montshwe 2006). Although the minority of farmers had a large herd, it is pleasing to see that farmers' herds mainly consist of breeding stock. Therefore, the larger the breeding stock, the higher the potential to increase the herd size.

Table 4.3: Farming systems and cattle breed selection among the respondents

Variable	Frequency	Percentage
Type of farming		
Cattle only	50	31.5
Mixed livestock	74	46.5
Crop and livestock	35	22
Cattle main enterprise		
Yes	128	80.5
No	31	19.5
Type of breed		
Brahman	5	3.1
Bonsmara	27	17
Nguni	23	14.5
Mixed breed	100	62.9
Boran	2	1.3
Simenthal	2	1.3

Table 4.3 shows that the majority of the farmers (46.5%) indicated that they were farming with mixed livestock, while 31.5% were farming with cattle only. Those that practised both crop and livestock systems were 22%. Of all the farmers who were interviewed, 80.5% indicated that cattle farming were their main enterprise. The majority of the farmers (62.9%) were farming with mixed breed, followed by Bonsmara cattle (17%).

It can be deduced from the results that farmers in the Capricorn district are mainly involved in livestock farming. This is because livestock farming has great potential to alleviate household food insecurity (Musemwa et al. 2008). Therefore, livestock ownership offers households a sense of security should the need for immediate cash arise or in times of unforeseen circumstances

Farmers are involved in mixed livestock and have cattle farming as their main enterprise. Therefore, other livestock can be used to complement income from cattle sales, especially

when the markets are not favourable for farmers to sell their cattle. Research has shown that cattle farming can lead to an increase in food security (Siegmund-Schultze 2007).

Table 4.4: Descriptive for farming characteristics

	N	Minimum	Maximum	Mean
Age of respondent	159	20	80	58
Total land size (Ha)	63	100	2811	932,49
Land size under cattle farming (Ha)	63	100	2000	746,89
Years practising cattle farming (Years)	159	2	43	14.40
Transport cost (Rand) Monthly	21	450.00	3500.00	1415.00
Gross income (Rand)		7 500.00	1 875 200.00	120 747.49

Table 4.4 shows that the small-scale cattle farmers of the Capricorn district are aged between 20 to 80 years, with 10% of the population being youth. The age of the farmer and more farming experience are thought to improve farming practices of the farmers and exposure to agricultural markets whereas younger farmers are focused towards better paying markets since they possess less experience in farming (Bester 2008). However, the average age in the Capricorn district was high implying that there was a high variability in farmers' ages.

As reflected in Table 4.4., the minimum years of cattle farming attained by the respondents were two years with a maximum of 43 years. The average years of cattle farming were 14 years. These results show that the majority of the farmers interviewed had vast experience in cattle farming and this is because the majority of the respondents were adults and aged people.

The minimum total size of land available to farmers was 100 hectares with a maximum of 2811 hectares. Table 4.4 also shows that the average land area under cattle farming was 746 hectares. From the results, it is also evident that only farmers on state land had large pieces of land for production.

Table 4.4 indicates that the minimum transport cost paid by farmers who hired transport was R450.00, maximum of R3 500.00 and a mean transport cost which farmers pay was R1 415.00. The minimum distance to where farmers were selling their cattle was 2 km with a maximum market distance of 86 km. Farmers selling at formal markets were the ones travelling longer

distances than those selling to the informal markets. The minimum annual gross income of farmers was R7 500.000 with a maximum of R1 875 200.00.

Table 4.5: Cross tabulation of land tenure system and land ownership among the respondents

		Land ownership								
		%	Family	Trust	PLAS/ State land	Com pany	Comm unity	Self- owne d	Oth er far mer	Chu rch
Land tenure syste m	Communal land	62	2	1	0	1	96	0	0	0
	Rent/ Lease	33	4	4	60	13	0	0	15	4
	Private land/farm	5	4	1	0	2	0	1	0	0
Total			8	4	32	10	94	1	8	2

Table 4.5 represents the results of cross tabulation between land tenure system and land ownership of the respondents in the Capricorn district. The results show that out of a total of 159 farmers, 62% farmed on communal land, 33% on rented land and 5% on private land. Of the farmers using communal land, 2% were farming on land owned by family, 1% on land owned by trust and company whereas 96% were farming on community owned land.

Regarding usage of rented land, very few farmers were using family land and trust land that were rented, 60% were on PLAS or state land. In relation to private land tenure system, 12% of the farmers indicated to own the land and 50% of the land belonged to the family.

It can be concluded from the study that land availability and ownership are problems among cattle farmers in the Capricorn district. The reason for this could be due to the fact that on communal land there is no control measures taking place and as a result, overgrazing sometimes takes place. Ownership of land can influence agricultural productivity, because farmers who do not own land can be reluctant to develop and maintain the land (Randela et al. 2000). It has been established from previous studies that tenure insecurity is the main obstacle to agricultural development (Moloi 2008).

Table 4.6: Infrastructure and equipment characteristics

	Sales pen	Loading ramps	Castrator	Dehorner	Off-loading ramps	Water points	Feedlot	Brand marker	Scale	Cold room	Kraal	Ear tags
Yes %	6.9	35.2	19.5	22	34	91.8	13.2	54.1	15.1	5.0	98.1	30.2
No %	93.1	64.8	80.5	78	66	8.2	86.8	45.9	84.9	95	1.9	69.8

Table 4.6 summarises the equipment and infrastructure that the farmers had at their disposal. The results show that the majority of farmers lacked the necessary infrastructure and basic equipment required for cattle farming. As reflected in the table above, 93.1% of the farmers did not have a sales pen, 64.8% did not have loading ramps, 80% did not have castrator, 86.8% did not have feedlot, 84.5% did not have a scale, 95% did not have a cold room and 69.8% did not have ear tags. Almost all of the farmers (91.8%) had water points, 98% had kraals and 54.1% had brand marker.

According to Pote (2007), poor smallholder farmers are unable to participate in lucrative agricultural markets due to a lack of household specific productive assets. An analysis of farmers' available infrastructure and machinery helps understand assets and systems that small-scale farmers possess for their farming activities. An analysis of farmers' machinery and equipment helps to determine whether farmers have or do not have the relevant production equipment that could allow them to produce quality and competitive products.

Small-scale cattle farmers in the study area lack critical infrastructure for production purposes which in turn affects the quality of their cattle. The inability of the cattle farmers to slaughter and sell the meat/beef could be due to the lack of relevant infrastructure (scales, coldrooms, etc.), market regulations and long distances to where formal markets are available.

Table 4.7: Cross tabulation between market, market satisfaction and reason for not being satisfied

MARKET	N= 159	MARKET SATISFACTION			REASON FOR NOT BEING SATISFIED		
		Satisfied	Less satisfied	Not satisfied	Market not guaranteed	Low selling price	Selling price is unknown
Butchery	1.9	100	0	0			
Auction	29	74	17	9	8	0	92
Abattoir	3	100	0	0	0	0	0
Open market	51	46	35	20	70	30	0
Other farmer	15	50	33	17	83	17	0

Table 4.7 summarises the results of the type of markets where farmers were selling their cattle along with market satisfaction and reasons for being less or not satisfied. The most used market was the open market with 51% farmers making use of them. These farmers explained that they sell to the open market because the buyers are close to business and there are no transport costs. The second most used market was auctions indicated by 29% of farmers. The farmers indicated that they use auctions because they offer a higher price and farmers can sell in numbers.

Butcherries (1.9%), abattoirs (3%) and other farmers (15%) were found to be the least market used for selling cattle. Although they are the least used type of market, it was indicated that there are benefits attached to each market. It was indicated that farmers sold their cattle to other farmers because they are close to business and there are no transportation costs. Regarding abattoirs, farmers cited that they are selling to abattoirs because they offer a higher selling price and farmers are able to sell in numbers.

The respondents were also asked if they were satisfied with the market they were selling to and all respondents selling to abattoirs and butcherries were satisfied. For those who were selling at auctions, 74% of the respondents were satisfied, 17% were less satisfied and 9% were not satisfied. The reason for being less or not satisfied was because the market was not guaranteed and the selling price unknown.

From the farmers that sold their cattle to open markets, 46% were satisfied with the market, 35% were less satisfied and 20% were not satisfied. When it comes to those selling to other farmers, 50% of the respondents indicated that they were satisfied with the market whereas 33% and 17% respondents were less satisfied and not satisfied respectively. It is evident that farmers selling to open markets and other farmers were less or not satisfied with their market because the market was not guaranteed and the selling price was low.

Out of 159 farmers interviewed, only 7.5% of the farmers slaughtered and sold carcasses whereas 92.5% sold live cattle. The discrepancy was because the majority of the farmers did not have cold-rooms where they could store the carcasses after slaughtering. Those who slaughtered cattle sold them to the public (67%) and local supermarkets (33%).

Table 4.8: Cross tab between market and market benefits

		N=	Market benefits					
		159						
		%	Higher price	Close to business	No transport costs	sell in numbers	Set own price	Market guaranteed
Market	Butchery	2.0	67	33	0	0	0	0
	Auctions	29	50	4	0	44	0	2
	Abattoir	3	20	0	0	40	0	40
	Open Markets	51	0	49	47	0	4	0
	Other farmers	15	0	63	33	0	4	0

The farmers were asked about the benefits derived from selling at their markets of choice. Table 4.8 indicates that, from the farmers who were selling to butcheries, 67% indicated that the market offered a higher price whereas only 33% said it was close to business. With regards to auctions, 50% of the farmers said the market offered higher price, 4% indicated it was close to business, 44% said they sold in numbers and 2% indicated the market was guaranteed.

Concerning abattoirs, only 20% of the farmers said the benefit was a higher price and 40% said they sold in numbers and the market was guaranteed.

With regard to those selling to open markets, 49% indicated that the benefit was that the markets were closer to their farms or households while 47% said there were no transport costs and lastly, 4% said they set their own price. Of those selling to other farmers, 63% indicated that the benefit was that the market was close to the business, 33% said there were no transport costs and only 4% said they set their own price.

These findings confirm the findings of Nkosi & Kirsten (1993) who highlighted that private sales or informal markets provided the shortest and simplest channel among smallholder cattle farmers and consequently, it was their most popular marketing option. This is because, according to Nkhori (2004), through these informal market channels, smallholder farmers transact directly with the ultimate consumer. Many socio-cultural functions performed in African societies provide a direct private market channel amongst individual households in rural areas and farmers incur low transaction costs.

This finding could also be linked to the demographic characteristics of farmers, namely that most smallholder cattle farmers have no formal education and lack support and extension services. A lack of support and extension services clearly denies farmers' entry into formal market channels, while a lack of formal education could be denying them knowledge of the advantages of using various formal market channels which normally pay reasonable and market related prices (Mazibuko 2013). The formal market allows farmers to sell cattle in numbers and offers higher prices but if the farmers are not satisfied with the price, they have the option not to sell.

It is noteworthy that the smallholder cattle farmers who participated in this study preferred markets from which they receive higher prices. These markets could be either informal or formal. This could also be an indication that smallholder cattle farmers are involved in cattle sales for financial gain.

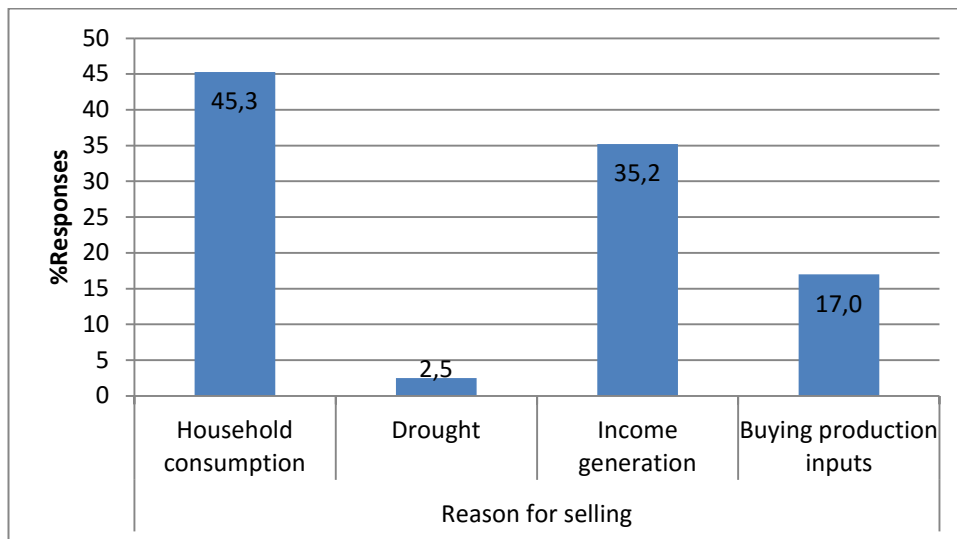


Figure 4.1 Reason for selling cattle

The figure above indicates that 45.3% of the farmers sold cattle because of household consumption, 2.5% sold due to drought, 35.2% sold because they wanted to generate income and 17% sold in order to procure some production inputs. This means that cattle is an important asset to the lives of many small-scale farmers and is used as a source of living and for generating income, as well as a precautionary measure during times of need. Musemwa et al. (2010) highlighted that smallholder cattle farmers keep cattle for cash benefits.

Table 4.9: Transport, transport type and cattle distribution

	Number	Frequency	Percentage
Have own transport	159		
Yes		41	26
No		118	74
Cattle distribution	118		
Hire transport		21	18
Transport by foot		8	7
Buyer transport them		88	75
Transport type	41		
Bakkie with trailer		40	65
Truck		20	32
Truck with trailer		2	3

Table 4.9 presents the results of transport availability to farmers, how they transport cattle if they do not have own transport and transport types for those who have own transport and those hiring transport. With regard to cattle distribution to markets, 18% of the farmers hired transport, 7% transported cattle by foot and 75% indicated that the buyer transported the cattle. In relation to the transport type used to transport cattle, 65% of the farmers used bakkies with trailers, 32% used a truck and 3% used a truck with a trailer.

It is evident that the majority of farmers in this study did not own any means of transportation for distributing cattle. Therefore, they resorted to hiring transport in the form of a truck or bakkie with a trailer which was often costly for them. This revelation is also in line with that of Mazibuko (2013) which highlighted that transport costs are high for farmers to get any meaningful benefits from their trading activities, thus discouraging small-scale cattle farmers from marketing activities. Therefore, for this purpose, they hire trucks. Hiring of transport could result in high transaction costs for small-scale cattle farmers, especially in cases where the market is far away from farmers.

The underdevelopment of rural roads and key infrastructure such as expensive or unavailable electricity has led to emerging cattle farmers experiencing high transport costs for agricultural products to the market as well as of farm inputs and reduced or no investment in cold storage facilities and processing of farm produce, thus reducing farmers' competitiveness (Mngomezulu 2010). The results in Table 4.6 further highlighted the link between a lack of appropriate transportation facilities and poor road infrastructure, which result in high transaction costs.

Table 4.10a: Cross tab between market information and market information source

N=159		%	Information source			
			Radio	Government extension officers	Extension publications	Co-farmer
Receive market information	Yes	71	1.0	36	13	50
	No	29				

Table 4.10b: Market information source, type of information received and duration

		%	Type of information received			Duration			
			Date of sales	Sales price	Buyers	Weekly	Monthly	Quarterly	Only when I am selling
Market information source	Radio	0.9	100			100			
	Government extension officers	36	68	27	5		71	29	
	Extension publications	13	53	47		80	20		
	Co-farmer	50	9		91		18	11	71

The farmers were asked if they had received market information prior to sales of their cattle and 71% indicated that they did while 29% indicated that they did not (Table 4.10a). The results also highlight that, from the farmers who did receive market information, only 0.9% of them got it from radio, 36% from government extension officers, 13% from extension publications and 50% from their co-farmers.

Table 4.10b indicates that, from the farmers who received market information from government extension officers, 68% received information about date of sales, 27% received information about sales price and 5% received information about buyers. When it comes to how often they received it, 71% of the farmers indicated monthly, whereas 29% received the information quarterly. From the farmers who received market information from extension publication, 53% of them received information about date of sales and 47% received information about buyers. The information was received weekly by 80% farmers and monthly by 20% farmers.

From the farmers who received information from co-farmers, 9% received information about date of sales and 91% received information about buyers. Most of the farmers (71%) received the information only when they were selling, 18% received the information monthly and only 11% farmers received the information quarterly. All the farmers who did not receive market information prior to sales indicated that they would have preferred to receive market information prior to sales.

Market information is important for accessing the formal market because it allows farmers to make well-informed decisions. Thus, farmers who are more informed are likely to participate in marketing channels that are more beneficial and offer better returns to their business. Farmers will also be able to meet the different formal market conditions. According to Burke (2009), lack of marketing knowledge exposes emerging farmers to a marketing disadvantage, e.g. they have a weak bargaining position vis-à-vis traders.

It can be concluded that cattle farmers find it difficult to access market information prior to sales, especially from the government extension officers. However, it is pleasing to see that those who received information get it as often as possible to keep them up-to-date with changes in the cattle market. The smallholder cattle farmers in the study rely on informal networks (other farmers) for information, which could put them at risk of getting biased information due to the opportunistic behaviour of the more informed group (Mazibuko 2013).

Table 4.11: Knowledge of market requirements

Market requirements	Poor (%)	Fair (%)	Good (%)
Average sales price per breed	13.2	40.3	46.5
Age of cattle	0	5.7	94.3
Cattle body weight	62.3	17.0	20.8
Muscle size	76.6	10.1	13.2
Cattle condition	1.9	37.7	60.4
Animal health	5.7	52.2	42.1
Animal health certification	73.6	11.9	14.5
Animal identification	10.7	23.9	64.8
Protein fat	94.3	0.6	5

Table 4.11 presents knowledge of farmers on formal market requirements. It is evident that most of the farmers have a better knowledge of the average age of cattle (94.3%), cattle condition (60.4%) and animal identification (64.8%). The results also show that the farmers' knowledge of cattle body weight (62.3%), muscle size (76.6%), animal health certification

(73.6%) and protein fat (94.3) is poor. It can be concluded that a lot need to be done in transferring knowledge about formal market requirements.

Before farmers can participate in the formal markets, it is of great importance that they have the right knowledge about the requirements of the market they are selling to. With this knowledge, it will be easy for farmers to meet the expectations of the markets and better prepare themselves before any sales agreement can take place. It can be deduced that cattle farmers in this study lack information about the formal market requirements for selling cattle.

Table 4.12: Sales, price and income

	Yes (%)	No (%)
Have you sold cattle in the past 12 months?	81.1	18.9
Are you satisfied with farm gate price for your consumers?	73	27
Are you satisfied with the income?	66	34
Have you ever sold to a different market before?	33.3	66.7
Is there a difference between your current and previous market?	82.4	17.6

The farmers were asked if they had sold cattle in the past twelve months and 81.1% of them indicated that they did whilst 18.9% did not sell any cattle (Table 4.12). When asked about price, 73% were satisfied with the farm gate price whereas 27% were not satisfied. When looking at the income, 66% of the farmers were satisfied with their gross income whereas 34% were not satisfied. About 33% of the farmers had sold to a different market before whilst about 66% of the farmers had always sold to one market. For those who had sold to a different market before, 82% indicated that there was a difference between their previous and current income whereas 17% indicated that there was no difference.

Smallholder farmers' ability to access potential cattle buyers plays a critical part in assuring good market prices for the farmers. It is noteworthy that farmers are selling their stock, are happy with their income and are exploring other markets. This shows that there is development as they can access other markets. Selling to different markets allows farmers to compare markets and stick to the one that is beneficial to them. However, it is worrisome to learn that the majority of the farmers have never sold to a different market before.

These farmers could be missing out on many other opportunities and benefits that could come should they try to market their cattle on other markets that are better than the ones they have

been using. These findings also highlight that farmers believe that different markets offer different levels of income. They also believe that selling to a different market will offer them a higher income as compared to their current market.

Table 4.13: Total number of cattle sold

Category	Frequency	Percentage
Calves (<1 year)	1621	50.4
Heifers (1-3 years)	561	17.5
Breeding cows (3-6)	300	9
Old cows (> 6 years)	601	18.6
Bulls (<3 years)	112	3.5
Bulls (>3 years)	43	1
Total	3208	100%

Table 4.13 summarises the results of the total number of cattle sold by farmers in the past twelve months. The cattle was divided in six categories namely; calves, heifers, cows, breeding cows, old cows, bulls less than three years and bulls greater than three years. From the six categories of cattle, calves contributed 50% of the sales, followed by old cows (18.73) and heifers (17.49%). The lowest percentage of sales was from bull greater than three years. It can be concluded that the best market for cattle farmers were calves.

It can be deduced from the results that the majority of the sales come from calves and old cows. It is encouraged that farmers sell calves because they usually offer reasonable prices and are high in demand. It is also pleasing to realise that selling breeding stock is amongst the least stock sold because they are the ones that offer the potential to increase the herd size of the farm.

Table 4.14: Different market and income

		If yes, how				
		%	Income will be low	Income will be high	Prices are market driven	Other markets buyers are guaranteed
Do you think if you were selling to a different market your income would be different?	Yes	56	45	49	2	3
	No	44				

The farmers were asked if they thought their income would be different if they were selling to a different market (Table 4.14) and 56% of the farmers indicated yes whereas 44% farmers said it would not be different. From the farmers who said their income would be different, 45% indicated that they thought it would be lower, 49% said it would be higher and 3% said other markets buyers were guaranteed. These findings highlight that farmers believe that different markets offer different levels of income. They also believe that selling to a different market will offer them a higher income compared to the current market.

Table 4.15: Support services

		If Yes, how many times per production cycle?				
		%	Once	Twice	Thrice	More than three times
Do you receive support services?	Yes	43	59	25	9	7
	No	57				

Table 4.15 summarises the results of support services received by farmers and the amount of times they receive it. Out of 159 farmers, 43% indicated that they did receive support services whereas 57% farmers did not. From those who received support services, 59% received it once, 25% received it twice and 9% received it three times per production and marketing cycle. All the farmers who did not receive support services indicated that they would prefer to receive support services.

Table 4.16: Type of support services received

Type of service	N= 69	Frequency	Percentage
Production management		69	100
Marketing management		38	55.1
Financial management		20	29
Record keeping		24	34.79

Table 4.16 summarises the results of the type of support services that farmers received. All 69 farmers received support services related to production management. About 55% of the farmers received marketing service. Only 29% of the farmers received financial management services whereas 34% received record keeping services.

Those who received support were mostly under the LDARD and DRDLR farmer support programmes. Although there are farmers who received support services, it is worrisome to note that the majority of small-scale cattle farmers in the Capricorn district do not have access to support services which leads them to produce poor cattle, mismanagement of the farm or business funds, poor record keeping and poor marketing processes.

4.3 Conclusion

This chapter provided a general overview of the demographic characteristics of small-scale cattle farmers in the Capricorn district of the Limpopo Province. The environments in which these farmers operate were also highlighted. The information was presented in tables and graphs. Understanding the socio-economic characteristics and working conditions of farmers can enable more informed and better farmer support programmes.

CHAPTER FIVE

EMPIRICAL RESULTS

5.1 Introduction

This section presents the results of econometric analyses which were aimed at revealing the relationship between small-scale cattle farmers' access to the market and their gross income. Data was analysed using two methods. Firstly, a logistic model was used to analyse the factors affecting small-scale cattle farmers' access to the formal market. The second approach involved using a two stage least squares model to determine the effect of market access on small-scale cattle farmers' gross income. The results of the two approaches are presented in the form of tables and discussed further.

5.2 Logistic model results

Table 5.1: Logistic regression results

Variable	B	S.E.	Z	p> z	VIF
Marital status	-1.271594	0.938	-1.36	0.175	1.11
Municipality	6.088366	2.224	2.74	0.006*	1.66
Education	5.755467	2.415	2.38	0.017**	2.69
Land tenure	7.827908	3.424	2.29	0.022**	2.88
Type of farming	0.1264764	1.295	0.10	0.922	1.24
Breed type	-2.592419	1.207	-2.15	0.032**	1.74
Own transport	4.16268	1.959	2.12	0.034**	1.70
Road infrastructure	-1.28755	2.131	-0.60	0.546	1.74
Sex	1.385465	1.130	1.23	0.220	1.15
Pricing strategy	-5.147976	2.281	-2.26	0.024**	2.17
Support services	1.050636	1.105	0.95	0.342	1.28
Market information	-1.712122	0.980	-1.75	0.081	1.30
Income	1.24e-06	0.000	0.09	0.930	1.88
Distance to markets	0.1705405	0.090	1.88	0.060	2.25
Age	-0.0892209	0.066	-1.36	0.174	3.96
Total land size	0.0071746	0.003	2.20	0.028**	3.20
Years in cattle farming	-0.1384998	0.0755175	-1.83	0.067	2.12
Constant	-5.693991	4.980	-1.14	0.253	
Number of observations = 159 Log likelihood = 50.503 LR Chi-square =170.41 R-square = 0.8019					

Table 5.2: Marginal coefficients

Variable	dy/dx	S.E.	Z	p> z
Marital status	-0.0498121	0.036	-1.39	0.164
Municipal location	0.2384992	0.077	3.10	0.002*
Education	0.2254585	0.087	2.59	0.010**
Land tenure	0.3066422	0.126	2.44	0.015**
Type of farming system	0.0049545	0.051	0.10	0.922
Breed type	-0.1015527	0.102	-2.35	0.019**
Own transport	0.1630644	0.072	2.28	0.023**
Road infrastructure	-0.0504371	0.083	-0.60	0.546
Sex	0.0542727	0.043	1.28	0.220
Pricing strategy	-0.2016613	0.082	-2.46	0.014**
Support services	0.0411565	0.043	0.96	0.335
Market information	-0.0670689	0.037	-1.80	0.071
Income	4.84e-08	5.531	0.09	0.930
Distance to market	0.0066806	0.003	2.01	0.045**
Age	-0.003495	0.002	-1.40	0.161
Total land size	0.0002811	0.000	2.33	0.020**
Years in cattle farming	-0.0054254	0.003	-1.92	0.055
Constant	-5.693991	4.980	-1.14	0.253

5.2.1 Logistic regression discussion

Before logistic regression was conducted, the variables were tested for multicollinearity and it was found that the variable carcass slaughter, total number of livestock and transport cost had a VIF value of above 5.0. Therefore, multicollinearity was present and the variables were excluded in running logistic regression.

The results for an estimated co-efficient for binary logistics are presented in Table 5.1. The results show that seven out of 17 variables considered in this study had a significant influence on the probability that small-scale cattle farmers have access to the formal market. These include municipality, educational level and land tenure system, type of breed, transport availability, pricing strategy and total land size. Only one variable was significant at 1%, and six variables were significant at 5%.

From the overall variables that affect farmers' access to formal markets, municipality, educational level, land tenure system, transport availability and total land size had a positive effect on farmers to access the formal market. Types of breed and pricing strategy are all negatively related to the probability of farmers' access to the formal market.

The principle assumption on which -2log likelihood ratio is based, is that there are socio-economic factors affecting small-scale cattle farmers' access to the formal market. The log likelihood ratio of 50.603 rejects the null hypothesis which states that none of the small-scale cattle farmers' socio-economic characteristics influence their access to the formal market. The Pseudo R square was 81% which implies that the model was useful in predicting the probability of small-scale cattle farmers accessing the formal market. The marginal effects of variables after logistic regression are presented in Table 5.2. Only significant variables from regression results are discussed.

- **Municipality**

The variable municipality was found to be statistically significant and positively related to access to the formal market (Table 5.2). This implies that farmers situated in Blouberg municipality are more likely to access the formal markets as compared to farmers in other municipalities. Livestock ownership decision is highly dependent on the climate and environment in which the farm is located (Seo & Mendelsohn, 2008). The results were unexpected as the majority of farmers in Blouberg have to travel long distances and pay transport to sell their cattle on the formal markets.

- **Educational level**

The educational level of cattle farmers was found to be positive and statistically significant at $P < 0.05$. Keeping all things constant, educational level was significant and positively related to the probability that the farmers have access to the formal market. The results indicate that farmers with at least secondary education have 23% chance of accessing the formal market as compared to farmers without secondary education (Table 5.2).

The results were expected as a higher educational level is associated with the ability to understand and interpret information. According to Makhura (2001), business leaders' education increases understanding of market dynamics and influences decision making. The results are consistent with the results of Olwande & Mathenge (2012).

- **Land tenure system**

Land tenure was found to be statistically significant and positively related to having access to formal market. When all variables are held constant, farmers operating on communal land were 31% more likely to access the formal markets as compared to those in other tenure arrangements (Table 5.2). The results were unexpected and in contrast with Moloi (2008) who found that, when farmers have secure land, they are likely to participate in the formal markets. Land tenure security associated with communal land ownership is an obstacle to agricultural development (Ortmann & Machete 2003).

- **Total land size**

Total land size has a positive and significant relationship with the probability of farmers accessing the formal markets, i.e. the probability of accessing the formal markets increases with an increase in land size. Thus, a unit increase in land size will increase the probability of accessing formal markets by 0.0002811 (Table 5.2).

This implies that farmers who have enough land for grazing and development are likely to participate in the formal market. The results agree with those of Osmani & Hossain (2015) and Okezie et al. (2012). This could be due to the effect that farm size has on total herd size and production. Farmers with large land size have the advantage of having a large herd which can lead to increased production and increased sales.

- **Breed**

Type of breed had a negative but significant effect on access to formal markets with $P < 0.05$ (Table 5.2). The negative relationship was expected since the majority of the formal markets required a specific breed whereas the majority of the farmers were farming with mixed breed. Farmers farming with mixed breed are 10% less likely to access the formal markets. Farming with one breed has more advantages in the formal market than farming with mixed breed. The socio-economic characteristics of the farmers indicated that the majority of the farmers are farming with mixed breed and would most likely sell their cattle to the informal markets.

- **Transport availability**

Transport availability was found to be statistically significant and positively related to access to formal markets. When all variables are held constant, small-scale cattle farmers who have their own transport are 10% more likely to access the formal cattle markets than those who do not have their own transport (Table 5.2). The positive relationship was expected since it is easy for farmers who have their own transport to go to every market as compared to those who do not have own transport. The farmers prefer the market where they do not have to worry about transportation of cattle and its costs.

The results are consistent with those of the study by Khapayi & Celliers (2016) which found that the lack of transportation is one of the factors limiting farmers to participate in the formal market.

- **Pricing strategy**

Pricing strategy was found to be statistically significant but negatively related to farmers' access to the formal market. Farmers using pricing strategy of price per head were 20% less likely to access the formal market (Table 5.2). The results are supported by the descriptive statistics as farmers prefer the pricing strategy that they have control over and obviously, in the formal market, the pricing strategy is market driven or dictated by buyers. The results are consistent with Sikwela (2013) who found that price is one of the factors increasing access to the formal markets.

The variables such as marital status, age, sex, income, type of farming, road condition, distance to market, market information, years in cattle farming and support services did not have any significant effect on the probability of access to the formal market. Even though gender, gross income, type of farming, road infrastructure, distance to markets and support services were insignificant, they had a positive relationship to the probability of accessing the formal market.

Age of farmers, market information and years in cattle farming were insignificant variables having a negative relation to the probability of accessing the formal market.

5.3 2SLS model results and discussion

5.3.1 Multicollinearity results

Before running the two stage least squares collinearity test must be conducted. Therefore, variance inflation factors were calculated to test for multicollinearity problem. Multicollinearity is important in ensuring that none of the independent variables contain the same information that could lead to inaccurate and biased results. The VIF values were analysed using the collinearity statistics (Table 5.3).

Table 5.3: VIF collinearity statistics

Variable	VIF	1/VIF
Age	4.02	0.248640
Market	3.45	0.290232
Total land size	2.96	0.338046
Education	2.85	0.350669
Pricing strategy	2.82	0.355221
Land tenure	2.81	0.356365
Distance to market	2.34	0.427882
Years in cattle farming	2.13	0.469388
Breed type	1.78	0.560616
Transport costs	1.71	0.585806
Municipal location	1.68	0.593528
Road condition	1.60	0.624984
Market information	1.34	0.748853
Support services	1.30	0.768630
Farming type	1.25	0.800708
Sex	1.18	0.846676
Marital status	1.12	0.892816

Table 5.3 indicates that all the VIF values of the independent variables are below 5.0. Therefore, it can be concluded that there is no significant presence of multicollinearity in the system of equation.

5.3.2 Heteroskedasticity test

Table 5.4: White test for heteroskedasticity

White's test for H_0 : homoscedasticity against H_a : unrestricted heteroskedasticity $\chi^2(158) = 159.00$ $\text{Prob} > \chi^2 = 0.4626$ Cameron & Trivedi's decomposition of IM-test			
Source	Chi2	Df	P
Heteroskedasticity	159.00	158	0.4626
Skewness	10.73	17	0.8702
Kurtosis	-3.15e+10	1	1.0000
Total	-3.15e+10	175	1.0000

White test was used to test for heteroskedasticity in the data. Based on data presented in Table 5.4, it can be concluded that there is no presence of heteroskedasticity since the P value is greater than 0.05. Therefore, we fail to reject the null hypothesis that the residuals are homoscedastic. The results of White test in Table 5.4 show χ^2 of 159 with a p value of 0.4626.

5.3.3 Results of Two Stage Least Squares

Table 5.5: Two stage least squares results

Variable	Coef.	Std.	S.E	Z	P>Z
Market	-1574511	0.0624003	-2.5	0.013	
Breed	215806.1	126729.8	1.70	0.089	
Years in cattle farming	-2661.459	3181.347	-0.84	0.403	
Type of farming	-32086.24	48072.41	-0.67	0.504	
Distance to markets	3156.165	2847.792	1.11	0.268	
Support services	71248.72	56450.99	1.26	0.207	
Transport costs	136668.4	67749.25	2.02	0.044	
Market information	92907.62	70870.78	1.31	0.190	
Municipal location	123402.6	66826.85	1.85	0.065	
Road condition	-171627.5	63827.12	-2.69	0.007	
Pricing strategy	-445367.6	217771.7	-2.05	0.041	
Age	-3903.671	3344.422	-1.17	0.243	
Education	215806.1	126729.8	1.70	0.055	
Marital status	-35115.37	46393.74	-0.76	0.449	
Sex	-141330.6	68866.26	-2.05	0.040	
Total land size	200.7231	69.74745	2.88	0.004	
Land tenure	158069.5	74245.39	2.13	0.033	
Constant	710500	352776.3	2.01	0.044	
No. of obs = 159					
R ² = 0.7172					
F-statistic= 18.42					
ENDOGENEITY TEST					
Durbin Wu Hausman χ^2 8.53116 (P = 0.0035)					
Over-identification test					
Sargan test χ^2 1.66285 (P = 0.4354)					

The two stage least squares model was used to predict the relationship between market access and income of small-scale cattle farmers in the Capricorn district. The results for the estimated co-efficient for 2SLS regressions are presented in Table 5.5. The results show that eight out of 17 variables considered in this study had a significant influence on the probability that market access has an effect on farmers' income. These include instrumented market access, educational level, land tenure system, sex, transport costs, pricing strategy and total land size.

The variables transport costs, educational level, total land size and land tenure system indicate a positive significant effect on farmers access. The remaining variables, market access, pricing strategy, road infrastructure and gender have a negative significant effect on farmers' income. Table 5.5 shows that the multiple R was at 0.7172 and adjusted R-Square was 0.667. Therefore, the hypothesis that market access has no effect on income was rejected because the value of R (0.703) indicated the correlation of coefficients of multiple squared connected all the independent variables and dependent variable.

Durbin-Wu-Hausman endogeneity test confirms that there is a correlation between the explanatory variables and error term, therefore, the use of the instrumental variable approach is valid. In testing whether the instruments are relevant and valid, the joint F-test of instruments and Sargan over identification statistics were used. The joint F-value of instrument (18.42) confirms that the variables are relevant. As stated by Stock & Yogo (2004), the joint F-value of instruments must be above 10. Sargan chi-squared over-identification test is not significant ($P=0.04354$), therefore we fail to reject the null hypothesis of instruments' validity.

- **Market access**

The results indicate that access to the market was found to have a negative but significant effect on farmers' gross income. The effect was shown by a significance of 0.013 (Table 5.5) at 5% level. This implies that farmers with access to the formal markets are less likely to generate a higher income than farmers who do not have access to formal markets. Pender & Dawit (2007) revealed that market participation increases household incomes resulting in increased food consumption. The results present an arguable discussion where market access reduces farmers' income as opposed to many studies that found that access to better or formal markets offers a higher income due to higher prices.

- **Transport costs**

The variable transport costs have a significant ($P=0.044$) and positive effect on farmers' income (Table 5.5). The results imply that an increase in transport cost to markets will increase farmers' income. The results are in contrast with those of Musemwa et al. (2008) that, if transport costs are low, farmers will sell in faraway markets, thus increased sales. Therefore, it can be argued in this study that those farmers who sell to formal markets must travel long distances and pay transport to reach markets that offer higher prices which could lead to higher incomes.

- **Road infrastructure**

Road infrastructure was found to be statistically significant but having a negative relationship with farmers' income at $P=0.007$ (Table 5.5). The negative relationship implies that farmers who used gravel roads were less likely to have higher incomes. The reason for a negative relationship is because farmers who use gravel roads must pay higher transportation costs as compared to farmers using tarred road. Therefore, farmers could opt not to sell to markets where they are supposed to hire transport. As a result, they miss out on opportunities in the formal markets.

- **Pricing strategy**

Pricing strategy was found to be statistically significant but negative in relation with farmers' income at $P=0.041$ (Table 5.5). The negative relationship implies that small-scale cattle farmers using pricing strategy of price per head were less likely to generate higher income. According to Benfica et al. (2006), the income and economic welfare of the farmers are determined by agricultural prices influencing production decision and investment. Furthermore, Alkon (2008) reports that the need for farmers to earn a fair price sometimes conflicts with a market's goal to improve food access for low-income shoppers.

- **Educational level**

The educational level of farmers has a statistically significant and positive relationship with farmers' income (Table 5.5). This implies that farmers with a higher educational level are more likely to have a higher income. The results are supported by Musemwa (2012), namely that educated farmers are more likely to be receptive to new technologies than uneducated and the more educated the farmers, the more active and innovative they become.

With increased knowledge and technologies, farmers can come up with better strategies that they can use to improve their production and thus increase their income. Farmers with

secondary education, market information and knowledge about the markets are likely to produce cattle that meet the markets' standards of higher prices, thus resulting in increased income.

- **Sex**

The variable sex was found to be statistically significant but negatively related to farmers' income (Table 5.5). The results imply that male headed households or farms are likely to have lower incomes as compared to female headed households. The results are in contrast with the study by Sikwela (2013) which highlighted the gender of household head to be significant because the household head ordinarily makes decisions with regard to what must be produced and sold. Also, market choice is influenced by gender as females tend to sell their produce to local markets and males to distant markets.

- **Land tenure system**

The variable land tenure system is significantly and positively related to farmers' income at $P=0.078$ (Table 5.5). The positive effect of the land tenure system implies that farmers who farm on communal land will generate more income than farmers with other tenure arrangements. The results were unexpected as the majority of the farmers on communal land do not have the relevant production resources to produce cattle that meets the formal market standards.

In addition, the positive effect of land on market participation is a reduced-form effect, since land increases farm output on one hand, but this leads to a higher household income, which increases the demand for food on the other hand (Mmbando et al. 2015).

- **Total Land size**

Total land size was found to be statistically significant and having a positive relationship with farmers' income (Table 5.5). This implies that an increase in land size available for production will result in an increase in farmers' income. With enough land and production inputs, farmers can increase the level of production, thereby increasing quantities of products to be sold.

The higher the stock sold, the higher the level of income. According to Modise (2008), a large farm is expected to generate more income. Furthermore, Mmbando et al. (2015) in Tanzania found that a 10% increase in farm size leads to an almost 7% increase in household income per capita.

The variables such as marital status, age, market information, years in cattle farming, type of farming, distance to markets and support services did not have any significant effect on the probability of access the formal market. Even though distance to markets, support services and market information were insignificant, they had a positive relationship on farmers' income. Age, farming type, marital status, years in cattle farming and distance to markets were the insignificant variables and had a negative relationship with farmers' income.

5.4 Conclusion

This chapter was the core of the study as it analysed the results of the two main objectives. The chapter analysed factors affecting small-scale cattle farmers' access to the formal market. Logistic regression results were analysed and marginal coefficients of the variable were also analysed. Also, the relationship between gross income and small-scale cattle farmers' access to the formal market was analysed. The multicollinearity, heteroskedasticity and autocorrelation tests were performed before running the 2SLS regression. In testing for relevance and validity of instrumental variables, the Durbin-Wu-Hausman and Sargan over-identification tests were performed. Two stage least squares regression was used to analyse the effect of market access on the income of small-scale cattle farmers.

The hypothesis that none of the small-scale cattle farmers' socio-economic characteristics significantly influence access to the formal markets was rejected. This was because there are variables that affected market access. Furthermore, the hypothesis that market access has no significant effect on small-scale cattle farmers' access to the formal market was also rejected. Although instrumental variables have been used, it cannot be concluded that the endogeneity problem was removed. But it can however be concluded that, in this study, the endogeneity problem was mitigated using instrumental variables.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter presents the overall summary of the study and concludes with the findings derived from the econometric analysis. The chapter also discusses the extent to which the research objectives and hypotheses have been addressed by the empirical analysis. Recommendations on ways to improve cattle farming and develop small-scale farmers in the Limpopo Province are suggested.

This chapter has four sections, namely (6.2) summary of the research, (6.3) conclusions of the key findings, (6.4) recommendations for improving productivity, income and market participation and lastly (6.5) recommendations for further research.

6.2 Summary of the study

The study was conducted in the Capricorn district of the Limpopo Province as one of the nine provinces of South Africa. Its neighbouring provinces are North West, Mpumalanga and Gauteng Provinces. The Capricorn district consists of four local municipalities after the disestablishment on Aganang local municipality, which are Polokwane, Blouberg, Lepelle-Nkumpi and Molemole local municipality.

Data was collected from 159 small-scale cattle farmers with a minimum of 20 cattle. Data was collected through interviews using a semi-structured questionnaire. The questionnaires were prepared in English but in the case where the respondent did not understand English, the questionnaire was interpreted in their home language. Farmers were interviewed at their homes and at their farms.

The aim of the study was to determine the effect of market access on the income of small-scale cattle farmers in the Capricorn District of the Limpopo Province. The first objective was to describe the socio-economic characteristics of small-scale cattle farmers in the Capricorn district. The second objective was to analyse the factors affecting farmers' access to the formal market. The third objective was to determine the effect of market access on the income of small-scale cattle farmers.

Chapter two reviewed literature on small-scale cattle farmers of South Africa and across the world. The chapter revealed that there are many factors affecting small-scale cattle farmers' access to the formal market and farmers' income. It also revealed that there is a significant relationship between market access and income.

The study used SPSS version 24 and STATA 14 to analyse data. Descriptive statistics were employed using the SPSS to describe the characteristics of small-scale cattle farmers. Descriptive results were presented in the form of tables, cross tabulations, graphs, frequencies and percentages. STATA 14 was used to test regression models. Two analytical techniques were used to test the hypotheses and to analyse data. The first technique was logistic regression which was used to analyse factors affecting small-scale cattle farmers' access to the formal market. Secondly, two stage least squares regression was employed to analyse the effect of market access on the income of small-scale cattle farmers.

6.3 Conclusion

The farmers who participated in the study mostly farm on communal land and farms rented from state land. Farmers have little knowledge about the formal market requirements hence they resort to selling to the informal market. Although they are exposed to the informal market, they are not satisfied with the market because buyers are not guaranteed and the selling price is low, resulting in lower incomes. The majority of the farmers have never sold to a different market before and those who had sold to a different market moved from the informal to the formal. The farmers also indicated that, should they be given the opportunity to sell to a market offering higher prices, they would gladly make use of the opportunity.

The overall study was intended to address two main objectives and hypotheses. The objectives were (i) to analyse the factors affecting small-scale cattle farmers' access to the formal market and (ii) to determine the effect of market access on the income of small-scale cattle farmers. The hypotheses were (i) none of the socio-economic characteristics of small-scale cattle farmers affect access to the formal market and (ii) market access has no effect on the income of small-scale cattle farmers.

Hypothesis (i) was rejected because seven of the socio-economic factors affected small-scale cattle farmers' access to the formal market. These factors were: municipality, educational level and land tenure system, type of breed, having own transport, pricing strategy, total land size.

Hypothesis (ii) was also rejected because there were factors affecting the income of small-scale cattle farmers in the Capricorn district. These include instrumented market access, transport costs, pricing strategy, educational level, gender, land tenure system and total land size.

6.4 Recommendations

- **Improving access to land**

Land availability and land size for livestock farmers have certain implications for South African small-scale cattle farmers. The observation made was that the majority of farmers operate on communal land with no security and farming infrastructure. Although there are farmers operating on land reform farms, there is still a need for new tenure reform arrangements. These arrangements can be in through farmers sharing the farm.

In South Africa, the government buys farms yearly and allocate them to individuals who are interested in farming. So, instead of allocating 1000 Ha to one farmer, they should rather sub-divide the farm into two equal hectares with 500 ha for each farmer. In this way, many farmers will benefit from the programme. Alternatively, one farm can be allocated to a company consisting of two or three members. In this way, more farmers will also benefit, not only with land, but also a larger size of land. Therefore, the larger the size of the land, the higher the potential for increased production. With secured land and large land size, the farmers will be able to increase their herd and increased land size leading to increased sales and income.

- **Encourage youth to participate in agriculture**

One of the findings of this study is that the average age of small-scale cattle farmers is 57 years. For the total sample size, 90% of the respondents were found to be above the national youth age of 35. Hence, it will be difficult for them to understand market requirements, market information and the importance of selling to different markets. Although in South Africa, little has been done in assisting youth in agriculture financially to start their own businesses and cooperatives. Therefore, youth in agriculture should not only be encouraged but services like grants, mentorship and institutional support services should be offered to them.

- **Encourage farmers to view farming as a business**

Literature has proven that many small-scale farmers keep cattle due to its social and cultural benefits. Therefore, it is encouraged that farmers, especially at household level, be advised of the business value that their cattle hold. When farmers view agriculture as a business, their farming practises will improve, leading to more improved productivity and quality products. Furthermore, farmers will be motivated to invest in production inputs because there will be return on investment. Hence, farmers will no longer be referred to as poor. Also they will consider different marketing channels available to grow their business and have better returns.

- **Formation of farmer groups**

Farmers should be encouraged to form farmer groups within their vicinity. These groups will be used as empowerment strategy by farmers themselves and will create unity amongst them. Farmers can have information days where they meet amongst themselves, educate each other, share information and ideas about how they can improve themselves and move to greater heights. In this way, they will not have to solely depend on government officials or service providers for information and other farming related matters.

Transportation of cattle for smallholder farming is still the most significant problem as most of the farmers do not own transport and resolve to selling to the market that does not require transport. Alternatively, they must hire vehicles from neighbours at very unaffordable rates and affect their profit as it takes a big budget of their income after selling. With these groups, farmers can use a collective transport and share transport costs when selling to auctions and abattoirs. A collective transport will help reduce individual transport costs.

- **Broadening provision of support services**

There is still a need for support services for small scale cattle farmers especially those farming on communal land. The study recommends that support and extension services should be broadened to all farmers. From the results it is evident that the majority of farmers who received support services especially from Government extension officers are those who received land from the DRDLR and under LDARD programmes.

Therefore, professional extension and support services should be offered to all farmers as often as possible so that farmers can be well-informed on all aspects of farming and business.

- **Establishment of one-stop service centers**

It is recommended that a one-stop service centre be available per ward or certain kilometres in each municipality so that farmers can get training and receive services such as market information, marketing, financial management, etc. This can be the best strategy because the service providers won't have to go to farmers one by one but instead, they can meet all in one place (collectively). Even those farmers who are not under any government programme or farmer group can still benefit from the centre.

The centre can serve as a link between farmers and Government, private sectors, auctioneers and even researchers. To resolve the problem of a lack of infrastructure, a communal infrastructure (sales pen, scale, cattle handling facilities, etc.) can be constructed at the centre so that they can be accessible to all farmers. Distances between the markets and small-scale farmers have shown to have a positive impact on access to the formal market. It also seemed as though the majority of the farmers have poor road infrastructure (gravel) to markets. Therefore, instead of farmers travelling long distances to markets, the consumers can meet with farmers at the centre for sales purposes.

6.5 Suggestion for further studies

Although enough research has been done in the agricultural field, there are still many areas that need to be investigated. Relating to the study, the following recommendations for further research must be considered:

- As the data used for the study was collected only in the Capricorn district, future studies can be conducted on the same topic in other districts of the Limpopo Province and other provinces of South Africa.
- Further studies can be done on the same topic with different commodities; either crop or small stock.
- Research should be conducted to distinguish the difference between low-income farmers and high-income farmers.
- Development of small-scale farmers revolves around the provision of support services. Therefore, the role of farmer support programmes on small-scale farmers should also be investigated in order for better policies to be implemented to assist farmers in deep rural areas.

- Lastly, the impact of farmer support programmes on the income of farmers should be investigated.

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APPENDIX 1

QUESTIONNAIRE: EFFECTS OF MARKET ACCESS ON INCOME OF SMALL SCALE CATTLE FARMERS IN THE CAPRICORN DISTRICT OF LIMPOPO PROVINCE, SOUTH AFRICA

TO BE FILLED BEFORE THE INTERVIEW COMMENCES

Name of the enumerator

Place of interview.....

Date of interview

Full name of respondent.....

Relationship to the business.....

Race.....

(Please tick in the box next to the answer)

A. DEMOGRAPHIC FACTORS										
A1. Gender					Male			Female		
A2. Age										
A3. Marital status										
Single		Married		Divorced		Widowed		Other(specify)		
A4. Municipality										
Blouberg		Molemole		Lepelle-Nkumpi				Polokwane		
A5. Educational level										
					Primary school					
					Secondary school(8-11)					
					Matric					
					Tertiary level					

B. FARMING									
B1. Land tenure system									
Communal land		Rent/lease		Private farm/land		Other (specify)			
B2. Who owns the land?									
Family		Trust		PLAS(state owned)		Company		Other(specify)	
B3. What is the total size of your land?.....									
B5. What is the size of land under cattle farming?.....									
B6. Type of farming									
Cattle only		Mixed livestock (including cattle)		Crop and livestock					
B7. Are cattle farming your main enterprise?									
Yes					No				
B8. How long have you been practicing cattle farming?.....									
B9. What is the total number of your cattle?									
				Calves (<1 year)					
				Heifers (3-6 years)					
				Old cows (>6 years)					
				Bulls (<3 years)					
				Bulls (>3 years)					
B10. Which breed are you farming with?									
Brahman		Bonsmara		Nguni		Mixed breed		Other (specify)	
B11. Do you have access to any of the following? You can tick more than one									
Sales pen		Off-loading ramps					Castrator		

Loading ramps		Water points		Scale	
Castrator		Feedlot			
Dehorner		Brand marker		Other (specify)	
B12. Did drought affect you in the past 3 years? yes				No	
C. Marketing management module					
C1. Where do you mostly sell your cattle?					
Butcheries		Auctions			
Abattoirs		Other farmers			
Open markets		Other(specify)			
C2. How long have you been selling to your market in question C1?.....					
C3. Have you ever sold to a different market before?					
Yes		No			
C4. If yes, which one?.....					
C5. In terms of your market in C1, what are the benefits?					
Higher price		Close to business		No transport costs	Other (specify)
C6. What is the main reason for selling?					
Household consumption		Buying production inputs			
Drought		Other (specify)			
Income generation					
C7. Are you satisfied with the market you are selling to?					
		Satisfied	Less satisfied	Not satisfied	

Butchery			
Abattoir			
Open market			
Auctions			
Other farmers			
Other (specify)			

C8. If less satisfied or not satisfied why?

.....

.....

.....

.....

.....

C9. Do you slaughter and sell carcass?

Yes		No	
-----	--	----	--

C10. If yes, where do you sell it?

Butcheri es		Supermarket		Public		Other (specify)	
----------------	--	-------------	--	--------	--	-----------------	--

C11. Do you have your own transport for distributing cattle when selling?

Yes		No	
-----	--	----	--

C12. If NO in C11, how do you distribute cattle when selling?

	Hire transport	
	Move animals by foot	
	The buyer transport	
	Other (specify)	

C13. What type of transport do you use when transporting cattle?

Bakkie with trailer		Truck		Tractor with trailer		Other (specify)	
C14. What is the distance to your consumers?							
Butcheries				Auctions			
Abattoirs				Other farmers			
Open market				Other (specify)			
C15. How much do you pay for transport?.....							
C16. What is the condition of the road you are mainly travelling on?							
Gravel		Tarred		Both			
D. MARKETING INFORMATION							
D1. Do you receive market information prior to sales?							
Yes			No				
D2. If yes, what is/are your source(s) of information?							
Radio				Government extension officers			
Television				Extension publications			
Co-farmer				Other (specify)			
D3. If yes, what type of information do you receive?							
			Dates of sales				
			Sales price				
			Buyers				
			Other (specify)				
D4. How often do you receive it in the production and marketing cycle?							
Weekly		Monthly		Quarterly		Other (specify)	

D5. If NO in D1, would you like to receive it?			
Yes		No	
D6. How will you rate your knowledge in terms of the following market requirements?			
	Poor	Fair	Good
Average sales price of cattle per breed			
Age of cattle			
Cattle body weight			
Muscle size			
Cattle condition(eyes, nose, coat, attitude, mobility, horns, etc)			
Animal health			
Animal health certification			
Animal identification			
Fat protein			
E. PRICING, SALES AND INCOME			
E1. Which pricing strategy do you use when selling you cattle?			
Price per head		Price per kilogram	
E2. Do you perform price survey before selling?			
Yes		No	
E3. How is a price set during sales?			
Negotiation		Market driven	Dictated by buyers (Other specify)
E4. Have you sold cattle in the past twelve months?			
Yes		No	

E5. If yes, how many did you sell?			
	Calves(<1 years)		
	Heifers (1-3 years)		
	Breeding cows(3-6 years)		
	Old cows(> 6 years)		
	Bulls (<3 years)		
	Bulls(>3 years)		
E6. Are you satisfied with farm gate price for your customers?			
		Yes	No
	Abattoirs		
	Butcheries		
	Open markets		
	Auctions		
	Other (specify)		
E.7 What was your income from cattle sales in the past twelve months?.....			
E8. Are you satisfied with the income?			
Yes		No	
E9. In relation to question C3, is there a difference in income between your current and previous market?			
Yes		No	
E10. If yes, which market provides better income?.....			
E11. Do you think if you were selling to a different market your income would be different?			
Yes		No	

E12.	If	yes,	how	(explain)?
.....				
.....				
.....				
.....				
.....				
.....				
.....				

E12. If given the opportunity to sell your cattle to the market with a better price would you take it?

Yes		No	
-----	--	----	--

F. Institutional support services

F1. Do you receive support services?

Yes		No	
-----	--	----	--

F2. If yes, how many times do you receive it per production and marketing cycle?

	Once	
	Twice	
	Thrice	
	More than three times	

F3. What services do you get? (*You can tick more than one*)

	Production management	
	Marketing management	
	Financial management	
	Record keeping	

		Other (specify)	
F4. If you do not receive services, would you like to receive some?			
Yes		No	
F5. Are you under any government farmer support programme:			
Yes		No	
F6. If yes, which one(you can tick more than one answer)			
PLAS		Recapitalization and development	
MAFISA		LDARD farmer support funding	
CASP		Other (specify)	

WE HAVE COME TO THE END OF THE INTERVIEW, THANK YOU FOR YOUR TIME AND ASSISTANCE. ONCE AGAIN I WOULD LIKE TO REMIND YOU THAT WE WILL SHARE WITH YOU THE RESULTS OF THE STUDY AND ALL THE INFORMATION YOU GAVE IN THIS STUDY WILL BE ANONYMOUS.