

**DETERMINANTS OF MARKET PARTICIPATION AND PROFITABILITY FOR  
SMALLHOLDER NGUNI LIVESTOCK FARMERS: IMPLICATIONS FOR FOOD  
SECURITY AND LIVELIHOODS IN THE LIMPOPO PROVINCE**

by

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**A RESEARCH MINI-DISSERTATION**

**Submitted in partial fulfilment of the requirements for the Degree of  
MASTER OF SCIENCE**

in

**AGRICULTURAL ECONOMICS**

in the

**Faculty of Science and Agriculture**

**School of Agriculture and Environmental Sciences,**

**Department of Agricultural Economics and Animal Production,**

of the

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**2019**

## **Dedication**

I sincerely dedicate this work to the Lord. He made it possible to complete this research paper. I have written because of His Faithfulness. I sincerely thank Him for this Grace.

## **Declaration**

I, Nkadameng Mapule Valencia declare that this dissertation, submitted for the Degree of Master of Science in Agriculture (Agricultural Economics) at University of Limpopo is my own work and it has not been submitted before to this university and other universities.

Signature\_\_\_\_\_

Date\_\_\_\_\_

## **Acknowledgements**

I would like to thank my supervisor, Prof. G. Makombe, for his mentorship, critique, leadership, enthusiasm, supervision, trust and exclusive support not forgetting his constructive criticism during the study. May good Lord bless you, Prof. Sincere thanks to my co-supervisors Prof. I.B. Oluwatayo and Dr. C. Mapiye for your guidance and critical criticism during my study. Thank you very much.

I would like to acknowledge research funds and bursary provided by the Department of Science and Technology-National Research Foundation (DST-NRF) Centre of Excellence (CoE) in Food Security (grant number: 140102). I would also like to devote my appreciation to Dr. C. Mapiye and Prof. K. Dzama of Stellenbosch University for nominating me for the DST-NRF bursary. I am also indebted to the National Agricultural Marketing Council (NAMC) for the supplementary bursary.

I would like to take the opportunity to acknowledge the Department of Agricultural Economics and the university staff for their support, guidance and motivation given to me direct or indirect during my study. I want to extend my appreciation to Dr. J.J. Hlongwane, Prof. A. Belete, and Mrs C.L. Muchopa for their support through comments from initial to final stage of the research project. I would also like to thank Dr. Rev. L. Ackerman for editing this research.

In the Limpopo Department of Agriculture and Rural Development, I would like to acknowledge Mr. C. Mojapelo for arranging data collection process within the Limpopo IDC Nguni Project as well as connecting us with the farmers; the assistance of Mr. O. Mapiye (MSc student at Stellenbosch University), for data collection; and I would also like to thank Mr. S.Rathobotha, Mr. N. Kgasago, Mr. P. Selomo and Mr. M.A. Nkoana for their assistance on statistics and testing the models.

I would like to thank Nguni cattle farmers for taking their time and courage to complete comprehensive and detailed questionnaires.

I would like to thank my parents (Veronica and Maxwell Nkadimeng), for their continuous support, motivation and love they shared to me in my whole life, my sisters (Vanessa and Valemusa Nkadimeng), my brother (Kgobane Nkadimeng) and my daughter (Bokang Nkadimeng). Your endless support is gratefully acknowledged.

I would like to convey my sincere gratitude and acknowledgements to the following people: Dr. P. Chaminuka, Mr. N.M. Sekhukhune, Mr. K.E. Mokhine, Ms. M.A. Rachoene, Mrs. M.N. Maleswene and Mr. P.P. Manaka and all my former classmates for your support.

More importantly, thanks to the Almighty for giving me the inner strength, knowledge and wisdom to complete this study.

## **Abstract**

Livestock production is the most important sub-sector in agriculture in South Africa. It contributes a very large proportion to the agricultural gross domestic product. It has been identified as the sub-sector that has potential in improving food security and livelihoods of the rural people. The current study analyses the determinants of market participation and profitability of IDC Nguni smallholder farmers in the Limpopo Province, South Africa. The aim of the study was to contribute to the body of knowledge that exist in the study area, particularly of Limpopo Province livestock marketing by analysing determinants of market participation and profitability.

The primary data were collected using structured questionnaires. All IDC Nguni Project beneficiaries (62 famers) were included in the survey. Descriptive data were analysed using Version 23 of SPSS. The logistic regression was used to analyse market participation data, multiple regression was used for profitability data and livelihood model for assessing the contribution of the project to livelihoods. The models were analysed using Stata 14.

The results revealed that 59% of the respondents participated in the market and 41% of respondents did not participate. The study revealed that 54% of the respondents indicate that market access was easy and only 38% of respondents indicated that market access was not easy and 8% of respondents revealed that they do not know how the market access was because they were not yet selling. Seventy percent of the farmers perceived their livelihoods being improved after joining IDC Nguni Cattle Project whereas 23% of the farmers perceived their livelihood not improve after joining IDC Nguni Cattle Project. Gross margin computation showed that 52% of the farmers made gross margins ranging between R2 000 and R481 200 during the 2015 production/marketing season. The overall gross margins showed that 46% of the farmers made loss ranging from R7 300 to R170 500 during the 2015 marketing season, and 2% of the smallholder farmers were operating break-even point. The average gross margin for Community Property Associations was R6 031 while for individual farmers it was R16 082. The decision making process, for example to sell

livestock, may be complex in the CPAs and hence a higher gross margin results for individual farmers than for CPAs. Thirty-six percent of CPAs made a loss, while 49% of individual farmers also made loss during 2015.

The results of logistic regression showed that marital status, education level, loan repayment, price of an animal and household income were all significant factors (at various probability levels and with different signs), influencing market participation in the study area. A multiple regression model revealed that empirically the herd size, farm size and distance travelled to the market were significant at various probability levels and with different signs influencing profitability in the study area. Livelihood model results revealed that recent increase in farm income and farm size were all significant at different probability levels and with different signs influencing smallholder farmers' livelihood improvement in the Limpopo Province.

The study identified some challenges faced by smallholder farmers in Limpopo Province. The major ones were inadequate access of market information, high transactional costs, poor conditions of the animals and poor access to markets.

Policy makers should come up with policies that support the smallholder farmers with formal training, seminars and workshops to improve profitability of the farmers. Basic training of production and marketing may enable the smallholder farmer to increase profits. Other recommendations were formation of farmers' organisations, access to financial resources and private-public collaboration to establish central selling points.

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## List of abbreviations and acronyms

<b>CASP</b>	Comprehensive Agricultural Supports Programme
<b>CPA</b>	Community Property Associations
<b>DAFF</b>	Department of Agriculture, Fisheries and Forestry
<b>DBSA</b>	Development Bank of Southern Africa
<b>DRDLR</b>	Department of Rural Development and Land Reform
<b>FAO</b>	Food and Agriculture Organisation
<b>GDP</b>	Gross Domestic Product
<b>GMA</b>	Gross Margin Analysis
<b>IDC</b>	Independent Development Co-operation
<b>IFAD</b>	International Fund for Agricultural Development
<b>ILO</b>	International Labour Organisation
<b>LDA</b>	Limpopo Department of Agriculture
<b>LDARD</b>	Limpopo Department of Agriculture and Rural Development
<b>LRAD</b>	Land Redistribution Agricultural Development
<b>MSc</b>	Master of Science
<b>NDA</b>	National Department of Agriculture
<b>OECD</b>	Organisation of Economic Cooperation Development
<b>SDEV</b>	Standard Deviation
<b>SLAG</b>	Settlement Land Acquisitions Grant
<b>STATSA</b>	Statistics South Africa

## CHAPTER ONE

### INTRODUCTION AND BACKGROUND

#### **1.1 Introduction and background**

Agriculture is the most important source of food security and livelihoods across the world. Seventy-eight percent of the world population, who live in rural areas, depend on agriculture (International Fund for Agricultural Development (IFAD), 2013). According to the International Labour Organisation (2007), agriculture provides 70% of the world's workforce and 36% of livelihoods to the people in the world. Agriculture is crucial for economic growth and contributes one third of the world's Gross Domestic Product (IFAD, 2013). In developing countries agriculture is the backbone of rural economies (Development Bank of Southern Africa, 2000). Agriculture forms a significant portion of the economies of all African countries and contributes to the African priorities such as eradicating poverty and hunger, boosting intra-Africa-trade, investment, economic transformation, creating jobs and providing food security. Agriculture contributes 30% of the African continent's GDP and contributes 60% of employment in the Sub-Saharan African region (IFAD, 2013; Omiti, Otieno, Nyanamba and McCullough, 2009).

Consistent with the world estimates, it is estimated that 69% of the people in South Africa live in rural areas (Statistics, South Africa, 2011). Agriculture is the most important source of income, employment, food security and livelihoods for them (National Department of Agriculture, 2006). In South Africa, the contribution of agriculture to the GDP is small compared to other African countries (Department of Agriculture, Forestry and Fisheries, 2010). Agriculture contributed 2.3% of the GDP in 2015 (Department of Agriculture, Forestry and Fisheries, 2016) as compared to an average of 12.7% to GDP in other Sub-Saharan African countries (Organisation for Economic and Cooperation Development, 2011). The contribution of agriculture to the GDP is declining as observed by NDA (2013). It dropped from 7.1% in the 1970's to 1.7% in 2011.

Agriculture contributes directly and indirectly to the economy in the form of forward and backward linkages. About 70% of agricultural output is used as input in the

manufacturing sector. Therefore, agriculture is a crucial and important source of economic growth for the South African economy. The main sub-sectors are crops, horticulture and livestock. The livestock sector is identified to be the most growing sector and is the largest contributor of the livestock sector to the gross agricultural value and to the agricultural gross domestic product. The livestock sector contribution increased from 42% to 47% from 1995 to 2010 (Meissner, Scholtz and Palmer, 2013).

The livestock sector has various breeds of cattle that can adapt to different conditions. The most common breeds found in South Africa are Bonsmara, Hereford, Afrikaner, Sanga, Drakensberger, Angus, Nguni and Brahman (Meissner et al., 2013). Among these breeds, Mapiye, Chimoyo and Dzama (2009b) identified Nguni cattle to be tolerant to diseases and parasites, adaptable to harsh environmental conditions and requiring low amounts of feeds. According to Simela, Montshwe, Mahanjana and Tshuwa (2006), Nguni livestock contributes to smallholder and rural people through the provision of milk, meat, horns, hides and income. The smallholder livestock farmers also keep the Nguni breed cattle and niche markets have been identified. For example, Nguni is one of the breeds that is common to smallholder livestock farmers, mainly because they require low inputs. The Nguni cattle produce meat that contains high free fat as well as beautiful hides for additional income to farmers (Ntshepe, 2011; Musemwa et al., 2008).

The Nguni Project in the Limpopo Province was initiated in 2006 by the University of Limpopo in partnership with the Independent Development Corporation (IDC), the Limpopo Department of Agriculture (LDA) and farmers to form the Limpopo IDC Trust. The project started in 2007. The aim of the project was to enhance Nguni production in communities. The project exists in five districts of the province, namely the Capricorn, Waterberg, Mopani, Sekhukhune and Vhembe Districts. The package given to farmers comprises of 30 pregnant heifers and 1 bull allocated to an individual farmer in the form of loan that the farmer has to repay within a period of 5 years. The cattle are reared to ensure development of top quality herds which can fetch high prices in the markets. The trust (IDC, LDA and University of Limpopo) assists in production and marketing on behalf of the farmers. The trust has already



signed a memorandum of understanding with a big retailer (*Pick n Pay*) to provide farmers a platform to supply beef (Angus bull x Nguni cow).

The beneficiaries of this project are Communal Property Associations (CPAs) and individuals. The project consists of beneficiaries of land programmes such as the Land Redistribution for Agricultural Development and Settlement Land Acquisitions Grant of the Department of Rural Development and Land Reform (DRDLR). The Settlement Land Acquisitions Grant (SLAG) and Land Redistribution for Agricultural Development (LRAD) farms were given priorities in terms of selection of IDC Nguni beneficiaries. Farmers were also identified through public and advertising systems. In the selection grazing capacities, infrastructural capacities were taken into consideration. One of the milestones of the project is that farmers are registered with the Nguni Cattle Breeders Society, which guides farmers through mentorship programmes to provide development support. The project has benefited 62 smallholder farmers up to date.

Markets play an integral part in agricultural and rural development (IFAD, 2013). Market participation ensures that farmers derive income, profits, and enhance livelihoods and food security. Smallholder market participation becomes a critical component to agricultural and rural development in African countries. The level of market participation determines the extent to which agricultural based livelihoods are vulnerable to food insecurity (Food and Agriculture Organisation, 2008). However, there are constraints hindering the smallholder livestock sector from participating in high-value markets. There are several constraints and policies faced by smallholder farmers in South Africa that need to be addressed so that improvements in the smallholder market participation can achieve food security and better livelihoods. The transformation and improvement through policies can assist smallholder farmers because livestock is a major source of livelihoods and income in the Limpopo Province. Food security is one of the major struggles to most of smallholder farmers in rural areas. Food insecurity exists whenever food security is limited or uncertain. World Bank (1986) defines food security as a situation where a given household is able to access the required food or quantities at all times to live a healthy and active life. Anderson (1990) classified food security in to two categories, namely food

security at national level and food security at household level. Food security at national level refers to the condition whereby the nation is able to manufacture, import, retain and sustain food needed to support its population with minimum per capita nutritional standards; at a household level food security refers to the availability of food in one's home to which one has access. Aliber and Hart (2009) argue that although South Africa seems to be food secure at national level, the same cannot be said about households in rural areas. Livestock farming has great potential to reduce household food insecurity as well as improving livelihoods significantly (Livestock in Development, 1999; Meissner, et al., 2013).

## **1.2 Key concepts in the study**

### **Market participation**

Agricultural market participation is defined as the integration of smallholder farmers into the input and output markets of agricultural products with a view to increasing their income level and hence reducing poverty as well as improving livelihoods (Gani and Adeoti, 2011). For the purpose of this study market participation is defined as the ability of smallholder Nguni livestock farmers to sell 15 cattle and more Nguni cattle in the formal and informal markets in 2015. Each farmer was given herd size of 300 cattle as a loan to repay in 5 years. Selling at least 15 animals would mean that farmer was able sustain herd size while participating in the market.

### **Smallholder farmers and emerging farmers**

Smallholder farmers are defined as farmers that derive their livelihood from growing crops or keeping livestock and are vulnerable to natural and economic shocks due to limited access to assets, power and markets (African Smallholder Farmers Group, 2012). For the purpose of this study, Nguni Project livestock farmers are viewed as smallholder farmers rather than emerging farmers because they have limited market access and low market participation in the high value markets irrespective of the number of cattle and land owned.

Furthermore, most of the Nguni Project beneficiaries do not grow into being commercial farmers one of discouraging reasons being marketing constraints such as lack of marketing facilities, high transactions costs, lack of agricultural information and poor conditions of livestock (Musemwa et al., 2008). Moloji (2008) defines

emerging farmers as previously disadvantaged black farmers, who begin to participate in the markets and have intentions to produce and sell more. This author further reveals that in some studies emerging farmers and smallholders are used interchangeably because emerging farmers in South Africa are involved in subsistence and small-scale farming because of constraints and resource endowments. The study of Barlow and Van Dijk (2013) clearly indicates that black emerging farmers have more difficulty in reaching high quality standard, in fetching higher prices, with logistics and distribution, meeting market requirements and continuity in supply. Similarly, smallholder farmers face the same problems.

### **Food Security**

Food Security is the situation that exist when all people, at all times have physical, social and economic access to sufficient, safe and nutritious food that meets dietary needs and food preferences for an active and healthy life. Food insecurity arises or exist when there is no or limited access to and availability of adequate food to meet dietary needs (FAO, 2002). This study adopts the FAO (2002) definition of food security.

### **Livelihoods**

Ellis (2000) defines livelihoods as the assets (natural, financial and social capital) and the activities that give access to institutional and social relations that together determine the living gained by an individual or household. Livelihoods can be defined by a bundle of different assets, abilities and activities that enable a person or household to survive (FAO, 2003a). This study defines livelihoods as means to make a living, which has to do with people's assets, incomes, activities as well as capabilities required to secure and acquire necessities of human life.

### **Profitability**

Profitability can be defined as the ability of a business to earn profit (Revenue minus total cost in production).

### **Livestock**

Livestock can be described as all domesticated animals, especially sheep, goats, cattle and pigs, intentionally reared in an agricultural setting for food and fibre and for

breeding purposes. Livestock may be raised for profit or subsistence. Raising animals (also known as animal husbandry) is an important activity in modern agriculture, which is being practiced in many societies, including South Africa (Ntshepe, 2011).

### **Communal Property Association**

Community Property Association refers to the group of people in the community having formalised rights to use the land (Jacobs, 2011). These groups of people benefit from the Act that was established by the Department of Rural Development and Land Reform. CPA Act no 28 of 1996 is the main instrument employed by DRDLR to provide the provision of land. Some of the Nguni project farmers in the study area were CPAs.

### **1.3 Problem statement**

The agricultural sector in South Africa is dualistic in nature, consisting of a commercial and a smallholder sector. Similarly, the livestock sector in South Africa also comprises of a commercial and a smallholder sector. The commercial livestock sector is well-established, highly productive and with market opportunities, whereas the smallholder livestock sector faces constraints such as limited market access, low productivity and limited market opportunities (DAFF, 2012). The commercial livestock sector contributes 25%-30% to the agricultural gross value while the smallholder livestock sector contributes less than 10% (NDA, 2006).

Despite the increasing demand of livestock products, especially meat (Meissner et al., (2013), smallholder farmers are experiencing challenges that hinder their production and ability to contribute significantly to food security as compared to commercial farmers. Nguni smallholder livestock farmers in the Limpopo Province sell their livestock in small quantities. The majority of smallholder livestock producers have limited access to the markets, experience low productivity and are also unable to meet market requirements such as age, weight, grade and conditions of the animal. As a results there is low smallholder market participation and consequently there are low profit margins for the farmers. Many smallholder farms are located far from potential markets which makes it difficult for farmers to sell their animals and when they do, they fetch low prices. These challenges threaten smallholder farmers'

livelihoods and increase their vulnerability to food insecurity as they primarily depend on animal husbandry.

Efforts have been made by government and non-government organizations to assist the smallholder livestock sector to overcome these constraints. Farmers support programmes, for example the Comprehensive Agricultural Support Programme (CASP), Ilima Letsema (government), and Nguni Project(non-government) were initiated to assist the smallholder farmers to boost production of smallholder farmers. However, low market participation is still a problem. This is in spite of the efforts made through several studies to identify market problems faced by all livestock smallholders as well as Nguni livestock farmers. It is very important to understand the reasons for low market participation of smallholder livestock farmers in high value markets. This study focuses on identifying determinants of market participation and profitability for smallholder Nguni livestock farmers and their implications to food security and livelihoods.

#### **1.4 Aim and objectives of the study**

##### **1.4.1 Aim of the study**

The aim of this study is to analyse determinants of market participation and profitability for smallholder Nguni Cattle Project farmers in the Limpopo Province and their implications for livelihoods and food security.

##### **1.4.2 Objectives of the study**

The specific objectives are to:

- i. Analyse the determinants of market participation for smallholder Nguni Cattle Project farmers in the Limpopo Province.
- ii. Analyse the determinants of profitability of smallholder Nguni Cattle Project farmers in the Limpopo Province.
- iii. Assess the contribution of smallholder Nguni Cattle Project production to livelihoods and food security.
- iv. Identify the challenges faced by smallholder Nguni Cattle Project farmers in the Limpopo Province.

### **1.5 Hypothesis of the study**

- i.  $H_0$ : There are no determinants of market participation of smallholder Nguni Cattle Project farmers in Limpopo Province.
- ii.  $H_0$ : There are no determinants of profitability of Smallholder Nguni Cattle Project farmers in Limpopo Province.
- iii.  $H_0$ : There is no significant contribution by Smallholder Nguni Project farmers to livelihoods and food security.

### **1.6 Justification of the study**

Market participation has been an issue of interest since South African markets were deregulated and liberalized (Montshwe, 2006). Markets play a role in ensuring food security and livelihoods of farmers (Kiriimi et al.,2013). This study focuses on identifying determinants of market participation and profits for smallholder Nguni livestock farmers who have intentions of becoming commercial farmers. The implications to food security and livelihoods are also be assessed. There is limited documentation on market participation and profitability of smallholder Nguni Cattle Project farmers.

### **1.7 Organisational structure of the study**

The study is organised into five chapters. Chapter one introduces the study and presents the background information as well as the problem statement, hypotheses, objectives and the motivation behind the study. The remainder of the study is organised as follows: Chapter two reviews the literature which provides theoretical background and views of the study from various authors; chapter three describes the research methodology focusing on the study area, method of data collection, the data analysis techniques employed to analyse data and model specification. Chapter four contains discussion, presentation and interpretation of findings and shows results of the descriptive analysis of variables as well as results of the regression analyses. Chapter five presents the summary, conclusion and policy recommendations.

## CHAPTER TWO

### LITERATURE REVIEW

#### **2.1 Introduction**

The deregulation and liberalization of South African markets has been a topic of interest for some time now, where the overall goal was to integrate the smallholder sector into the commercial sector as well as improving the efficiency of the markets. Montshwe (2006) and Kirimi et al., (2013) argue that commercializing agriculture depends on many factors, such institutional, human and natural resources. It is clear that an increase in market participation by the smallholder sector is affected by complex issues.

#### **2.2 Review of previous studies**

##### **2.2.1 Background of the South African cattle farmers**

Livestock is produced throughout South Africa by both commercial and smallholder farmers with different breeds and numbers (Meissner et al., 2013). It is estimated that almost 70% of South African land has been used by livestock. Livestock production contributes heavily to food security and livelihoods of the South Africans. The South African livestock industry accounts for 47% of the Agricultural Gross Domestic Product. However, livestock production has been a topic of interest, due to lack of knowledge and limited market information (Meissner, Scholtz and Palmer, 2013). Meissner et al., (2013) state that the beef cattle are estimated at 13.6 million and they further indicate that more than 2 million smallholder farmers are involved in livestock farming in South Africa. It is estimated that the previously disadvantaged or smallholder farmers in South Africa own between four and five million head of cattle. That is 41% of the nation livestock herd. Furthermore, Limpopo has got 6 500000 beef cattle in the commercial and 433 000 in the smallholder livestock sector and 12 000 dairy cows in 2013.

Regardless of smallholder farmers owning about 41% of the countrywide livestock herd, smallholder livestock farmers are the main livestock keepers; however most of them fetch low prices and profits from livestock. The productivity of livestock is generally low as they rarely find their way into lucrative marketable outlets such as

feedlots and abattoirs. For this reason, buyers are reluctant to buy livestock from smallholder livestock sector (Ntshepe, 2011). Motshwe (2006) and Musemwa et al., (2010) results are in line with Ntshepe (2011). Musemwa et al., (2010) emphasised that smallholder cattle farmers fail to attract buyers in their communities due to various reasons including poor conditions of an animal. It is clear that market requirements play the critical role on whether farmer will participate or be profitable.

The red meat market was heavily regulated after the Marketing Act of 1967 was passed. The regulation was mainly on the control over the price, markets the farmers were selling to and the movement of animals. The Meat Board was the main board that regulated the livestock sector. Every farmer, who owned 20 or more animals, was registered within the board. However, the policies were reviewed in early 1990's and the Marketing Act of 1967 was abolished. The transformation of legal and institutional framework led to the introduction of Marketing Act 47 of 1996 (NDA, 2005). The act was passed in 1997. The aim of the deregulation of the market was to increase efficiency and market access by the farmers. Apart from policy review and transformation within the livestock sector, smallholder farmers are still trapped in the circle of low profit margins. According to Montshwe (2006), low profit margins are constituted by a lack of market access, market information and poor and inadequate infrastructure. Several studies such as Musemwa et al., (2010), Montshwe (2006) and Hlongwane et al., (2014) reveal that market access and participation remains a challenge within the livestock sector.

## **2.2.2 The role of smallholder cattle farmers rural development**

In the perspective of rural development, agriculture has a direct role to play in the economic welfare of South Africans due to its impact on different sectors: economic (income), social (employment, quality of life, health) and environmental (landscape, biodiversity, preservation of natural resources, and carbon sequestration), in addition to its importance as a provider of primary raw materials for the food and other industries (foodstuffs, fibres, bio-fuels, and timber) (FAO, 2006).

### **2.2.2.1 Food provision and raw materials to industries**

Food secures not only the survival of the mankind, it helps people to live happier and healthier. Agriculture provides the backbone for survival of the people. Food



improves the welfare of the people. Livestock production provides various meat products to the people. Industries need agricultural raw material to produce semi-finished and finished goods. For example, the skins and hides from livestock are the raw material for manufacturing shoes in secondary sector. Agriculture provides the overall growth in the industries.

#### **2.2.2.2 Employment**

The livestock sector provides employment to the rural people (ILO, 2007). Seventy percent of South African people live in rural areas and therefore most of them labour within agricultural sector. According to FAO (2006), rural economy plays an important role with regard to employment, since the economic growth in urban centres is too slow to generate sufficient employment to absorb the migrated labour force, particularly in transition countries. The contribution of agriculture is obvious in rural areas where it is one of the major economic activities, although small semi-urban centres play a major role in the economic growth of rural areas. Therefore, employment in rural areas may depend heavily on agriculture and related sectors, especially in areas where tourism and the incentive to invest in industry are very low. Consistent with the goals of the Nguni Project, beneficiaries are encouraged to hire at least two labourers in the farms to enhance employment.

#### **2.2.2.3 Income for the rural population**

In many developing countries like South Africa, the role of agriculture in the economy is generally acknowledged (Machete, 2004:2). There is a school of thought that argues that since the majority of the people in most developing countries lives in rural areas and is engaged in agricultural production or agricultural related activities, agriculture is the most effective way to reduce poverty (Machete, 2004:2). According to Machete (2004:3), results of the studies conducted in several countries indicate that the pro-poor role of agricultural growth could be dramatic, and much more effective than other sectors at reducing poverty and hunger. According to FAO (2004:12), agricultural growth has strong and positive impact on poverty, often significantly greater than that of other economic sectors. Machete (2004: 4) indicates that farming is the greatest contributor to household income where more than 40% of the total household income is generated from farming. Non-farm income includes

old-age pension, remittances, wages, and family business (Machete, 2004:4). Smallholder farmers derive their livelihoods from agricultural activities. This implies that the livestock sector brings incentives to smallholder farmers to produce more and sell the surplus in the markets (Vink and Van der Heijden 2013). It contributes to economic growth and rural development.

### **2.2.3 Market participation of smallholder cattle farmers in South Africa**

Various authors, such as Omiti, et al., (2009), Moloji (2008), Hlongwane et al., (2014) and Montshwe (2006) have identified determinants of market participation such as gender, farmers' access to credit, marital status, distance to market, external source of income, market information, infrastructure, education and age. Hlongwane et al., (2014) found that farmers' access to credit, marital status, gender, market information and infrastructure were found to be positively related to market participation, while distance to market and external source of income were negatively related to market participation. The farmers' level of education and age of a farmer were positively related to market participation while distance to output market, experience in farming and external source of income were negatively related to market participation. However, Montshwe (2006) found that training, total herd size, market information, farming system, remittances, mortality, lobola, household size and theft were positively related to market participation and member of commodity association was negatively related with farmer's marketing participation. It is evident from Montshwe (2006) and Hlongwane et al., (2014) that they agree only on market information that showed positive relationship with market participation in both studies.

There are various reasons that enable smallholder farmers to participate in the markets and various reasons that inspire farmers to keep their livestock. Farmers keep livestock for cultural reasons, for financial security, weddings, funerals, donations, religious celebrations and as part of their wealth (Borge-Johannesen and Skonhott, 2011). Similar reasons were also observed and noted in Musemwa et al., (2010). FAO (2011) argues that large proportions of the population in developing countries keep livestock as part of farming operations and for generating income. Therefore, the enthusiasm of the smallholder farmers to sell livestock determines whether farmer would participate in the markets or not.

Montshwe (2006) claims that lack of infrastructure is a barrier for smallholder farmers to participate in mainstream markets whereas Omiti et al., (2009) stress that improved rural infrastructure (such as roads or market facilities) is only a necessary but not a sufficient condition for improving market access by smallholder livestock farmers. The authors further indicate that the sufficient conditions are integration whereby farmers come together to bring down the transaction costs. However, Nkhori (2004) noted a different view from Montshwe (2006) that even if farmers are in areas with good road linkages, the distance from the markets tends to influence transaction costs. It is, therefore, clear that rural infrastructure may have positive effects however does not determine whether farmer would participate in the market or not because of other factors, such as transaction costs, herd size, market prices and information, which play a critical role in market participation.

The evidence suggests that smallholders do not often participate much in livestock markets and their overall market share is very low. Scholtz et al.,(2008) found that in South Africa more than 70% of the beef slaughtered in the formal market sector was from commercial farmers. Omiti et al., (2009) with different view from Scholtz et al, (2008) who indicate that participation in the agricultural commercial sector holds considerable potential to unlock better opportunities for smallholder farmers such as better incomes and sustainable income. Therefore, it is not a coincidence that smallholder livestock market participation has potential to improve food security and livelihoods.

Various authors such as Meissner et al., (2013) and Kirimi et al., (2013) argue strongly that there is a need for smallholder farmers to participate in the agricultural commercial markets because livestock has been recognised to be the fastest growing subsector in agriculture and therefore can play a critical role in paving the road to agricultural development. From these authors it is very clear why Livestock in Development (1999) identifies livestock farming as the agricultural activity that is most likely to improve food security, livelihoods as well as reducing poverty levels in South Africa and among developing nations.

Makhura (2001) found that the transaction costs create obstacles for smallholder farmers to participate in markets in the Northern Province [*sic*; now Limpopo

Province] and he discovered that physical facilities, closeness to market, shortage of resources such as transport and low market information are the main limitations to farmers' marketing activities. The inability of farmers to bargain for prices together with restricted credit relationships with the buyers led to farmers being exploited during the transaction where most of them end up accepting any given price. The study of Makhura is consistent with Montswe (2006) and Musemwa et al., (2010) because they both agree that smallholder farmers suffer inconsistencies in the livestock market due to high transaction costs. Xaba et al., (2013) claim that the majority of smallholder farmers encounter high production and transaction costs that limit their ability to sustain their livelihood in Swaziland. It is clear that prices, transaction cost, market information and marketing of agricultural produce are critical for smallholder farmers to participate in markets, realize profits and be able to sustain their livelihoods.

The study conducted by Omiti et al., (2009) in Kenya reveals that the majority of smallholder farmers who are located in rural areas produce low volume and usually sell at farm gate prices in rural markets. Only a small portion of their produce is sold in the lucrative markets and that shows that smallholder farmers do not effectively participate in formal markets that would have offered opportunity to increase their income. The result concurs with the findings of Scholtz et al., (2008).

According to Barret (2008), market participation cannot be explained by a single factor (example price motivations) since may be both a consequence and a cause of development. He claims that farm households' market participation requires access to technology, private and public productive assets, which involve various sunk and fixed costs, alleviation of coordination problems, and liquidity limitations at all decision-making levels. The study by Musemwa et al., (2007) reveals that market outlets are available for Nguni beneficiaries such private selling, auctions and abattoirs. Private selling is considered to be the simplest and cheapest way of selling to the markets, which is commonly practised by smallholder farmers in rural areas. By selling privately, smallholder farmers can avoid high transport costs. According to Nkhori (2004), direct sales give both producers and consumers great profit margins because they eliminate middlemen and several marketing costs.

Scholtz et al., (2008) point out that South Africa is expected to create market opportunities for smallholder livestock farmers in order to respond to the increase in the population, changing lifestyles, urbanisation, and changes in consumer preferences associated with an increase in disposable income of the middle class. The view was also supported by Thornton et al., (2010).

Hlongwane et al., (2014) say that the government can increase market participation of smallholder maize farmers through encouraging group market participation, upgrading of roads to enable smooth accessibility of farmers to output markets and establishment of local points of sales in farming areas. This might also apply to smallholder livestock farmers. This was also recommended in Montswhe (2006).

#### **2.2.4 Profitability of smallholder cattle production**

According to Xaba et al., (2013) determinants of profitability in vegetable production are age, sex, education of the farmer, experience, access to market information, access to extension services, access to credit, distance to the market, number of dependents and marketing agency; they also found that access to extension services, access to market information, access to credit, education of the farmer or having a marketing agency all have got positive influence on the profitability, whereas age and distance to the market has negative influence on the profitability. These determinants were also found in Machete (2016) and Mulaudzi (2015) who conducted similar livestock profitability studies. They further claim that market participation becomes more profitable when smallholder farmers are able to reduce transaction costs and produce at low cost and that improved marketing leads to better prices for the farmers.

The NDA (2005) says that it is not economically viable or profitable to sell only one or two animals in the market once per annum because transport costs hinder smallholder to reap benefits from the market. Selling few animals does not allow to cover the transport costs, because most of the farms are located far from potential markets.

Previous research by Ramsey et al., (2005) has been conducted on factors affecting cost, production and profitability in United States of America and they found the feed costs to be the largest expense in a livestock enterprise. Feed costs have got a

negative sign in the profit model, implying that when feed cost increases, the profits in the enterprise decline. Feed costs increase, if the benefits of grazing do not outweigh the added costs. Mulaudzi (2015) also showed that animal feeds account for more than 50% of total production costs of livestock. Mulaudzi (2015) and Ramsey et al. (2005) shared similar views on animal feeds. Their study further reflects that grazing is typically the most cost-effective means to meet livestock nutritional needs. The study revealed that improved production skills have got a positive effect on profitability of a livestock enterprise. A high level of reproduction helps to achieve success in livestock and contributes to sustainability. Better management increases the lives and health of livestock, serves as a strategy to improve the enterprise and results in decreased cost, improved production and increased profits.

### **2.2.5 Livelihoods and food security of smallholder farmers**

South Africa is a food secured nation because it has the ability to produce adequate staple foods as well as the capacity to import food, if needed, in order to meet the basic nutritional requirements of the population (FAO, 2008). However, Aliber and Hart (2009) argue that South Africa is only food secure at national level, whereas at household level is not secure.

DAFF (2012) has discovered that smallholder livestock farmers face many challenges that restrict their growth and ability to contribute as effectively to food security as commercial farmers do. Smallholder farmers are located mostly in rural areas where the lack of physical and institutional infrastructure limits their expansions of the farms and their market access.

A study of Kirimi et al., (2013) reveals that commercialization of smallholder agriculture can lead to an increase in income to farmers. It is clear that the increase in income may enable the households and farmers to purchase diversified goods that include food, health care, education and other, better services that enhance the standard of living and thus lead to sustainable, healthy lifestyles. The study identifies commercialisation as the critical source for improving food security and livelihoods of the farmers. The study concurs with Vink and Van der Heijden (2013) who also showed the ability to access the market as a key for smallholder farmers to earn

income and improve their livelihoods. IFAD (2013) has pointed out that the lack of market access increases the vulnerability of livelihoods and food security of smallholder farmers. This publication further argues that market participation is a key to develop poor and rural smallholder farmers. It is clear that markets, market access, market participation and better returns can improve livelihoods and food security status of the smallholder farmers.

Ngqangweni and Delgado (2003) state that a livestock enterprise is a way of improving livelihood, food security and addressing poverty because it has got the potential to generate high returns. However, Ramoroka (2012), with a contradicting view from Ngqangweni and Delgado (2003), argues that smallholder farmers in rural areas with marketable stock remain trapped in the poverty cycle because of lack of access to profitable markets. It is clear from these views that reasonable prices and access to market are important factors to reduce poverty, improve livelihood and food security of these farmers. In the livelihood vulnerability context, Montshwe (2006) and Ndoró et al., (2014) claim that cattle mortality and thefts were found to be significant factors explaining positive livestock market participation decisions in the Limpopo, Eastern Cape and Northwest Provinces in South Africa.

## **2.2.6 Nguni cattle marketing**

The available marketing channels are described below.

### **2.2.6.1 Informal markets**

The informal market is considered to be the simplest form of market for smallholder farmers. According to Musemwa et al., (2008), selling cattle to a private buyer is considered to be effective. The results of the Nkhori (2004) study also support the argument. Smallholder farmers who sell to individuals are most likely avoiding transport costs because the buyers are willing to provide transport. Most of smallholder farmers sell to individual buyers for various occasions. The occasions include weddings, funerals, ceremonies, religious and traditional rituals. These ceremonies also prefer mature old animals whose price is discounted in the formal market. The informal market allows the farmers to determine the price because there are no middlemen involved thus increasing the margin. The concern of this market is that both demand and price are not as predictable as in the formal market.

### **2.2.6.2 Abattoirs**

The abattoir is one of the marketing channels that can be used by smallholder farmers. However, the NDA (2005) reveals that this is the least used marketing channel because it imposes more risk to the farmers than other channels. The risk of using abattoirs is that it determines the price of the cattle considering various factors such as age, weight, grade, health status, and body conditions. Apart from these factors, long distance becomes another barrier for smallholder farmers to access these markets as there are few abattoirs relative to their farm locations. However, if the producers meet market specifications, maximum returns are gained by the producers.

The abattoir marketing channel is not flexible to smallholder farmers because the majority of smallholder farmers sell few animals at different intervals that in turn do not justify the transport costs. According to the NDA (2005), selling fewer animals to long distance markets does not benefit the farmers because the transport costs are higher. It is therefore economically inefficient. The abattoirs are not economically viable to smallholder farmers because they limit group marketing. Group marketing is considered an effective way of minimising transport costs to market because the transport costs are shared among the farmers in the group.

### **2.2.6.3 Auctions**

Auctions for livestock are recognized places of business where livestock is assembled at regular intervals. The Nguni Breeders Association does advertise these auctions, and the prices. The livestock is sold by public bidding to the buyer who offers the highest price per head (Nkosi and Kirsten, 1993). The livestock auctions are public markets open to all buyers and sellers. During actions the price paid or received is influenced by the number of prospective buyers for cattle.

### **2.2.6.4 Feedlots**

Another available option to smallholder farmers is to sell directly to the feedlots. Feedlots buy only young animals (7-9 months). Factors such as age and weight determine the price. However, in the Limpopo Province, there are few feedlots. The distance to the feedlot remains a major obstacle to smallholder farmers who are scattered all over the province.



### **2.2.6.5 Contractors**

The IDC Nguni Project provides opportunities to smallholder farmers with large herd size to sell their cattle to the big retailers and meat suppliers in South Africa. Retailers like *Pick n Pay* sell quality meat from the Nguni breed and fetch good prices. The Limpopo IDC Nguni Project board of trustees negotiated contracts on the behalf of smallholder Nguni beneficiaries at no cost. The contract requires consistency in supply to enjoy all the benefits. This is a convenient and effective marketing channel for farmers with large herds. Although, through this arrangement, *Pick n Pay* is willing to pay a good price to the Nguni project farmers, at their current level of production, they cannot guarantee the supply required by *Pick n Pay* consistently. This arrangement with *Pick n Pay* also requires that the Nguni project farmers sell a cross between Nguni and Angus (an exotic breed). However, the Angus bulls failed to survive under the conditions where the hardy Nguni can survive thus jeopardising this arrangement.

### **2.2.6.6 Butcheries**

Butcheries are another marketing channel that exists for smallholder farmers to sell cattle directly. Butcheries offer basic marketing services to the farmers, especially smallholder farmers, who are not capable of marketing their cattle efficiently and profitably through other existing formal channels. Musemwa et al., (2010) claim that smallholder farmers have bargaining and negotiating power in determining the price of the cattle when selling to the butcheries. This gives farmers the opportunity to get good prices that maximise their utility from sales.

### **2.2.6.7 Speculators**

Farmers also sell cattle to speculators. A speculator in the live cattle market has been described as an individual who trades in the commodities market with the aim of making profits (NDA, 2005). Speculators buy directly from the farmers and are also known as the principal buyers in the auctions. One of the problems that has been documented by Nkosi and Kirsten (1993) is that speculators normally convince farmers to sell cattle to them using the market prices which are only known to the speculators. They try to get animals cheap and try to depress prices at auctions.

Except for the informal markets, direct sale to butcheries and negotiated sales to outlets like *Pick n Pay*, most of the markets offer low prices for Nguni cattle. This is

mostly because the standards set in these markets are based on exotic animals and they do not take into account the good qualities of the Nguni cattle. Although the Nguni cattle project farmers can qualify as pure Nguni cattle breeders, they are not registered as such and therefore they do not qualify to enjoy the price benefits. Farmers have reported many instance where known registered Nguni breeders bought cattle from a Nguni project farmer for R5 000 per animal and then, in as short a period as two weeks, sold the same animals for R10 000 per animal as pure Nguni breed. The Nguni Project farmers cannot enjoy this benefit. There is also a good market for Nguni hides, offering good prices, but again at their level of production the Nguni project farmers cannot provide the necessary quantities. The Nguni project farmers therefore find themselves in somewhat of a marketing quandary which requires external assistance (say from the government, the IDC or elsewhere) for them to overcome.

### **2.3 Chapter summary**

The chapter has provided a solid background on the livestock farming sector and its contribution to food security and livelihoods, market participation, marketing channels and profitability in South Africa. Evidence was given by various authors on the role, the importance and contribution of market participation and profitability to livelihoods and food security.

Various studies reveal the constraints and challenges faced by smallholder livestock farmers from production to marketing perspectives (Montshwe, 2006; Ntshepe, 2011 and Kirimi et al., 2013). Interventions by smallholder farmers would be necessary. However, interventions by the smallholder livestock farmers are needed to complement interventions by the government and by the private sector to address the existing constraints and challenges.

## CHAPTER THREE

### RESEARCH METHODOLOGY

#### **3.1 Introduction**

The chapter describes the research methods used in the study. The chapter also explains how the study was conducted including the data collection procedures, descriptive statistics and empirical results (or models) for analysing the data. The chapter explains all the dependent and independent variables and the method used to achieve the objectives of the study.

#### **3.2 Description of the study area**

The study was conducted in the Limpopo Province because it is one of the provinces identified to have high levels of food insecurity while livestock production dominates agricultural activity. Limpopo Province's economy is based on agriculture therefore it is important to evaluate and investigate cattle projects and individual cattle farmers and their contribution to livelihoods and food security. The Limpopo Province is located in the north-eastern corner of South Africa and shares borders with Zimbabwe, Mozambique and Botswana (South African Cities Networks, 2011). At 8.8 million hectares, it accounts for 10.3% of the area of South Africa. The latest estimates show that Limpopo has a population of 5.4 million (STAT SA, 2011). It is surrounded by Mpumalanga, North West and Gauteng Provinces. The Limpopo Province consists of five District Municipalities namely: Greater Sekhukhune, Mopani, Vhembe, Waterberg and Capricorn District Municipalities. According to DAFF (2015), livestock uses 74% of Limpopo's total area as grazing land. The study was conducted at Capricorn Municipality (CDM), Greater Sekhukhune, Mopani, Waterberg and Vhembe District Municipalities where Limpopo IDC Nguni Project participants are located (Figure 3.1).



[www.mapsofworld.com/south-africa/provinces/limpopo.html](http://www.mapsofworld.com/south-africa/provinces/limpopo.html)

Figure 3.1: Map of Limpopo Province and its districts.

### 3.3 Research methods

The study used the post-positivist research paradigm. To achieve the objectives, the study also used quantitative research methods. A quantitative research method was used to source and obtain data through questionnaires from smallholder Nguni livestock farmers. Furthermore, quantitative research was used for descriptive statistics to quantify data responses to generalize results (Cooper and Schindler, 2008).

### **3.4 Research design**

A descriptive cross-sectional research design was employed in the study with an aim of describing the market participation and profitability of smallholder Nguni livestock farmers in the Limpopo Province. The approach in this study employed a survey that had a predetermined structured questionnaire that yielded data for statistical analysis.

#### **3.4.1 Data collection**

The primary data were collected through structured questionnaires and interviews. Input-output data were collected to enable the computation of gross margins. The primary data were collected to enable the estimation of the model market participation, profitability and livelihood. The questionnaire was further administered in two local languages, namely Sepedi and Venda, to accommodate farmers to respond freely. The primary data were collected between July and September 2016.

#### **3.4.2 Population/ sample**

The project consists of 62 smallholder farmers. Sixty-one farmers who are in the IDC Nguni Project Trust were included in the sample. One farmer was not interviewed due to funeral in the family. The sample size was reduced to 61.

For the purpose of analysing the model, the sample size was further reduced from 61 to 50 because some the farms were co-operatives and CPA's and therefore demographic characteristics such as age, gender, marital status, household size and education level of the farmers, which are included in the model, could not be used in the econometric models because the farms were owned by community and participants play an almost equal role in decision making. Table 3.1 outlines the distribution of IDC Nguni smallholder farmers within the study area.

**TABLE 3.1: DISTRICT AND MUNICIPALITY LEVEL DISTRIBUTION OF IDC NGUNI FARMERS IN LIMPOPO PROVINCE(N=61)**

<b>DISTRICT MUNICIPALITIES</b>	<b>LOCAL MUNICIPALITIES</b>	<b>NUMBER OF FARMERS</b>	<b>CPA's</b>
<b>Vhembe</b>	Lephalale	2	-
	Makhado	3	-
<b>Waterburg</b>	Modimolle	6	3
	Mogalakwena	13	1
	Mookgophong	4	-
<b>Mopani</b>	Maruleng	1	1
<b>Greater Sekhukhune</b>	Elias Motsoaledi	3	-
	Ephraim Mogale	1	1
	Greater Tubatse	2	1
<b>Capricorn</b>	Aganang	3	-
	Blouberg	3	-
	Lepelle-Nkumpi	1	1
	Molemole	9	-
	Polokwane	10	3
<b>TOTAL</b>		61	11

### 3.5 Data analysis

STATA 14 was used to analyse the data. STATA is a basic statistical and econometric computer package to estimate model results. Descriptive statistics including means and frequencies; standard deviations were also calculated. SPSS 23 was used to manage data.

#### 3.5.1 Descriptive statistics

Descriptive statistics were used to analyse the data collected on the socio-economic characteristics of the smallholder Nguni cattle farmers and it was also used to

assess the livelihoods and food security of the smallholder farmers in the Limpopo Province. Descriptive statistics include the means, percentages, standard deviation and frequencies. Econometric models were used to analyze determinants of market participation, profitability and the livelihoods of smallholder farmers.

### 3.5.2 Logistic Regression Model

The logistic regression model was used to analyse the determinants of market participation for individual Nguni farmers in the Nguni Project. Sales were used as proxy for market participation. The logistic regression model was specified as follows:

$$\log [p_i / (1-p_i)] = \beta_0 + \beta_1 X_1 + \dots + \beta_n X_n$$

$p_i$ : Participation in the market by  $i^{\text{th}}$  farmer (farmer who sold at least 15 animals in the previous year, i.e. in 2015). Each farmer was given herd size of 300 cattle as a loan to repay in 5 years. Selling at least 15 animals would mean that farmer was able sustain herd size while participating in the market.

$1-p_i$ : Non-participation by  $i^{\text{th}}$  farmer (farmer who sold  $\leq 14$  animals in the previous year, i.e. in 2015).

The model is specified as:

$$MP = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + U_t$$

Where

MP = Market participation (1 if farmer participated in market; 0 otherwise);

$\beta_0$ : constant of the equation;

$\beta_i$ : coefficients of explanatory variables,

$X_i$ : independent variables;

$U_t$ : error term or unexplained variables

The independent variables of this model are described in table 3.2.

**TABLE 3.2: DESCRIPTION OF VARIABLES FOR MARKET PARTICIPATION LOGISTIC REGRESSION MODEL**

VARIABLE	DESCRIPTI ON	MEASUREME NT	EXPECT ED SIGN	EXPLANATION
<b>Dependent Variable</b>				
Market participation	1 if farmer participates in the markets 0; otherwise	Dummy		
<b>Independent Variables</b>				
X <sub>1</sub> : Education level	Education level of farmer	Number of years	+	As educational level increases market participation is expected to increase
X <sub>2</sub> : Household income	Farmer's household income	Rand	±	This can either be positive or negative. If income is high farmers may pay off their loan quickly then reduce market participation to build up herd.
X <sub>3</sub> : Marital Status	1 if farmer is married, 0 otherwise	Dummy	+	Married farmers may gather more information than single ones therefore increasing market participation
X <sub>4</sub> : Farming	Number of years farmer	Number of years	+	Experience is expected to be



experience	being in farming enterprise with cattle			positively correlated to market participation
X <sub>5</sub> : Price of animal	Price of animal in the market	Rand	-	If price is high farmers will pay off their loan quickly then reduce market participation to build up herd.
X <sub>6</sub> : Extension Services	1 if farmer has access to extension services, 0 otherwise	Dummy	+	Extension is expected to be positively correlated to market participation
X <sub>7</sub> : Distance	Distance the farmer travel to markets	Kilometres (km)	-	Distance to market is expected to be negatively correlated to market participation
X <sub>8</sub> : Loan Repayment	1 if farmer has repaid the loan; 0 otherwise	Dummy	-	When loan repayment is completed, market participation will reduce as farmers build herd.
X <sub>9</sub> : Government Assistance	1 if farmer get assistance from government, 0 otherwise	Dummy	+	Government assistance is expected to be positively correlated to market participation
X <sub>10</sub> :	1 if farmer is	Dummy	+	Cooperative

Member of co-operative	the member of co-operative 0; otherwise			membership is expected to be positively correlated to market participation
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### 3.5.3 Gross Margin Analysis

#### i. Computation of gross margin

Input-output data from the different Nguni smallholder farmers were used to compute gross margins for individual farmers. The *gross margin* is the value of the output of an individual enterprise (gross value of production), less the variable costs directly attributable to generating the value (Conradie and Landman, 2013). However, the gross margin does not take account of fixed costs. Gross margin was used as a proxy for profitability.

The gross margin relationship can be stated as:

$$\text{Gross margin} = (TR - TVC) \dots \dots \dots (1)$$

Where TR = Total Revenue (Livestock sales) and TVC = Total Variable Costs (i.e. feeds, labour cost, fuel, transport cost, electricity, maintenance, animal health costs). The data necessary for the computation of the gross margin were collected and calculated from individual farmers and CPAs.

#### ii. Multiple regression analysis for gross margin

Multiple regression analysis was used to analyse the determinants of profitability for the Nguni IDC Project farmers. The gross margin was used as a proxy for profitability. The model was specified as follows:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + U_t$$

Where:

$Y_i$ : is the gross margin

$\beta_0$ : constant of the equation;

$\beta_i$ : coefficients of explanatory variables;

$X_i$ : independent variables;

$U_t$ : error term or unexplained variation;

The independent variables are described in table 3.3.

**TABLE 3.3: DESCRIPTION OF VARIABLES FOR GROSS MARGIN MULTIPLE REGRESSION ANALYSIS**

VARIABLE	DESCRIPTION	MEASUREMENT	EXPECTED SIGN	EXPLANATION
<b>Dependent Variable</b>				
Profitability	Gross margin of the farmer	Rand		
<b>Independent variables</b>				
X <sub>1</sub> : Education level	Education level of the farmers	Number of years	+	Education level of the farmer is expected to be positively correlated to profitability
X <sub>2</sub> : Herd Size	The number of animals owned by the farmer	Number	+	Herd size could be negative or positive. It could be negative if the farmer has started repaying the loan and will affect profitability negative.
X <sub>3</sub> : Extension services	1 if farmer has access to extension service; 0 otherwise	Dummy	+	Extension service is expected to be positively correlated to profitability
X <sub>4</sub> : Distance	The distance to the market	km	-	Distance is expected to be negatively correlated to profitability
X <sub>5</sub> : Farm Size	The size of land owned by the farmer	Hectares	+	Farm size is expected to be positively correlated to

				profitability
X <sub>6</sub> : Farming Experience	Number of years in farming	Number of years	+	Experience is expected to be positively related to profitability
X <sub>7</sub> : Marketing Agency	1 if the farmer has marketing agency	Dummy	+	Farmers that belong to marketing agency are expected to have increased profits

The age of the farmer was highly correlated with the farming experience of the farmer during analysis. The age was dropped off to reduce multicollinearity.

### 3.5.4 Livelihood model

The livelihoods model was specified as follows:

$$\log [p_i/(1-p_i)] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_n X_n + U_t$$

Where

$\log [p_i/(1-p_i)]$ : Livelihoods (dependent variable) improvement is probability of the outcome

$\beta_0$ : constant of the equation

$\beta_1, \beta_2, \dots, \beta_n$ : coefficient of independent variables

$X_1, X_2, \dots, X_n$ : independent variables

$U_t$ : error term

The dependent variable was specified as livelihood improvement (Li) after joining Nguni Project.

$$Li = \beta_0 + \beta_1 \text{ age} + \beta_2 \text{ gender} + \beta_3 \text{ household size} + \beta_4 \text{ recent increase in farm income} + \beta_5 \text{ farm size} + \beta_6 \text{ land ownership} + \beta_7 \text{ household expenditure} + U_t$$

Livelihoods were assessed based on a livelihoods outcome scoring scheme which includes: tangible and intangible asset ownership, access to food, education and

health services, gaining new skills, engaging in agriculture but non-livestock based economic activity and non-agriculture economic activity (Table 3.4).

<b>TABLE 3.4: THE LIVELIHOOD SCORE (DEPENDENT VARIABLE) CRITERIA</b>		
	<b>PLEASE TICK ONE</b>	
1. Tangible assets ownership	Yes	No
2. Intangible asset ownership	Yes	No
3. Access to food	Yes	No
4. Access to education	Yes	No
5. Access to health services	Yes	No
6. Gaining new skills	Yes	No
7. Economic activity other than livestock farming	Yes	No
8. Any economic activity that is not related to agriculture	Yes	No

The scoring criteria are guided by Kusters et al., (2006) and CARE (2010). This was used to assist in the interpretation of the livelihoods econometric model.

If the farmer scores 4 or more then the livelihood is interpreted as having improved after being in the project and livelihoods outcome =1, but 0 otherwise. The criterion is guided by the CARE approach to assess livelihood (Carney et al., 1999). Table 3.5 describes the variables for the livelihoods equation.

**TABLE 3.5: DESCRIPTION OF VARIABLES FOR LIVELIHOOD MODEL**

VARIABLE	DESCRIPTION	MEASUREMENT	EXPECTED SIGN	EXPLANATION
<b>Dependent variable</b>				
Livelihoods outcome	1 if farmer's livelihood has improved, 0 otherwise	Dummy		
<b>Independent variables</b>				
X <sub>1</sub> : Age	Age of the farmer	Years	+	Age is expected to be positively correlated to livelihood outcome
X <sub>2</sub> : Gender	1 if male, 0 otherwise	Dummy	+	Gender is expected to have positive correlation if male sell more cattle than women
X <sub>3</sub> : Household size	Number of the members in the household	Number	-	The size of the household is expected to be negatively correlated to livelihood outcome
X <sub>4</sub> : Recent increase in	1 if yes, 0 otherwise	Dummy	+	Recent increase in farm income is

farm income				expected to be positively correlated to livelihood outcome
X <sub>5</sub> : Farm size	The size of the farm	Hectares	+	Farm size is expected to be positively correlated to livelihood outcome
X <sub>6</sub> : Land ownership	The size of land owned by farmer	Hectares	+	Land owned by farmer is expected to be positively correlated to livelihood outcome
X <sub>7</sub> : Household expenditure	The expense incurred by the household per month	Rand	+	Household expenditure is expected to be positively correlated to livelihood outcome

### 3.5.5 Food security

The results of the market participation, gross margin and livelihoods analyses are used in the discussion of the potential contribution on the Nguni Project farmers to food security.



### Food Security Cluster

For the purpose of the study sales were used to create clusters that enabled to classify the contribution of the smallholder Nguni production to household food security. The study used sales as proxy for income. The study focus affordability as one of the dimension of food security. The cluster method is consistent with D’Haese et al., (2011). The cluster considers income as the important determinant of food security.

TABLE 3.6: THE CONTRIBUTION OF SALES (INCOME) CLASSIFIED INTO CLUSTERS		
CLUSTER	CATEGORY	STATUS
1	Sales (R0 - R30 000) per annum	Severely food insecure
2	Sales (R30 001 - R90 000) per annum	Moderate food insecure
3	Sales (R90 001 and more) per annum	Food secure

The food security cluster shows how households with low income have lower food security status. The cluster was used to explain food security status of the Nguni project farmers and their households’ food security status. The clusters used an average number of household members to compute average monthly income per household member. Cluster 1 consists of farmers with low income, cluster 2 consist of Nguni farmers with moderate income and cluster 3 consist of farmers with high income.

### 3.6 Limitation of the study

The major limitation of the study is the small sample size.

### 3.7 Chapter Summary

The chapter has described methods used and applied to achieve the objectives of the study. The study used logistic regression, multiple regression analysis, and livelihood models. Gross margin analysis, food security clusters and livelihood score assessment was computed from the primary data that were collected from

smallholder Nguni cattle project farmers in the Limpopo Province. Variables (both dependent and independent) have been explained in detail in this chapter.

## CHAPTER FOUR

### RESULTS AND DISCUSSION

#### **4.1 Introduction**

The aim of the study was to analyse the determinants of market participation and profitability of smallholder Nguni Cattle Project farmers in Limpopo Province. The first specific objective was to analyse the determinants of market participation for smallholder Nguni Cattle Project farmers in Limpopo Province using descriptive statistics and logistic regression. The second specific objective was to analyse the determinants of profitability for smallholder Nguni Cattle Project farmers in Limpopo Province using descriptive statistics and multiple regression analysis. The third specific objective was to assess contribution of smallholder Nguni production to livelihoods and food security using descriptive statistics and livelihood model. After data was collected, it was analysed to achieve set objectives of the study. The chapter presents the results of the study and discussion.

#### **4.2 Descriptive statistics**

In this section descriptive statistics are represented in tables, graphs, percentages and frequencies.

##### **4.2.1 Continuous socio-economic variables**

The age of the farmer influences their livestock production especially in smallholder farming which is regarded as being characterised by high labour intensity. Table 4.1 shows that the average age of the farmers was 57 years with a minimum of 31 years and a maximum of 78 years.

**TABLE 4.1 SOCIO-ECONOMIC CHARACTERISTICS OF THE FARMERS:  
CONTINUOUS VARIABLES(N=50)**

<b>VARIABLE</b>	<b>MEAN (SDEV)</b>	<b>MINIMUM</b>	<b>MAXIMUM</b>
Age (years)	57 (12)	31	78
Education (years)	13(4)	1	22
Farming Experience (years)	12(9)	3	34
Household Size (members)	6(2)	1	12
Herd size (number of cattle)	139 (118)	36	600
Household/ Farm Income (R)	165 865 (180 019)	R0	R 765 000

Education is the key to understanding basic principles of farming (Moloi, 2008). Farmers with education have an understanding of production techniques, marketing and of existing opportunities. Table 4.1 shows that the minimum years of education was 1 and the maximum was 22. The average years of education were 13 with standard deviation of 4. This means most farmers in the Nguni Project had tertiary qualifications. This might imply that they have better understanding in acquiring farming knowledge than the less educated farmers who comprise most smallholders.

The minimum farming experience of the smallholder was 3 years and the maximum was 34 years. The average farming experience was 12 years with standard deviation of 9. The household size ranged between 1 and 12 members, with an average household size of 6 members and a standard deviation of 2.

The results show that the minimum number of cattle owned by farmers was 36, maximum of 600. The results also show that the average herd size of smallholder farmers was 139 cattle with standard deviation of 118. Furthermore, the minimum household/farm income was R0 and maximum was R765 000. The mean and standard deviation household/farm income were R165 865 and 180 019, respectively. The IDC and Nguni officials play a critical role by providing Nguni smallholder Cattle Project farmers with information such as marketing and production.

#### 4.2.2 Discrete socio-economic variables

The gender participation within the Nguni Project shows that 82% of the farmers were male (Table 4.2).

<b>TABLE 4.2: SOCIO-ECONOMIC CHARACTERISTICS OF FARMERS: DISCRETE VARIABLES(N=50)</b>		
<b>VARIABLES</b>	<b>CATEGORY</b>	<b>(%)</b>
Gender	Male	82
	Female	18
Marital Status	Married	78
	Single, widowed and divorced	22
Member of Cooperative	Not a member	96
	A member	4

The results show that male participation was greater than female participation in livestock production within IDC Nguni Cattle Project. The female participation in livestock production and marketing remains a challenge. This might be because females are more engaged with other activities or undertaking household tasks.

The proportion of the respondents that were married is 78%, while 22% were single, widowed or divorced. The implication of this finding was that most of the farmers were married and they make use of family members as labour. This may increase their productivity and increase marketable livestock and to reduce their labour costs. Being married determines the capability of the farm households to allocate all their resources efficiently on both farm and non-farm activities to boost the household income.

A farmers' cooperative offers a thriving channel for additional contact with a large number of farmers including opportunities for participatory communication with extension organizations (Peterson, 1997). Only 4% belonged to a farmer cooperative. According to Randela (2005), farmer organisations are important means

of linking producers with markets, where an individual producer cannot enjoy economies of scale.

#### 4.2.3 Distribution of herd size, distance and farm size (farm characteristics)

The average distance to market was 37 kilometres. The maximum distance travelled to market was 150 kilometres while minimum distance travelled to market was 1 kilometre (Table 4.3).

<b>TABLE 4.3: DISTRIBUTION OF HERD SIZE, DISTANCE AND FARM SIZE (N=61)</b>			
<b>VARIABLES</b>	<b>MEAN (SDEV)</b>	<b>MINIMUM</b>	<b>MAXIMUM</b>
Distance [km]	37(35)	1	150
Farm size [ha]	1835 (3847)	85	4600

Table 4.3 further shows that the smallest farm size owned and used by the smallholder farmer was 85 hectares and the maximum was 4 600 hectares with an average of 1 835 hectares. The standard deviation of farm size was 3 847.

Over 64% of the farmers were responsible for providing transport of the animals to the market. About 25% of transport to market was provided by the buyers. This could be through private sales because buyers usually buy at farm gate. Eight percent of the transport of the animals to market was provided by middlemen. Only two percent of the transport to market was provided by marketing organisation and 2% of the transport was provided by auctions (Figure 4.1).

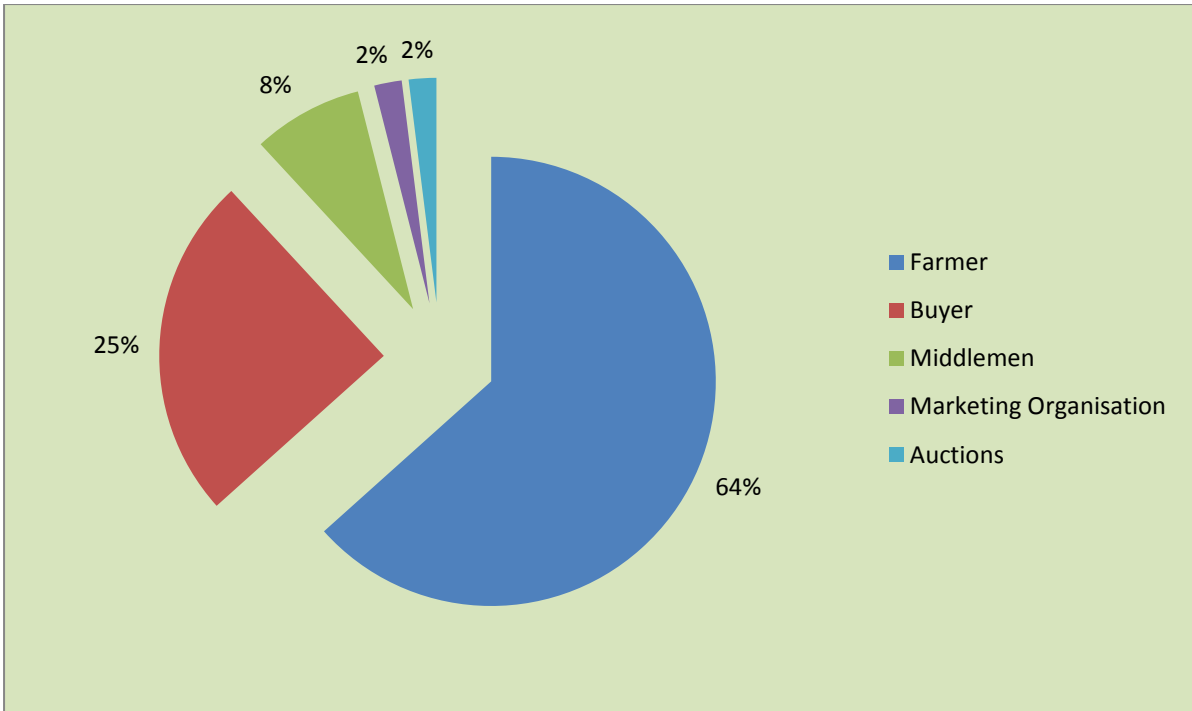


Figure 4.1: Provider of the transport to the market(%) (n=61)

**4.2.4 Extension services**

Over 37% of Nguni project farmers met were visited by a government extension officer once a month (Figure 4.2). More than 16% of the respondents have been visited by a government extension officer once in 3 months, while 11% of the respondents stated that they were visited by a government extension officer once in four months. Sixteen percent of the respondents have never been visited by a government extension officer, whereas 5% of the respondents stated that they are only visited by a government extension officers on request. This level of variation shows inconsistencies in the extension approach used by the government and raises questions about its potential effectiveness.

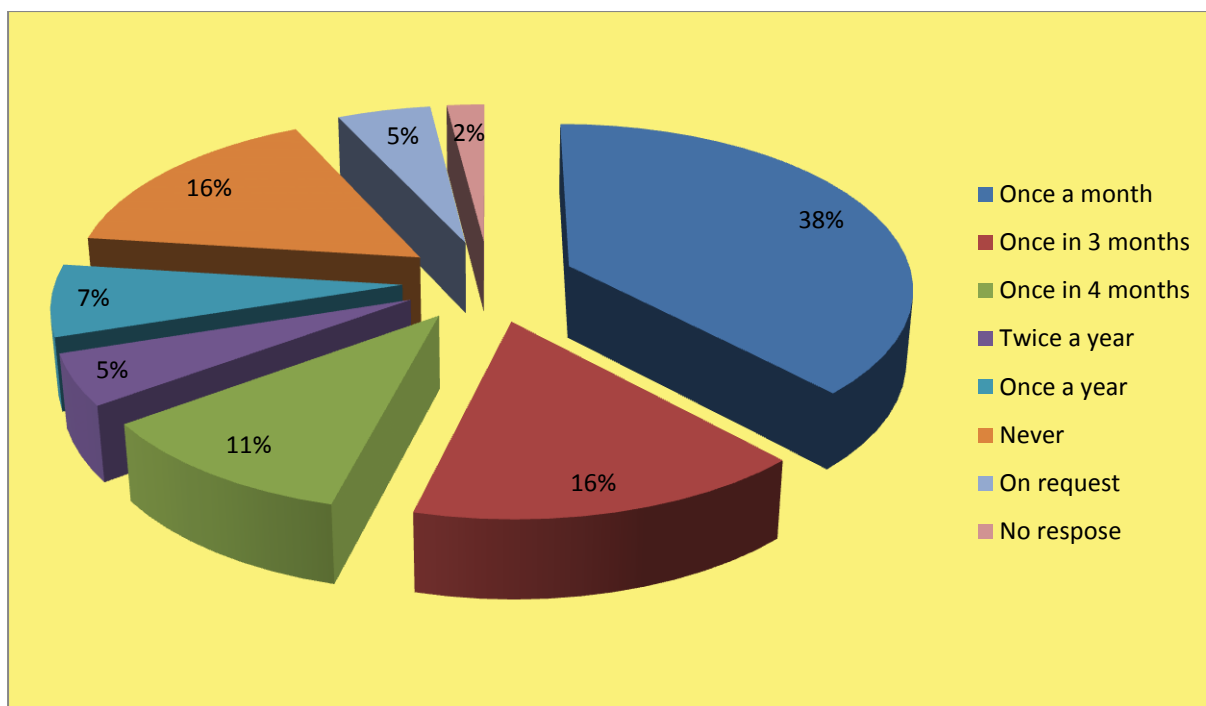


Figure 4.2: Visits by the government extension services(%) (n=61)

#### 4.2.5 Land tenure system

The type of land ownership system has influenced agricultural development (Jacobs, 2011). Farm size influences the level of commercialization in agriculture (Martey et al., 2012). The type of land ownership has influence on the type of the livestock investment. Table 4.4 shows that 26% of the Nguni project farmers had the title deed of the land they were using and 18% had the right to use the land they are farming on (that is communal land owned by chiefs and tribal authority).

**TABLE 4.4: LAND TENURE SYSTEM(N=61)**

LAND TENURE SYSTEM	%	MEAN (HECTARES)	MINIMUM (HECTARES)	MAXIMUM (HECTARES)
Leased/Rent	56	1500	85	4200
Communal	18	3830	645	4600
Private	26	1266	421	4600



Table 4.4 further shows that 56% of the smallholder farmers use the land benefited from LRAD and SLAG programmes.

Several studies such as Martey et al.,(2012) also revealed that land ownership and farm size has got an influence on productivity and investment on the farm. The farm size under leased land ranges from 85 hectares to 4 200 hectares. The farm size under communal land ranges from 645 hectares to 4 600hectares and the farm size under private land ranges from 421 hectares to 4 600 hectares.

## 4.2.6 Marketing channels

### 4.2.6.1 Type of marketing channel used

Farmers are able to sell their animals through various livestock marketing channels. The marketing channel ranges from private sales at farm gate to auctions, feedlots, abattoirs and speculators (Table 4.5).

<b>TABLE 4.5: TYPE OF MARKETING CHANNEL USED BY NGUNI FARMERS IN THE LIMPOPO PROVINCE (N=61)</b>	
<b>MARKETING CHANNEL</b>	<b>(%)</b>
Private sales\Individuals (include farm gate sales) Informal markets	11
Abattoirs	3
Speculators	2
Auctions	36
Feedlots	8
Unspecified	34
No response	5

Thirty-six percent of the Nguni Project farmers sold animals to auctions, 11% were private sales, whereas 34% of the farmers did not specify the marketing channel they were using. The farmers reported that auctions were easily accessible and reliable because the payments were made immediately after selling the cattle. Most of the farmers from different districts used auctions held in Polokwane. Farmers also

reported that private sales were the simplest form of marketing channel because the buyer come and buy cattle at farm gate. In farm gate sales there were no transport costs incurred and prices were higher. The abattoirs and speculators were the least used marketing channel. They accounted for 3% and 2%, respectively. The farmers reported the classification system in the abattoirs depreciate the prices of the cattle and the prices received from speculators were reported to be low. These findings are consistent with Musemwa et al., (2007). Xaba et al., (2013) say that the decision on the type of marketing farmers are using depends on distance to the market, location of the channel and whether the farmer has the ability to meet market requirements such quality, standard and consistency of supply.

#### **4.2.7 Marketing and cattle physical challenges faced by Nguni Cattle Project farmers**

The challenges of the Nguni Cattle Project farmers were divided into marketing and cattle physical challenges. The cattle physical challenges related challenges reported by farmers include animal body weight and poor condition of the animals which affect meat quality when selling the animals in the formal markets such as auctions (Table 4.6).

<b>TABLE 4.6: MARKETING AND CATTLE PHYSICAL CHALLENGES FACED BY NGUNI FARMERS (N=61)</b>			
<b>MARKETING CHALLENGES</b>		<b>CATTLE PHYSICAL CHALLENGESS</b>	
<b>CATEGORY</b>	<b>(%)</b>	<b>CATEGORY</b>	<b>(%)</b>
Low prices	18	Low body weight	21
High transport cost	10	Poor conditions of animal	8
Lack of market access	13	No cattle physical challenges	70
No marketing challenges	59		

The majority of Nguni farmers (70%) did not cattle physical challenges when selling the animals in the market. The type of marketing channel used by the farmers have influence on market requirements such weight and condition of an animal. It was observed that majority of the farmers preferred auctions and private sales. Through auction the weight of an animal is considered whereas through private sales the body weight is not taken into considerations. Twenty percent of Nguni farmers experienced low body weight animals and 8% of the farmers experienced poor body conditions of the animals.

Eighteen percent of the farmers reported that they received low prices in the market when selling the animals. This could be related to low weight problems. Ten percent of the farmers reported that they experienced high transport costs. High transport cost may be as a result of distant markets. High transport costs could negatively affect gross margins of the farmers. Thirteen percent of the Nguni farmers reported that they had a lack of access to the market. They further explained that lack of market access may be caused by lack of relevant marketing information, inability to negotiate for higher prices and poor conditions of the animal.

Animals with poor body condition fetch low prices because of the body weight. The weight of an animal determines the price per kilogram of an animal. Light-weight animals tend to fetch low prices. Heavy-weight animals fetch good prices (Ntshepe, 2011). Some of the farmers are not able to provide feeds and vaccines for the cattle and this leads to a poor condition of the animals. Animals with poor condition are not desirable as far as the markets are concerned. Animal feed is the highest expenditure in livestock production. Feeds are one of the major challenges of Nguni farmers, especially during very harsh conditions of drought. The body condition of the animals was extremely negatively affected by drought.

Transaction costs are the costs incurred when making a market related transaction. For example, the cost of searching information in the market and screening the buyer are examples of transactions costs. High transaction costs are a barrier to smallholder farmers selling cattle in the formal markets. According to Makhura (2001), transaction costs hindered the market participation of smallholder farmers in the Northern Province [now *Limpopo Province*]. He further argues that proximity and

shortage of resources affect the market information negatively. Market information provides a better position to smallholder farmers to negotiate when transactions are taking place. Transactions costs in the case of smallholder Nguni cattle farmers are the transport costs to the market, information search costs and to go to police stations for permits and valid identification certificate before selling the cattle (Musemwa et al., 2010). The majority of the farms in rural areas are located far away from the markets ;therefore, transport becomes more expensive because of the poor roads and the distance to the market. The majority of smallholder farmers do not have any marketing organisation that would enable them to share the cost of transport to market and access to market information. The cost of transport incurred by farmers was relatively high due to poor roads. Nkhoru (2004) mentions that good roads make it easier for smallholder farmers to reach markets. Barney et al. (1999) insist that better access to market information reduces the risk in market participation.

#### 4.2.8 Market information

Table 4.7 shows various sources of market information for the current study. The sources comprise government extension services, radio, and other farmers through interactions, auctions and farm records.

<b>TABLE 4.7: SOURCES OF MARKET INFORMATION BY NGUNI FARMERS(N=61)</b>	
<b>CATEGORY</b>	<b>(%)</b>
Government extension services	77
Neighbouring farmers	11
Auction	3
Internet	2
Own records	3
Radio	2
Did not get any information	2

Market information plays a critical role in agricultural development. Market information helps farmers to explore market opportunities and improve their

competitiveness. According to Sokoya (2014), agricultural information including market information can be accessed through different sources. Hence it can be disseminated through different channels and methods.

In the current study market information includes information on market outlets and prices.

Seventy-seven percent of the smallholder Nguni project farmers seek cattle management advice and market information from the government extension officers. It is evident that smallholder farmers in developing countries depend on the government extension services as the main sources of agricultural information (Adetayo and Eunice, 2013). Eleven percent of smallholder Nguni farmers seek cattle management advice and market information from neighbouring farmers (other farmers). The communication between farmers may be limited by the spatial distribution of the farms and that farmers have not yet adopted social media technology. Mapiye (2016) further explains that farmers' ability to seek advice and information after being faced with a challenge was associated with characteristics such as location. Only 2% of the farmers seek management and marketing information from the internet.

Thirty-eight percent of the farmers have received formal training on animal production and livestock management (Figure 4.3). Figure 4.3 shows that only 8% of the farmers have received formal training on marketing and agribusiness management. Training plays an important role in the development of the smallholder sector as it closes the gap of limited knowledge (Montshwe, 2006). Fifty-four percent of the in Nguni project farmers did not receive any formal training such as workshops or seminars related to animal production, livestock management, marketing and agribusiness management. The level of variation in the enhancement of skills to smallholder farmers shows inconsistencies in effectiveness of rearing livestock. Montshwe (2006) argues that training is one of the important aspects of commercialising the smallholder sector since it has the potential to align what the smallholder farmers are producing and what markets requires.

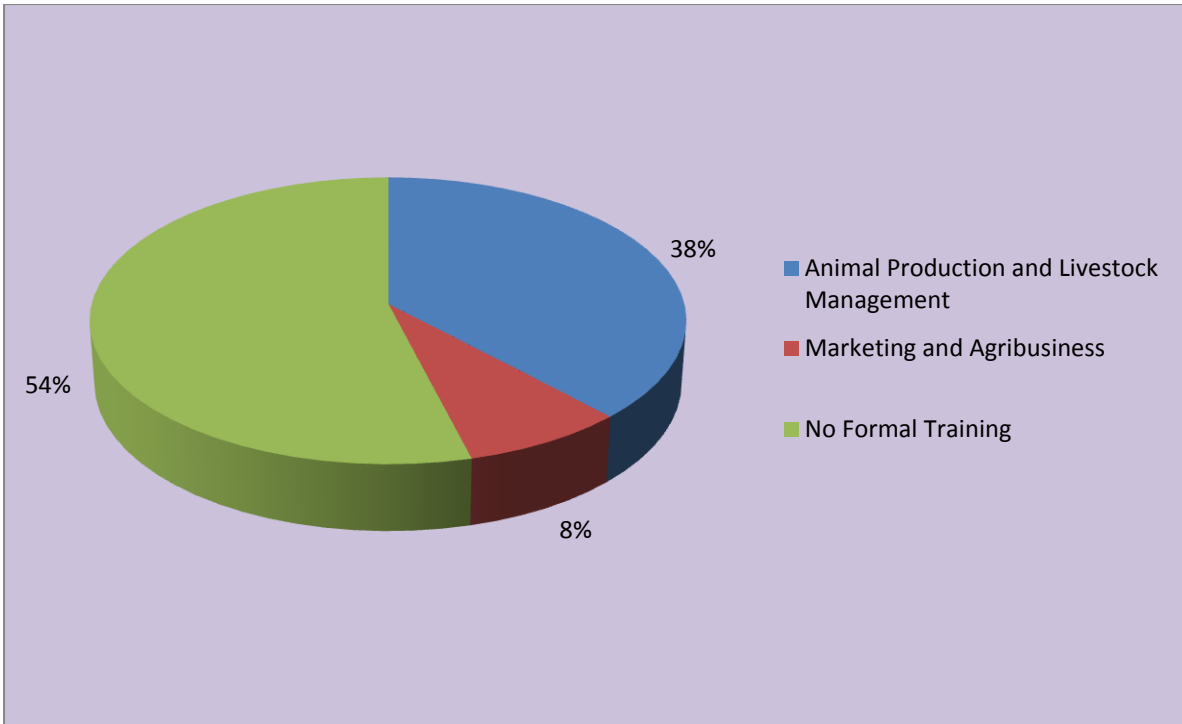


Figure 4.3: Formal Training (%) (n=61).

#### 4.2.9 Market Participation and Access for Nguni Project farmers

Table 4.8 summarises the market participation of Nguni project farmers. Fifty-nine percent of the farmers participate in the markets whereas 41% do not. Fifty-four percent of the farmers reported that market access was easy, 38% of the farmers reported that market access was difficult whilst 8% do not know about the markets. The easy market access might be influenced by good roads, available markets and short distances to the market. Some of the farmers reported that they do not know about market access because they were not selling.

**TABLE 4.8: MARKET PARTICIPATION AND ACCESS OF THE NGUNI FARMERS(N=61)**

<b>MARKET PARTICIPATION</b>			<b>(%)</b>
	Participate		59
	Do not participate		41
<b>Market Access</b>			
	Easy		54
	Difficult		38
	Do not know		8
<b>Access to credit</b>			
	Access to credit		23
	Do not have access to credit		77
<b>Loan repayment</b>			
	Yes		39
	No		47
	Paid some		11
	No response		3
<b>Price of animal</b>			
	2 000-3 000		13
	3 001-4 000		26
	4 001-5 000		30
	5 001-6 000		11
	Above 6 000		10
	Did not sell		10
	Mean	R 4 584	
	Standard deviation	R 1 364	

Twenty-three percent of the respondents had access to credit and 77% of the respondents did not. The reason may be that they do not have title deeds for the land they are using and the Nguni livestock is still on loan. Thirty-nine percent of the respondents paid for a soft loan for the cattle and 47% of the respondents have not repaid the soft loan of the cattle while 11% have paid half of the soft loan of the cattle from the IDC Limpopo Nguni Trust. The average price at which the cattle were sold in the markets was R4 584 with a standard deviation of 1 364.

Because the sample used in the regression analysis reduced to N=50, it is important to report some of the summary statistics for that sample of 50 because it is from this sample that generalisations based on the regression analyses will be drawn. Of the sample used in the regression analysis 64% participate in the markets whereas 36% do not (Table 4.9).

<b>TABLE 4.9: MARKET PARTICIPATION AND ACCESS OF THE SAMPLE USED IN REGRESSION ANALYSIS (N=50)</b>		
<b>VARIABLE</b>	<b>CATEGORY</b>	<b>(%)</b>
Market Participation	Participate	64
	Do not participate	36
Market Access	Accessible	62
	Inaccessible	38
Access To Credit	Access to credit	24
	No access to credit	76
Loan repayment	Repaid	34
	Not repaid	66

Of the sample used in the regression analysis 62% of the farmers reported that markets were accessible, whereas 38% reported that market access was difficult and that markets were inaccessible. Of the sample used in the regression analysis 24% had access to credit and 76% did not. Thirty-four percent of the respondents used in the regression analysis paid the soft loan of the cattle and 66% have not repaid the soft loan of the cattle from IDC Limpopo Nguni Trust.



#### **4.2.10 Livelihood Improvement**

Seventy-seven percent of the farmers have seen improvement in their livelihoods after joining the Nguni cattle project. The improvement in the farmers' livelihood might have been brought by sales of cattle and slaughtering of cattle for home consumption. Twenty-three percent of the smallholder Nguni cattle farmers have not seen improvement in their livelihoods after joining the project.

Sixty-one percent of the respondents experienced an increase in their farm income recently, while 38% did not. Seventy-eight percent of the respondents diversified their cattle farming with other farm and non-farm activities. Twenty-two percent did not diversify the cattle farming. Over 36% of the respondents diversify the cattle farming with rearing other livestock such as sheep, goats, dogs, pigs, donkeys, poultry and geese. More than 23% diversify livestock farming with crops and horticulture. Only 20% of the farmers diversified the livestock farming with non-agricultural activities. It is evident that some smallholder Nguni Cattle farmers diversified cattle farming before joining Nguni Project because they have maximum of 34 years experience in farming in general and average farming experience with livestock is 12 years while Nguni Project started 11 years ago.

Table 4.10 shows that slightly more than 46% of Nguni project farmers always sell cattle when there is a pressing need. Therefore, cattle serve as part of savings for smallholder farmers. This means that smallholder farmers sell cattle the need of money arises. Thirty-one percent of the farmers sometimes sell when the need for money arises.

<b>TABLE 4.10: LIVELIHOOD IMPROVEMENT OF NGUNI FARMERS(N=61)</b>		
<b>VARIABLES</b>		<b>(%)</b>
<b>Increase in recent farm income</b>		
	Increased	61
	Decreased	38
	No response	2
<b>Livelihood improvement</b>		
	Improved	77
	Not improved	21
	No response	2
<b>Diversification in farming</b>		
	Did not diversify	21
	Diversified	79
Diversification in	Other livestock	36
	Crops	23
	Non-agricultural activities	20
<b>Pressing needs</b>		
	Do not sell	26
	Sometimes sell	28
	Always sell	46

Twenty-six percent of Nguni project farmers do not sell cattle when the pressing need arises. This means farmers use other ways to raise money to settle their needs.

For the same reason explained earlier for Table 4.11 some livelihoods assessments for the sample included in the regression analysis are provided. Of the sample included in the regression analysis 64% of the respondents realised an increase in their farm income recently after joining the Nguni IDC Cattle Project whereas 36% of smallholder farmers did not realise any increase in the farm income recently.

**TABLE 4.11: SOME LIVELIHOODS ASSESSMENTS FOR THE SAMPLE (N=50)**

VARIABLES	CATEGORY	(%)
Recent increase in farm income	Increased	64
	Decreased	36
Livelihood improvement	Improved	80
	Not improved	20
Loan repayment	repaid	42
	Not repaid	58
Pressing needs	Sell	68
	Do not sell	32

Eighty percent of smallholder Nguni livestock farmers who were included in the regression analysis, reported improvement in their livelihoods after joining the Nguni Project. The reasons for livelihood improvement might be that the some of the farmers' slaughter cattle for home consumption, some farmers sold cattle in the market to generate income and other farmers have diversified farming with other businesses that complement their livelihood. Twenty percent of the farmers indicated that their livelihoods have not improved. Some of the reasons for not having improvement were because farmers were not selling in the markets due to inadequate access of market, insufficient supply, inability to meet buyers' requirements, and that their loans were not yet fully paid to the IDC Nguni Cattle Project Trust.

Forty-two percent of the respondents used in the regression analysis have repaid the loans. This implies that they can focus on producing for the market because they have settled the soft loan. The results further indicated that 58% of smallholders have not yet finished repaying the loan. Sixty percent of the respondents used in the regression analysis often sell cattle when the pressing need arise. Therefore, cattle serve as part of savings for smallholder farmers. This means that smallholder farmers sell cattle the need of money arises. Table 4.11 also indicates that 32% of respondents do not sell cattle when the pressing need arises.

Regarding the livelihood scoring 77% of the farmers had 4 and more Yes responses which means that they perceive that their livelihoods have improved after joining IDC Nguni Project (Table 4.12).

<b>TABLE 4.12: OVERALL SCORE BY CARE APPROACH(N=61)</b>	
<b>Number of Yes</b>	<b>(%)</b>
0-3	23%
4-8	77%

Twenty-three percent of the respondents perceive that their livelihoods have not improved after joining the project. The CARE approach assists to explain if the livelihoods of the farmers are able to address the needs of the farmers within the project or not (CARE, 2010).

#### **4.2.11 Household food security assessment**

Seventy-seven percent of the Nguni Project farmers have seen improvement in their food security status after joining the Nguni cattle project (Table 4.13).

<b>TABLE 4.13: HOUSEHOLD FOOD SECURITY ASSESSMENT(N=61)</b>			
<b>VARIABLES</b>	<b>CATEGORY</b>		<b>(%)</b>
<b>Food Security improvement</b>			
	Improved		77
	Not improved		23
<b>Food Availability</b>			
	Yes		80
	No		20
<b>Amount Spent on Food</b>			
	R0-1000		16
	R1000 - 2000		25
	R2001 - 3000		26
	R3001-4000		13
	R4001 and more		15
	Not disclosed		5
	Mean	R 2 902	
	Standard deviation	R 1 898	
Average amount spent on food (Rand/ household member)		R483	
<b>Number of cattle slaughtered</b>			
	Did not slaughter		46
	Slaughter		51
	Did not disclose		3

The improvement might have been brought by sales derived from selling cattle and by-products as well as slaughtering of cattle for home consumption. Twenty-three percent of the smallholder Nguni cattle farmers have not seen improvement in their food security status.

Eighty percent of smallholder farmers believe that Nguni cattle production enhances food availability in their households. Twenty percent of smallholder farmers believe that Nguni cattle production does not enhance food availability in their household.

The average household expenditure on food was used to proxy the current food security status of the farmers because household monthly expenditure on food is seen as a major determinant of food security (D' Haese et al., 2011). According to Smith (2002), the percentage of total household expenditure on food is an effective measure of food security vulnerability. Households that spend a high portion of their income on food are very likely to be food insecure. The average household expenditure on food was 2 902 with standard deviation of 1 896. The share of monthly food expenditure over the household's total monthly expenditure is lowest for food secure households. D'Haese et al., (2011) argue that a household's monthly food expenditure is also seen as a major determinant for food security in the Limpopo Province. In this regard it is observed that average amount on food by households (Nguni project farmers) were R483 per household member which is higher than the average monthly expenditure per household member reported by D'Haese et al., (2011) for the Limpopo Province. They reported that severely food insecure households spend on average less money per month for purchasing food (R111per household member) than moderately food secure (R 141 per household member) and food secure households (R 244 per household member). From the comparison, it can be concluded that more than 54% of the Nguni farmers in Limpopo Province were food secured.

Forty-six percent of the farmers slaughtered cattle for home consumption. The number of cattle slaughtered range between one and seven per annum. Fifty-one percent of the farmers did not slaughter cattle for home consumption. Three percent of the farmers did not provide responses regarding slaughtering the cattle. Slaughtering cattle for home consumption contributes to household food security.

FAO (2003) argues that families with financial resources are likely to escape extreme poverty and suffer rarely from chronic hunger, while poor families not only suffer the most from chronic hunger, but also entail the segment of the population mostly at risk during food shortages and famines. Moreover, household income was regarded

as the important determinant of food security because higher income level groups can purchase more appropriately required nutritious food than low-income groups (D’Haese et al., 2011). Table 4.14 shows that Nguni project farmers (household’s) income also determines the level of food security in a significant way.

The clusters were formulated by classifying the income sales of the smallholder Nguni project farmers in Chapter 3, Table 3.6. The clusters were guided by D’haese et al., 2011 study in Limpopo Province. Sales were used to classify the contribution of Nguni farmers to food security. The focus was on the affordability dimension of food security and income was identified to be the major determinant of food security. Fifty-eight farmers out of 61 farmers interviewed disclosed their farm income or sales whereas three farmers did not disclose the farm sales at all. This has affected the sample size in Table 4.14 and gross margin table (Table 4.17).

<b>TABLE 4.14: FOOD SECURITY CLUSTER (N=58)</b>				
<b>CLUSTER</b>	<b>INCOME (SALES) [R]</b>	<b>AVERAGE INCOME (PER MONTH) [R]</b>	<b>INCOME PER MONTH HH MEMBER [R]</b>	<b>(%)</b>
1	0-30 000	2 500	417	18
2	30 001 - 90 000	2 501-7 500	418-1250	28
3	90 001 and more	7 501-10 000	1251-1667	54

Table 4.14 shows that 18% of smallholder Nguni beneficiaries in Cluster 1 made annual sales of between R0 and R30 000. Twenty-eight percent of the farmers in Cluster 2 made sales of between R30 001 and R90 000 while 54% of the farmers in Cluster 3 made sales of R90 001 and more. The results were supported by food security study conducted in the Limpopo Province by D’Haese et al., (2011).

Food secure households have an average monthly income of about R1 251 per member, moderately food secure households earn an average monthly income ranging from R418 to R1 250 while severely food insecure households earn about R417 per member. D’Haese et al., (2011) show that higher income goes hand in hand with an increased food security status of the households. Food secure

households have an average monthly income of about R1 121 per household member while severely food insecure households earn about R350 per household member. As in the case of monthly income, it can be observed that the household's food security status improves as the amount of monthly sales increases.

From the findings for the food security clusters, it can be concluded that the majority of Nguni farmers and their household members were food secure as the result of being part of Nguni Cattle Project.

#### **4.2.12 Government assistance**

Efforts have been made by the South African government to assist the development of the smallholder livestock sector after 1994. The priority has been given to the smallholder livestock sector as it is the most vulnerable and previously disadvantaged (Department of Agriculture Forestry and Fisheries, DAFF, 2010).

Seventy-seven percent of the farmers have received government assistance in the form of equipment, water boreholes, LRAD programmes, vaccines, feed supplements, advice, training and funds or grants (Table 4.15).



**TABLE 4.15: GOVERNMENT ASSISTANCE TO NGUNI FARMERS (N=61)**

VARIABLE	CATEGORY		(%)
Government Assistance	Did not receive government assistance		23
	Received government assistance		77
		Equipment and water	11
		LRAD beneficiaries	26
		Vaccines and feeds supplements	21
		Advice	8
		Training	3
		Funds and grants	8

Many of the farmers have received government support through LRAD programmes. Twenty-one percent of the farmers reported that they received vaccines and feeds supplement from the government, followed by 11% of the farmers who received equipment (includes fences, windmill, water trough etc.) and water boreholes from government. Eight percent of the farmers received advice from the government while 3% of the farmers received government assistance in the form of training.

#### **4.2.13 Solutions proposed by Nguni project cattle farmers for their problems**

Figure 4.4 show that 16% of the farmers reported that feedlots could be a solution to the problem relating to low body weight and poor diet. Figure 4.4 shows that 8% of the farmers reported that crossbreeding of the Nguni cow with other breeds could solve issues relating to small body frame of Nguni cattle by improving its body size. Seven % of the farmers reported that access to market could solve problem relating to barriers that limit farmers in their access to the market such as marketing information and strengthened negotiations. Only 2% of the farmers reported that training could solve limited knowledge in animal production and marketing of cattle.

The majority of the farmers did not have proposed solutions to the problems they experienced. It is clear that Nguni farmers had limited knowledge in terms of necessary interventions.

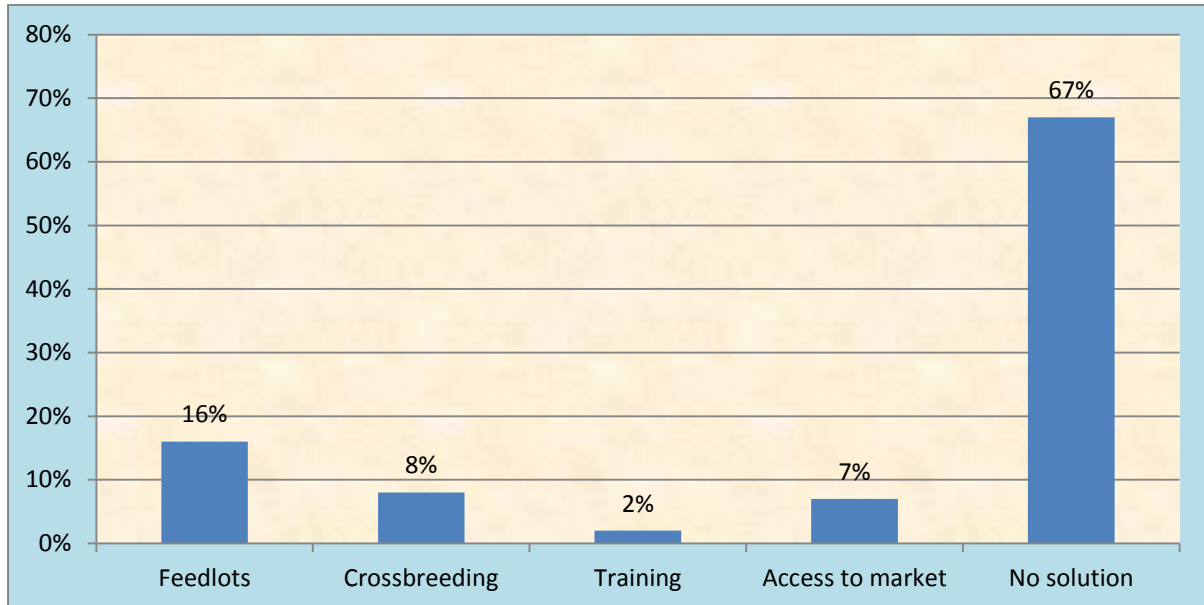


Figure 4.4: Solutions proposed by Nguni farmers for their problems (%) (n=61).

### 4.3 Results of the empirical model estimations

This section discusses the results of the three models, namely the logistic regression model for market participation, the multiple regression analysis for gross margin and the livelihoods model.

#### 4.3.1 The logistic regression model for market participation

Table 4.16 summarises the results of the logistic regression model for market participation. Five out of the ten variables were statistically significant, namely the education level, marital status, household income, price of an animal and loan repayment.

**TABLE 4.16 LOGISTIC REGRESSION RESULTS FOR THE DETERMINANTS OF MARKET PARTICIPATION (N=50)**

EXPLANATORY VARIABLES	COEFFICIENT	STANDARD ERROR	T RATIO
Education Level ( $X_1$ )	-0.549**	0.215	-2.55
Household Income ( $X_2$ )	0.000**	0.000	2.57
Marital Status ( $X_3$ )	3.029**	1.456	2.08
Farming Experience ( $X_4$ )	-0.076	0.061	-1.23
Price of Animal ( $X_5$ )	-0.002**	0.001	-2.54
Extension Services ( $X_6$ )	-0.703	1.439	-0.49
Distance ( $X_7$ )	-0.019	0.013	-1.44
Loan Repayment ( $X_8$ )	-2.472*	1.289	-1.92
Government Assistance ( $X_9$ )	2.049	1.256	1.63
Member Of Co-operative ( $X_{10}$ )	-3.613	3.042	-1.19
Constant	19.041**	7.757	2.45
Model Summary			
<b>Log likelihood = -15.940866</b>			
<b>LR <math>\chi^2(3) = 33.46</math></b>			
<b>Pseudo <math>R^2 = 0.5121</math></b>			

\*\*\*=significant at 1%, \*\*=significant at 5%, \*=significant at 10%

The LR chi squared value of 33.46 which is not a good statistic for model fit because it is greater than 30. However, the overall significance of the model shows that it is explaining the dependant variable compared to an empty model. The value of LR chi squared means that there is significant relationship between explanatory and dependent variables in the model. The high chi-square implies that there might be an inclusion of irrelevant variables or exclusion of relevant variables. We concluded that, in this case, the latter is more likely because if any of the insignificant variables were left out, it made some of the significant variables insignificant. Though the model does explain the dependent, given that the chi squared is greater than 30 the quality of fit can be improved. This model is a first approximation. There is a need to understand the production system further by both observation and in-depth discussion with farmers in order to identify the variables that may be missing in this

model and therefore resulting in the apparent omitted variable bias (OVB). The high chi squared value could also be a result of the small sample size. The value of log(likelihood) is -15.940866. This implies that 16% of variables are not predicted correctly. The value for log (likelihood) is accepted because it falls within the range of < 45.

The coefficient of marital status was significant at 10% and has a positive sign. This implies that the likelihood of the married farmers is high to participate in the markets than their counterparts who might be single, widowed or divorced. The results are consistent with those found by Hlongwane et al., (2014). It may be that being married influences the capacity of the farmer to allocate resources to their agribusiness.

The level of education of the farmers was significant with a negative co-efficient. This implies that education level of the farmers or respondents and market participation are negatively related. This means that a unit increase in the level of education of the farmer is likely to decrease the probability of market participation rate by 0.549. . This result is counter-intuitive. Educated farmers are likely to pay off their loans quickly and focus on herd management and building. Therefore, the level of farmer's education reduces market participation. The negative relationship was unexpected and is not supported by previous studies, for example, several studies have found a direct relationship between the level of education and successful performance in farming (Montshwe et al., 2005; Bizimana et al., 2004). As study by Lubungu et al., (2012) suggests the importance of education in increasing the ability of households to make use of market information and thus, exploiting market opportunities. There are several studies that found a direct relationship between the level of education and successful performance in farming (Montshwe et al., 2005). Human capital, represented by the farmer's formal education (at least secondary level) is known to increase a farmer's understanding of market dynamics and therefore improve decisions about the amount of output unit sold in the market (Makhura, 2001).

Moloi (2008) and Lubungu et al., (2012) found that having more than primary education is a key driver in reducing the probability of a household being poor. Therefore, the highest level of education of household heads influences smallholder

farmers' participation in commercialization positively thus increases the probability of the farmer to be food secure.

Education plays critical role in smallholder farmer participation in the niche/ formal markets (Lubungu et al., 2012). Education is an essential factor that a farmer can use to easily facilitate and understand basic farm and financial management, agricultural marketing principles, and the ability to create business networks. The education level of the farmer has the potential and capacity to improve the competitiveness of the farmer in order to generate farm income (Xaba et al., 2013). An advanced level of education is linked with more understanding and more access to information and hence it enables the farmer to participate in formal markets (Nkhorh, 2004).

Market participation can enable the farmers to improve their livelihood as well as the food security at the household level. Low levels of education get in the way of smallholder farmers to act in response to the latest business opportunities or better methods of doing farm business, production, and marketing and managing risk as a result; low levels of education negatively affect participation of smallholder farmers in the formal markets (Lubungu et al., 2012 and Ramoroka, 2012).

Given the preponderance of evidence showing that the sign of education should be positive, there is a need to explain the negative sign on education. This counter-intuitive result may be due to the fact that in the case of the Nguni project farmers, the educated farmers may pay off their loans quickly, focusing on herd building instead of market participation. It could also simply be a result of OVB as discussed earlier in the goodness of fit interpretation.

Price had a significant but negative coefficient in the analysis, which implies that the price of an animal has got a negative relationship to market participation. It also implies that unit increase in the price of an animal is likely to decrease the probability of market participation by rate of 0.002. Generally, as the price of an animal increases it is likely to induce smallholder farmers to participate in the markets (Montswe, 2006). Once again, this may appear counter-intuitive but it can be explained by the idea that when prices are high, farmers quickly satisfy their income

requirements thus reducing market participation and focus on loan repayment. The relationship of price and education on market participation needs to be explored after loan repayment.

The variable loan repayment was found negatively significant to market participation and the negative relationship was expected. This implies that the likelihood of the farmers who did not pay their soft loans to Nguni Project to participate in the market is high. This also mean that as farmers finish their loan repayment, they reduce market participation. This result is consistent with that of education and price because as farmers complete paying their loans they then focus on herd building and reduce market participation. This result suggests strongly that the apparent counter-intuitive signs of education and price may not be a result of OVB after all. It also suggests that loan repayment may force farmers to participate in the market before they are ready to. Farmers are therefore encouraged to pay their loans as quickly as possible so that the normal variable relationships can be restored to the advantage of the herd management.

The household income is positively and significantly associated with the market participation of farmers. This implies that a unit increase in the household income is likely to increase the probability of market participation rate. This variable requires further analysis to identify the sources of income for the farmers. Farmers have several sources of income because some of them have diversified. In this study there was no time for the necessary deep understanding in order to arrive at the impact of income on market participation. There is also possible relationship because sales increase income. However, excluding sales also results in fewer significant variables, poorer model fit and more inconsistent signs on other variables.

Market information was supposed to be included in the model, but it was not because there was no variation in market information. All the farmers reported that they were accessing market information from various sources. The study of Mapiye(2016) on the IDC Nguni smallholder Cattle Project farmers in the Limpopo Province concluded that farmers access information from government extension services, farm to farm meetings and other farmers. The other sources of information that were used were auctions, newspapers, TV, magazines and radio. According to a

study by Mapiye (2016), government extension officers disseminated information to 57% of the smallholder livestock farmers. The model can be improved if a threshold for market information access could be identified and used to design a dummy variable that can be used in the model.

#### 4.3.2 The multiple regression model for livestock profitability

Gross margin was used as a proxy for profitability. The average gross margins calculated and summarised for individual farmers and CPA's are indicated in table 4.17.

<b>TABLE 4.17 : GROSS MARGINS FOR NGUNI PROJECT FARMERS(N=58)</b>			
<b>COMMUNAL PROPERTY ASSOCIATIONS (CPA)</b>			
	<b>INCOME FROM CATTLE [R]</b>	<b>TOTAL VARIABLE COST [R]</b>	<b>GROSS MARGIN [R]</b>
Total GM for CPAs	1 047 002	980 661	66 341
Average for CPAs	95 182	89 151	6 031
<b>INDIVIDUAL FARMS (INCLUDE FAMILY TRUST FARMS)</b>			
	<b>INCOME FROM CATTLE [R]</b>	<b>TOTAL VARIABLE COST [R]</b>	<b>GROSS MARGIN [R]</b>
Total GM for individual farmers	5 460 601	4 704 747	755 854
Average for individual farmers	116 183	100 101	16 082
Sample average	113 841	99 562	14 279

The gross margins were calculated from 58 smallholder livestock farmers who provided required data. From the data in Table 4.17 one can calculate that 52% of the farmer's gross margin was from R2 000 to R481 200 during the 2015 marketing season. The average gross margin for CPAs was R6 031 while for individual farmers was R16 082. The decision making process, for example to sell livestock, may be complex in the CPA and hence there is a higher gross margin for individual farmers than for CPAs. Thirty-six percent of CPAs made loss while 49% of individual farmers also made loss during 2015.

Table 4.18 summarises the results of the multiple regression model for livestock profitability. The multiple regression model was used to estimate the factors that explain the profitability of the smallholder farmers. The adjusted  $R^2$  was 42%, the F-test was 4.22 and the overall model was significant in the explanation of the dependent variable at 1%. Forty-two percent of the variation in the model was explained by explanatory variables (Table 4.18).

<b>TABLE 4.18:GROSS MARGIN MULTIPLE REGRESSION RESULTS(N=50)</b>			
<b>EXPLANATORY VARIABLES</b>	<b>COEFFICIENTS</b>	<b>STANDARD ERROR</b>	<b>T RATIO</b>
Education level( $X_1$ )	-1380.965	3847.549	-0.36
Farm experience( $X_2$ )	-517.019	1684.995	-0.31
Extension services( $X_3$ )	11084.74	32170.1	0.34
Distance to market( $X_4$ )	747.600*	412.106	1.81
Herd size ( $X_5$ )	435.975***	133.572	3.26
Farm size ( $X_6$ )	42.791**	14.661	2.92
Marketing Agency ( $X_7$ )	-23735.27	40784.13	-0.58
Constant	-103822.9	114020.2	-0.91
Model Summary			
Adjusted $R^2$ =42			
F-test= 4.22			

\*\*\*=significant at 1%, \*\*=significant at 5%, \*=significant at 10%.

Three out of the seven hypothesized variables, namely herd size, distance travelled and farm size were significant.

The coefficient of herd size was significant at 1% with the expected positive sign. This implies that as the herd size increases the gross margins also increase. Fidzani (1993) argues that large herds generate a higher marketable surplus than small herds. It is therefore expected that the larger the herd the higher will be the participation of smallholder cattle farmers in the markets, which leads to improved profitability. This result may also support the negative signs on education and price



assuming that farmers are aware of this relationship, then after repaying the loan it makes sense that they focus on herd building and thus reduce market participation.

The coefficient of farm size of was also significant with the expected positive sign. This implies that an increase in the size of the farm leads to an increases in the gross margin. This finding is consistent with the results of Xaba et al., (2013).

The coefficient of the distance travelled by the farmer to the market was significant with unexpected positive sign. This implies as the distance travelled to the markets increases, the gross margin increase. It was expected that distance travelled reduces the gross margins of the farmer by increasing the transaction cost. Although this may appear counter-intuitive, it is possible that the more distant markets are the ones from which the farmers received higher prices. Of course the increase in the gross margin would be a function of the balance between the increase in transport costs and the increase in price. This relationship certainly warrants further investigation as it is inconsistent with the finding of Xaba et al., (2013) and Ramoroka (2012), who found the opposite relationship.

#### **4.3.3 The livelihoods model**

In chapter 3, livelihood improvement was assessed based on a livelihoods outcome scoring scheme which includes: tangible and intangible asset ownership, access to food, education and health services, gaining new skills, engaging in agriculture but non-livestock based economic activity and non-agriculture economic activity. Some socio-economic variables such as age and gender were included in the livelihood model supported by literature.

Table 4.19 summaries the results of the livelihoods model.

<b>TABLE 4.19. RESULTS OF THE LIVELIHOOD MODEL(N=50)</b>			
<b>EXPLANATORY VARIABLES</b>	<b>COEFFICIENT</b>	<b>STANDARD ERROR</b>	<b>T RATIO</b>
Age (X <sub>1</sub> )	-0.048	0.052	-0.91
Gender (X <sub>2</sub> )	-0.090	1.312	-0.07
Household size (X <sub>3</sub> )	-0.486	0.299	-1.63
Recent increase in farm income (X <sub>4</sub> )	5.728***	2.476	2.57
Farm size(X <sub>5</sub> )	-0.00008	0.0003	-0.30
Land ownership(X <sub>6</sub> )	-2.916**	1.401	-2.08
Household expenditure (X <sub>7</sub> )	-0.00025	0.00024	-1.01
Constant	7.935**	3.890	2.04
Model Summary			
<b>Log likelihood = -13.303808</b>			
<b>LR chi<sup>2</sup>(7) =24.43</b>			
<b>Pseudo R<sup>2</sup> = 0.4683</b>			

\*\*\*=significant at 1%, \*\*=significant at 5%, \*=significant at 10%.

The LR chi squared is 24.43 which means that the model is of good fit since the rule of the thumb is that the LR chi squared should be less than 30. In terms of goodness of fit, the log(likelihood) is -13.303808; from that one may conclude that 13% of the variables were not predicted correctly (Table 4.19). Two out of seven hypothesized variables, namely recent increase in farm income and land ownership were significant.

Recent increase in farm income had the expected positive coefficient. This implies that there is a positive relationship between recent increase in farm income and the farmer's livelihood improvement. A unit increase in the recent increase in farm income is likely to increase the probability of livelihood improvement by 5.728. These findings indicate that there are definite benefits for Nguni Project farmers from participation in the projects. The results are supported by Nziane (2009); Kirimi et al., (2013) and Vink and van der Heijden (2013).

The land ownership variable is significant but has an unexpected negative sign. The land ownership has got negative regression coefficient and is significant at 10%. This implies that the livelihood improvement and land ownership have a negative relationship. The land ownership does not increase the likelihood of farmers' livelihood being improved and thus is decreasing the probability of the farmer' livelihood improvement. As land size increases livelihoods decrease. This may be a sign of the fact that farmers do not have access to resources to farm large tracts of land. They may need both government assistance (as shown in the market access model) and extension support. The results are in line with Hall (2007).

The variables such as age, gender, size of the household, farm size and household expenditure did not have a significant relationship with the likelihood of the farmers having improved livelihood and being food secure.

#### **4.4 Chapter summary**

In this chapter, the probability of Nguni Project Cattle farmers participating in the cattle markets were analysed. The variables that are significant in impacting market participation are education level, marital status, household income, price and loan repayment. Auctions play a vital important role as the most used and preferred marketing channel. Although markets are reported to be accessible, distance to market is long. Farmers across the province transport live animal to auctions held in Polokwane. Information pertaining to dates of auctions or prices of animals is important. Therefore, strengthened collaboration and interactions between farmers and extension services could assist to increase participation of the farmers in the markets. Feedlots can also alleviate the market distance problem.

The determinants of profitability of the Nguni Project cattle farmers are farm size, herd size and distance to the market. Distance has shown positive impact in increasing the profitability and hence market participation. The majority of the farmers provided transport to the market. This could decrease the gross margins of the farmer, especially if markets are far from the farms. Establishment of central selling points at local municipality or ward level could decrease the cost of selling at distant markets and further increase farmers' gross margins, if similar prices are realised.

The probability of Nguni Cattle Project farmers' likelihood in improving livelihoods were analysed. The variables that are significantly related to likelihood of improving livelihoods are recent increase in farm income and land ownership. Land ownership decreases as the farmer's livelihood. The majority of Nguni farmers were beneficiaries of LRAD and used leased land under LRAD programmes. Farmers do not have access to resources to farm large tracts of land. They may need both government assistance, access to credit and extension support to alleviate the problem.

## CHAPTER FIVE

### SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

Chapter 5 presents a summary of the study results, conclusions and recommendations, together with areas for further study.

#### **5.1 Summary**

The aim of the study was to analyse the determinants of market participation and profitability of smallholder Nguni Cattle Project farmers in the Limpopo Province. The first objective was to analyse the determinants of market participation for smallholder Nguni Cattle Project farmers in Limpopo Province and the hypothesis stated that there are no determinants of market participation for smallholder farmers in Limpopo Province. The second objective was to analyse the determinants of profitability for smallholder Nguni Cattle Project farmers in Limpopo Province and hypothesis stated that there are no determinants of profitability for smallholder Nguni Cattle Project farmers. The third objective was to assess the contribution of smallholder Nguni Cattle Project production to livelihoods and food security and hypothesis stated that there is no significant contribution by smallholder Nguni Cattle Project farmers to livelihoods and food security.

A logistic regression model was used to analyse the determinants of market participation of the smallholder farmers; in this analysis five out of the ten hypothesized variables were found statistically significant, namely education level of the farmer, marital status, household income, price of an animal and loan repayment, which all had effect on the market participation of smallholder farmers that was found to be statistically significant. This implies that these variables that are significantly related to likelihood of market participation.

The majority (59%) of the farmers reported that they have participated in the markets. Some farmers did not participate in the markets. One of the major reasons for not participating was related to conditions under contract of IDC and farmer's loan payment arrangements. The majority (66%) of the farmers in the project reported that they have not paid the soft loan back. As a result, this affects their decision to

sell in the market. Farmers are therefore encouraged to pay their loans as quickly as possible so that the normal variable relationships can be restored to the advantage of the herd management.

Household income was positively and significantly related to market participation. The higher the household income the higher market participation. However, household income for the current study focused on the income from livestock sales (cattle) only. The variable requires further analysis to identify other sources of income for the farmers. Farmers have several sources of income because some of the farmers are diversified. Some of the farmers within the Nguni Cattle Project diversify Nguni cattle farming with other livestock such as poultry, sheep, goat, donkeys, pigs and geese. Cropping is also a possible source of farm income as well as non-agricultural income sources. Income from these possible sources was not estimated in this study.

Some of the marketing channels that were used by Nguni farmers paid low prices. These affect the farmers' market participation and hence their profitability. Some of the Nguni farmers sold their animals to buyers who bought at low prices and then sold the animals later (in a short space of time) as pure breeds at a higher price. Therefore, farmers were faced with market quandary. The government and the IDC should intervene in order for the farmers to benefit from the potentially high prices of pure breeds.

Price was found to be one of the determinants of market participation, however with unexpected relationship. The higher the price the lower the market participation. This means that if the price is high, the farmers satisfy their income needs by selling less animals (participating less in the market) and focussing on loan repayment.

The education level of the farmer was one of the determinants of market participation. Education plays a critical role in farmers' decision making as it makes it easy to understand basic principles of farming. The study has revealed that educated farmers are likely to pay off their loans and focus on herd building, thus reducing their market participation. Therefore, less educated farmers should be trained to gain relevant skills that may influence and increase their productivity in

cattle farming. The majority of the farmers within the project reported that they have not received any formal training. Provision of formal training to less educated farmers perhaps could bridge the gap. Therefore, the more productive the less educated farmers are, the quicker they could be able to pay off their loans and focus on herd building. Good herd management in future could increase market participation and increase their profitability.

The multiple regression model was used to analyse the determinants of profitability of the smallholder farmers. Three out of the seven hypothesized variables were found significant, namely farm size, herd size and distance travelled to the market. This implies that an increase in herd size and farm size increases the gross margins, thus the profitability of the smallholder farmers. The positive relationship between distance to market and profitability is surprising, but farmers may be realizing higher prices at distant markets. This relationship warrants further investigation.

Most smallholder livestock farmers were profitable under livestock farming enterprise. However, there were farmers who made significant loss under the enterprise. The level of variation in gross margins shows that some of the farmers may need interventions such as collective selling, assistance with production resources such as subsidy of feed supplements and vaccines to improve profitability of the livestock enterprise.

Herd size was one of the determinants of profitability of Nguni farmers. The increase in herd size positively increases the profitability of the farmers. However, loan repayments reduce the herd size and consequently the gross margins. Therefore, the Nguni farmers should quickly pay off their loans and focus on herd management. It can be concluded that farmers, who have paid up their loans in full have better chance of improving the gross margins, thus profitability.

The livelihood model was used to analyze the contribution of IDC Nguni Cattle Project to improvement in the livelihood of smallholder farmers. Two out of seven hypothesized variables were found to be statistically significant. These variables were recent increase in farm increase and land ownership.

Most of the farmers reported that their livelihoods have improved after joining the Nguni Project. Some of the improvements in the livelihoods were brought by cattle sales. Hence some improvements in the livelihood were brought by recent increase in income through market participation. The majority of the farmers reported that they diversify livestock farming with other livestock (such as sheep, poultry, pigs and goats), crops and non-agricultural business.

The majority of the Nguni cattle farmers were beneficiaries of the LRAD programmes. Some of the farmers owned their farms (have title deeds) but other farmers leased land under the LRAD programme. However negative relationship between land ownership and livelihood shows that those who lease are disadvantaged in terms of livelihoods.

## **5.2 Conclusion**

Hypotheses were formulated and tested in the study. The first hypothesis stated that there are no determinants of market participation for smallholder Nguni Cattle Project farmers in Limpopo Province. The hypothesis was rejected because the results revealed that there are determinants of market participation for smallholder farmers in Limpopo Province. The determinants of market participation that were significant are education level of the farmer, marital status, household income, price of an animal and loan repayment.

The second hypothesis stated that there are no determinants of profitability for smallholder Nguni Cattle Project farmers in Limpopo Province. The study rejected this hypothesis because the results show that there are determinants of profitability for smallholder Nguni Cattle Project farmers in Limpopo Province. The determinants of profitability were herd size, farm size and distance travelled to the market.

The third hypothesis stated that there is no significant contribution by smallholder Nguni Project farmers to livelihoods and food security. The study fails to accept hypothesis because there is significant contribution of smallholder Nguni cattle project farmers to livelihoods and national food security. The smallholder Nguni cattle farmers contributed to food security and livelihoods because there was



increased income from previous year as a result of the significant production and market participation.

The study identified challenges that were faced by smallholder Nguni Cattle Project farmers. The challenges faced by the farmers were categorised into marketing challenges and cattle physical challenges. Marketing challenges faced were low prices for animals (18%), lack of market access (13%) and high transportation costs to the market (10%). Cattle physical challenges faced were low body weight (21%) and poor conditions of an animal (8%). Therefore, it is necessary to find ways to assist farmers to overcome these challenges.

### **5.3 Policy recommendations**

Based on the overall conclusions drawn from the study findings, the following recommendations were made.

#### **a. Formation of farmer's organisations/ commodity groups**

It is important to encourage farmers to form farmers' organisations or commodity groups, as they have an important role to play in mobilizing the farmers towards collective selling. Collective selling could enable the farmers to gain some control over the market and hence could reduce the cost of selling in the market for individual farmers. The findings show that the majority of farmers provide their own transport to the distant markets. The commodity groups have the potential to link farmers by sharing information to explore the markets opportunities. Commodity groups could perhaps assist in addressing some of the challenges and constraints such as marketing information and strengthened negotiation capacity of the farmers to bargain for better prices. The majority of the smallholder farmers mainly depend on government extension as the source of market information. Farmers can share information among themselves through farmers' organisation and commodity groups. Collective marketing also enables them to enjoy economies of scale and may reduce the high variability in profitability.

### **b. Public private partnership to establish central selling point**

Collaboration between the government and the private sector to establish central selling points of cattle can reduce high transport costs incurred by smallholder farmers. The majority of smallholder farmers from various districts sell their cattle in auctions at Polokwane as a central point. The distance to the desired output markets from smallholder farmers are showing a negative impact on gross margins of the smallholder cattle farmers. The majority of smallholder farmers travel long distances to reach markets. The maximum distance that was travelled by the farmers was 150 kilometres. It is recommended that a central selling point from which the cattle farmers could sell their cattle should be established at local municipality or ward level to encourage participation and profitability of the farmers. Market information dissemination and auctions (date and place of auctions) could be linked to the municipality or the ward. Therefore, the government can increase market participation by investing in upgrading the roads and the market infrastructure to enable smooth accessibility to markets. This might normalise the relationship between profitability and distance which was found to be positive in this study.

### **c. Loan Repayment**

Some of the farmers still owe their loans to the Nguni IDC Project. It negatively affects their herd size and hence their decision to sell and their profitability. Farmers are therefore encouraged to pay off their loans as quickly as possible so that the normal variable relationships can be restored to the advantage of the herd management.

### **d. Formal training**

It is evident that the majority of the Nguni farmers in the current study did not receive any formal training in livestock production. Formal training may bridge gap between educated and less educated farmers in terms of knowledge of basic farm business management. Formal training could be in the form of workshops and seminars on animal production, livestock management, marketing and agribusiness management which are very critical for the success of the livestock farmers. Some of the challenges and constraints such as poor conditions of the animal and market requirements could be addressed by equipping farmers with knowledge regarding

animal production, marketing and livestock management. This could assist both educated and less educated farmers to quickly pay off their loans and focus on herd management. This may also improve cattle productivity and thus enable farmers to realise better prices. The increased profitability may have positive effects on farmers' livelihoods and food security. Therefore, the Department of Agriculture, Forestry and Fisheries (DAFF), the Limpopo Provincial Department of Agriculture, the Agricultural Research Council (ARC) and other stakeholders in the red meat market such as the National Emergent Red Meat Producer Organisation (NERPO) and the National Agricultural Marketing Council (NAMC) could perhaps intervene to assist the coordination of such trainings.

#### **e. External interventions by the government**

The issue of low prices for Nguni cattle is a challenge. Perhaps the government could intervene by creating a platform (like management database) to disseminate information on prices and available markets for livestock farmers. This could ease market selection and access for some of the farmers and encourage informed decision on the type of marketing channel to use. Some of the farmers are not well informed about pricing their cattle.

Farmers do not have access to resources to farm the large tracts of land which they were given by the government. They may need both government assistance, access to credit and extension support to alleviate the problem.

The study has revealed concerns regarding the level and variation in the frequency of visits by government extension officers to the Nguni farmers. Therefore, strengthened collaboration and interactions between farmers and extension services could assist to increase participation of the farmers in the markets.

#### **5.4 Areas for further research**

There are other relevant issues that are not addressed in this study. Hence the following areas for further research are recommended.

- The focus of the study was on Nguni cattle project farmers. There is a need for research to investigate the market participation, profitability and livelihood

of other Nguni farmers (non-project farmers) in the Limpopo Province that are not part of the IDC Nguni Cattle Project to compare the benefits.

- A similar study should be conducted including other provinces of South Africa and in South Africa as a whole, where similar projects exist, so as to use a larger sample size.
- The other on-farm and off-farm income generating activities need to be investigated so as to properly establish the relationship between income and market participation.
- The potential for national food security contribution of the Nguni Project farmers requires further assessment.

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## Appendix

### Annexure A: Questionnaire

#### **A survey on determinants of market participation and profitability for smallholder Nguni Cattle Project farmers: Implications for food security and livelihoods in Limpopo Province**

Please read the following statement carefully before completing the questionnaire. This questionnaire is meant to address the preceding project. It is to be completed by farmer with the help of the enumerator. It is meant to generate information on socio-economic characteristics, household demographics, cattle feeding and health management, markets, assessment on food security and livelihoods and Access to credit. The information provided will be used only for the purposes of this research and will be treated strictly confidentially, with no mention of names in the analysis. Please tick the appropriate boxes when necessary or fill the blank spaces provided.

I agree to complete the questionnaire and do so in a completely voluntary manner. I understand that my responses will be kept confidential.

Signature \_\_\_\_\_ Date \_\_\_\_\_

Enumerator:..... Municipality name:.....

Community name:..... Name of respondent:.....

#### **A. HOUSEHOLD DEMOGRAPHICS**

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<b>1.</b>	<b>What is the size of your household?</b>	Total	Adults. M	F	Children. M	F

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2.	<b>Marital status</b>	1= <i>Single</i>	2= <i>Married</i>	3= <i>Widowed</i>	4= <i>Divorced</i>
3.	<b>What is your household profile?</b>				
	Name	Gender	Designation	Age	Main Occupation

4.	<b>What is your highest level of education?</b>	.....
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5.	<b>Religion</b>	1= <i>Christianity</i>	2= <i>Traditional</i>	3= <i>Moslem</i>	4= <i>Other (specify)....</i>
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**B. SOCIO-ECONOMIC SITUATION OF FARMERS**

6.	<b>How long have you been farming?</b>	1= <i>In general.....</i>	2= <i>On the livestock.....</i>
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7.	<b>What is your farm size in ha?</b>	.....
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8.	<b>Land ownership</b>	1= <i>Private</i>	2= <i>Leased</i>	3= <i>Communal</i>
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9.	How did you acquire the land?	.....
10.	Do you have title deeds	1= Yes <input type="checkbox"/> 2 No <input type="checkbox"/>

11.	What crops did you grow this season?			
Crop	Area (ha)	Total Output	Amount	
			Human consumption	Livestock consumption

12.	What type of livestock do you currently have? (Rank 1 as the most important specie)						
Livestock species	Cattle	Goats	Sheep	Pigs	Poultry	Donkeys	Others (specify)
Number							
Rank							

13.	Where did you get capital to invest in cattle farming?	1= Borrowed from bank
	2= Borrowed from family	3= Borrowed from friends
	4= Own savings	
	5= State aid	6= Others (specify).....



14.	<b>Do you have any formal training in livestock farming?</b>	1= Yes	2= No
15.	If yes, please specify .....		

**B. CATTLE HERD STRUCTURE AND MANAGEMENT**

16.	<b>What is the composition of your herd?</b>		
	1. Calves (<1 year)	2. Steers (>1 year)	3. Breeding females (>1 year)
Number			

17.	<b>How many cattle of each breed do you have?</b>	1= <i>Nguni</i>	2= <i>Bonsmara</i>	3= <i>Hereford</i>
4= <i>Brahman</i>	5= <i>Africaner</i>	6= <i>Mixed breeds</i>	7= <i>Others</i> (specify).....	

18.	<b>If you have lactating cows, how many are they?.....</b>
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19.	<b>How did you acquire your cattle?</b> .....
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<b>20.</b>	<b>Who is the owner of the cattle?</b>			
	2= <i>Father</i>	3= <i>Mother</i>	4= <i>Children</i>	5= <i>Other</i> (specify).....

<b>21.</b>	<b>What are your reasons for using the breed you named in 20? (Tick one or more) (Rank according to importance for Nguni and non-Nguni breeds)</b>				
	Nguni	Bonsmara	Hereford	Brahman	Afrikaner
Reasons	Rank	Rank	Rank	Rank	Rank
High growth rate					
High milk yield					
Low feed requirements					
Resistant to diseases					
Resistant to parasites (internal and external)					
High fertility (reproductive rates)					
Good meat quality					
Good temperament					
Horns					
Attractive skin colour					
Marketability					
Affordability					
Availability					

Other (specify)					
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<b>22.</b>	<b>What are the problems associated with Nguni breed?</b> ..... .....
<b>23.</b>	<b>What do you think can be done to resolve these problems for Nguni breed?</b> ..... .....
<b>24.</b>	<b>What are the problems associated with non-Nguni breed?.....</b> .....
<b>25.</b>	<b>What do you think can be done to resolve the problems for non-Nguni breed?</b> .....

<b>26.</b>	<b>How many calves did you get from your herd in 2015?.....</b>
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<b>27.</b>	<b>What are your sources of labour for cattle production?</b>		
Type of employee	<i>1= Full-Time (F-T) hired labour/workers</i>	<i>2= Part-Time (P-T) hired labour/workers</i>	<i>3= Family members</i>
Number			

<b>28.</b>	If you use hired labour/workers, how much do you pay your hired labour/workers?	1= <i>Part-time</i>	2= <i>Temporary</i>	3= <i>Full-time</i>	4= <i>Contract</i>
Cash (R/month)					
Other (specify)					

<b>29. How often do you see a government and veterinary services agents?</b>		
	<b>Extension agent</b>	<b>Veterinary agent</b>
1=Once per month		
2=Once every 3 months		
3=Once every 4 months		
4=Twice a year		
5=Once per year		
6=Do not see him/her		

<b>30.</b>	<b>Where do you get most cattle management advice?</b>	1= <i>Extension officers</i>			
		2= <i>Neighbours</i>	3= <i>Radio/TV</i>	4= <i>Corporate manager</i>	5= <i>Own records</i>
	6= <i>Publications (newsletters, periodicals)</i>	7= <i>Other (specify).....</i>			
<b>31.</b>	<b>Do you get assistance from the government?</b>	1= <i>Yes</i> 2= <i>No</i>			

<b>32.</b>	<b>If yes, specify?</b> .....
<b>33.</b>	<b>How can you best describe growth of cattle production at your farm in the past five years?</b>
1= <i>Improved</i> . If yes, how? .....	
2= <i>Remained the same</i> . If yes, why? .....	
3= <i>Deteriorated</i> . If yes, what is the cause? .....	

### C. CATTLE FEEDING MANAGEMENT

<b>34.</b>	<b>What kind of method do you use to feed your cattle?</b>	1= <i>Herding</i>	2= <i>Paddock</i>
	3= <i>Stalling</i>	4= <i>Yard</i>	5= <i>Free grazing</i>
	6. Other (specify).....		

<b>35.</b>	<b>What are the sources of feed for your cattle?</b>	1= <i>Veld</i>	2= <i>Natural Pasture</i>
	3= <i>Conserved feed</i>	4= <i>Crop residues</i>	5= <i>Bought-in feed</i>
	6 =Planted pasture		
	7=Other (specify).....		

<b>36.</b>	<b>Which grazing method do you use?</b>	1= <i>Continuous grazing</i>
	2= <i>Rotational grazing</i>	3= <i>Rotational resting</i>
	4= <i>Other</i> (specify).....	

<b>37.</b>	<b>Comment on the availability of grazing in the different seasons of a year:</b>				
<i>Rainy season:</i>	<i>1= Very good</i>	<i>2= Good</i>	<i>3= Moderate</i>	<i>4= Poor</i>	<i>5= Very poor</i>
<i>Winter:</i>	<i>1= Too much</i>	<i>2= Good</i>	<i>3= Moderate</i>	<i>4= Poor</i>	<i>5= Very poor</i>
<b>38.</b>	<b>Comment on the quality of feeds in the different seasons of a year:</b>				
<i>Rainy season:</i>	<i>1= Very good</i>	<i>2= Good</i>	<i>3= Moderate</i>	<i>4= Poor</i>	<i>5= Very poor</i>
<i>Winter:</i>	<i>1= Too much</i>	<i>2= Good</i>	<i>3= Moderate</i>	<i>4= Poor</i>	<i>5= Very poor</i>

<b>39.</b>	<b>What are the sources of water for your cattle in 2015?</b>		<i>1= River</i>	<i>2= Dams</i>
	<i>4= Boreholes</i>	<i>5= Wells</i>	<i>6= Municipality</i>	<i>7= Others (specify)</i> .....

<b>40.</b>	<b>What is the general body condition of your cattle in the different seasons of the year?</b>				
<i>Rainy season</i>	<i>1= Very good</i>	<i>2= Good</i>	<i>3= Moderate</i>	<i>4= Poor</i>	<i>4 = Very</i>
<i>Winter</i>	<i>1= Too much</i>	<i>2= Good</i>	<i>3= Moderate</i>	<i>4= Poor</i>	<i>4= Very poor</i>

41.	<b>Do you provide supplementary feeding to your cattle?</b>	1= Yes	2= No
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42.	<b>If yes, when do you provide the supplements?</b>	1= <i>Rainy season</i>	2= <i>Winter</i>
	3= <i>Dry season</i>	4= <i>All year round</i>	5= <i>In times of emergence</i>
			6= <i>Other.....</i>

43.	<b>How often do you provide supplementary feeding?</b>	1= <i>Once/day</i>	2= <i>More than twice/day</i>
	3= <i>Every 2-4 days</i>	4= <i>Weekly</i>	5= <i>Forty -nightly</i>
			6= <i>Other (specify).....</i>

44.	<b>What type of supplements do you provide to your cattle?</b>	1= <i>Bought in commercial feed</i>
	2= <i>Cereal grains</i>	3= <i>Crop residues</i>
		4= <i>Browse legumes</i>
		5= <i>Herbaceous legumes</i>
	6= <i>High nutrient grasses</i>	7= <i>Vitamin/mineral leaks</i>
		8= <i>Other (specify).....</i>

#### D. CATTLE HEALTH MANAGEMENT

44.	<b>How many cattle died in 2015?</b>
	<i>Nguni breed.....</i>
	<i>Non-Nguni breeds.....</i>

<b>45.</b>	<b>If your animals get sick, what do you do?</b>		
1= <i>Nothing</i>	2= <i>Treat</i>	3= <i>Other (specify).....</i>	

<b>46.</b>	<b>If you treat your animals, what type of medicine do you use?</b>		
1= <i>Conventional</i>	2= <i>Traditional</i>	3= <i>Other (specify).....</i>	

<b>47.</b>	<b>What are the major causes of mortality of your cattle? (Tick one or more)</b>		
1= <i>Old age</i>	2= <i>Extreme climate</i>	3= <i>Predators</i>	
4= <i>Diseases</i>	5= <i>Poor diet</i>	6= <i>Others (specify).....</i>	

### E. MARKETS

<b>48.</b>	<b>What is your major source of income?</b>	1= <i>Salary</i>	2= <i>Crops</i>
		3= <i>Livestock</i>	5= <i>Pensions</i>
		4= <i>Social grants</i>	

<b>49.</b>	<b>How many cattle did you sell in 2015/6?</b>	.....
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<b>51.</b>	<b>Which season do you prefer to sell your animals and why?</b>
	1= <i>Rain season, Why.....</i>
	2= <i>Winter season, Why.....</i>
	3= <i>Dry season, Why.....</i>



<b>52.</b>	<b>Are you a member of any marketing organization?</b>
1= Yes	How does the organization help you market your cattle? .....
2= No	What is your reason for not joining? .....

<b>53.</b>	<b>Where do you obtain cattle marketing information?</b>	1= <i>Retailers</i>	2= <i>Newspapers</i>
3= <i>Radio</i>	4= <i>TV</i>	5= <i>Extension officers</i>	6= <i>Other farmers</i>
		7= <i>Buyers</i>	8= <i>Other.....</i>

<b>54.</b>	<b>How do you rate your knowledge in terms of the following?(Please tick one for each)</b>			
	1= <i>Very Poor</i>	2. <i>Poor</i>	3= <i>Fair</i>	4. <i>Good</i>
Cattle feeding				
Cattle breeding				
Marketing of cattle				
Farm business management				
Risk management				
Record keeping				
Cattle welfare management				
Cattle health management				

<b>55.</b>	<b>If transport is required to get to the market who provides it?</b>	<i>1= Farmer</i>	<i>2= Buyer</i>
	<i>3= Marketing organisation</i>	<i>4= Middlemen</i>	<i>5=Other farmers</i> <i>6=Other.....</i>

<b>56.</b>	<b>Do you face challenges meeting the carcass classification (grades required) by formal markets?</b>	<i>1= Yes</i>	<i>2=N o</i>
<b>57.</b>	<b>If yes, what are the challenges?</b> a)..... b).....		
<b>58.</b>	<b>What do you think can be done to meet the grades required formal markets?</b> a)..... b)..... c).....		

<b>59.</b>	<b>What other marketing constraints do you experience beside the one mentioned for Nguni and non-Nguni breeds?</b> a)..... b)..... c).....
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## F. CONTRIBUTION OF CATTLE TO FOOD SECURITY

### HOUSEHOLD FOOD SECURITY

60.	What are your reasons for keeping cattle and how do you rate the contribution towards the reason? <i>(Tick where appropriate)</i>				
	Very high contribution	high contribution	Small contribution	Neutral	No contribution
Milk for own consumption					
Draught power					
Manure					
Income from cattle sales					
Skins/Hides					
Payment of Lobola					
Savings (bank on hoofs)					
Ceremonies					
Status					
Bones					
Other (specify)					

62.	How many cattle did you slaughter for home consumption in 2015/16?.....
-----	-------------------------------------------------------------------------

<b>63.</b>	<b>If you slaughter cattle for home consumption what do you do with the following by-products?</b>	
<b>Buy-product</b>	<b>Use</b>	
1. Offals		
2. Skins/Hides		
3. Horns		
4. Bones		
5. Blood		
6. Manure		
7. Others (specify).....		

<b>64.</b>	<b>Are you happy with your progress in cattle farming business for the past 5 years?</b>	<b>1=Yes</b>	<b>2=No</b>
		<i>s</i>	<i>No</i>
1= Yes    give main reason.....			
2= No    give main reasons .....			

<b>65.</b>	<b>What is the average amount of money that you spent on food items per month? R.....</b>
<b>66.</b>	<b>Alternative sources of income total income for 2015</b>
<b>Crops</b>	

<b>Salary</b>	
<b>Milk</b>	
<b>Hides</b>	
<b>Horns</b>	
<b>Non-farm activities</b>	

**NATIONAL FOOD SECURITY**

<b>67.</b>	<p><b>Given your experience in cattle farming with Nguni cattle, comment on the contribution to the availability of food on the markets that is coming from the project?</b></p> <p><input type="checkbox"/> <i>Very high contribution</i>   <input type="checkbox"/> <i>High contribution</i>   <input type="checkbox"/> <i>No change</i>   <input type="checkbox"/> <i>Low contribution</i>   <input type="checkbox"/> <i>Very Low contribution</i></p>
<p><i>Give reason for your thought?.....</i></p>	

<b>68.</b>	<p><b>Do you think prices rise or fall when selling cattle in the market?</b>  Yes <input type="checkbox"/> No <input type="checkbox"/></p>
<p><i>Why?.....</i></p>	
<p><b>What was the average price a year ago?</b>  R.....</p>	

<b>69.</b>	<p><b>How are the markets accessible?.....</b></p>
<p><i>Why?.....</i></p>	

<b>70.</b>	<b>Have there been any changes in people selling cattle in the markets?</b>
<i>Why?</i> .....	
.....	

<b>71.</b>	<b>What is the contribution of Nguni Project to national food security?</b>
.....	
.....	
.....	
.....	

**G. LIVELIHOOD ASSESSMENT**

<b>72.</b>	<b>Did you gain cattle production skills the last 5 years?</b>
Yes <input type="checkbox"/> No <input type="checkbox"/>	
<i>If yes give details</i> .....	

<b>73.</b>	<b>What is the distance to access to health services?</b>
.....	

<b>74.</b>	<b>Have there been any changes recently in the quality of road, housing, school or transport(Buses, trucks)?.....</b>
<i>What were these changes?</i>	
.....	

<b>75.</b>	<b>Did your overall farm income increase in the 2015/16 season from before?</b>
<i>Increased</i> <input type="checkbox"/> <i>Decreased</i> <input type="checkbox"/>	

<b>76.</b>	<b>What is the name of the nearest large market for traders to buy your supplies?</b>
.....	

<b>77.</b>	<b>What resources did and do you have?</b>	
	<b>Before Joining Project</b>	<b>After Joining Project</b>
	1.	
	2.	
	3.	

<b>78.</b>	<b>Do you think your livelihood has improved after joining the project? <i>Improved</i></b> <input type="checkbox"/> <b><i>Not improved</i></b> <input type="checkbox"/>
	<i>If yes(improved), how?.....</i>

<b>79.</b>	<b>Have there been changes in the cattle herd sizes at your farm?</b> Yes <input type="checkbox"/> No <input type="checkbox"/>
	<i>If yes, how?.....</i>

<b>80.</b>	<b>Are there changes in the food security status of the household?</b> Yes <input type="checkbox"/> No <input type="checkbox"/>
	<i>If yes, what is the change?.....</i>

<b>81.</b>	<b>Are you satisfied with prices you receive in the markets?.....</b>
	<i>How?.....</i> .....

<b>82.</b>	<b>Are you satisfied with number of animals you sold in 2015?.....</b>
	<i>How?.....</i>

<b>83.</b>	<b>Who is responsible for meeting the household needs?</b>
	.....

<b>84.</b>	<b>How do you often ask when you need help?.....</b>
	.....



85.	How does the household meet their food needs?.....
-----	----------------------------------------------------

**H. ACCESS TO CREDIT**

86.	Do you have access to credit?
Yes <input type="checkbox"/> No <input type="checkbox"/>	
<i>If yes, whom did you get the money.....</i>	

87.	Who provide the credit?.....
<i>How much?.....</i>	

**J. LOAN REPAYMENT**

88.	Have you managed to repay the loan from Nguni Project?
Yes <input type="checkbox"/> No <input type="checkbox"/>	
<i>If no, why.....</i>	

Determinants of market participation and profitability for smallholder Nguni livestock farmers in Limpopo province: Implications for food security and Livelihoods

Table 1: The value of variable costs for a period of one year (2015)

<b>Income</b>	<b>Price</b>	<b>Quantity</b>	<b>Total Amount</b>
Number of animals sold in 2015			
<b>Other Income</b>			
Offals			
Horns			
Hides			
<b>Variable costs</b>			
Vaccinations (per cattle)			
<b>Feeds</b>			
i. Commercial feeds			
ii. Crop residue			
iii. Bought in feeds			
iv. Concentrates			
v. Planted feeds(ha)			
Fattening costs (per animal)			
Slaughter house costs (per animal)			
Labour costs			
<b>Gross Margin- Variable costs)</b>			

Table 2: Replacement value of fixed cost for a period of one year (2015)

<b>Fixed cost</b>	<b>Number</b>	<b>Establishment Value</b>	<b>Life Span</b>	<b>Annual replacement</b>
Kraal(m)				
Fencing(m)				
Buildings				
Land leasing(ha)				
Water				
Electricity				
Veterinary Services				
Livestock insurance				
Ear tagging				
Branding				
Breeding cost				
Artificial Insemination				
Transport cost to the market sold				
Marketing costs				
<b>Total Fixed Costs</b>				

## Annexure B: Livelihood Assessment Score

Questionnaire Id	TA	IA	AF	AE	AHS	GNS	EA	ENA	Total
1	√	X	√	√	√	X	√	√	6/8
2	√	√	√	√	MI	X	X	X	4/8
3	√	X	√	√	√	X	X	√	5/8
4	√	X	√	√	√	√	√	X	6/8
5	√	X	√	X	√	√	√	√	6/8
6	√	X	√	√	√	X	√	X	5/8
7	√	√	√	√	MI	√	√	X	6/8
8	√	X	√	√	MI	X	√	√	5/8
9	√	√	√	√	√	√	X	√	7/8
10	√	√	√	√	√	√	X	√	7/8
11	√	√	√	√	√	√	X	X	6/8
12	√	√	MI	MI	√	√	√	X	5/8
13	√	X	√	√	MI	X	√	X	4/8
14	√	X	√	MI	MI	X	X	X	2/8
15	X	√	√	X	√	√	X	X	4/8
16	√	X	√	X	X	√	X	X	3/8
17	√	√	√	X	√	√	X	X	5/8
18	√	√	√	MI	MI	X	√	X	4/8
19	X	√	√	√	√	X	X	X	4/8
20	√	√	√	x	√	√	X	X	5/8
21	√	√	√	X	MI	X	X	X	3/8
22	√	√	√	√	X	√	√	√	7/8
23	√	X	√	√	√	√	X	X	5/8

24	√	√	√	√	√	√	X	X	6/8
25	√	√	√	X	√	√	√	X	6/8
26	√	√	√	MI	√	X	X	X	4/8
27	√	X	√	√	√	√	X	√	6/8
28	√	X	√	MI	MI	X	X	X	3/8
29	√	MI	√	√	X	√	√	X	5/8
30	√	X	√	√	√	X	X	√	4/8
31	√	X	√	√	√	X	X	X	4/8
32	√	X	√	√	MI	X	√	X	4/8
33	√	√	√	√	MI	√	X	X	5/8
34	√	√	√	√	√	√	X	X	6/8
35	X	X	√	√	MI	X	X	√	3/8
36	√	√	√	√	√	X	√	X	6/8
37	√	X	√	√	√	√	X	X	5/8
38	√	√	√	MI	√	MI	X	√	5/8
39	√	X	√	X	√	X	X	X	3/8
40	√	√	√	√	MI	√	√	X	6/8
41	X	MI	√	MI	√	√	MI	MI	3/8
42	√	X	√	√	√	√	X	X	5/8
43	X	√	√	√	√	X	X	X	3/8
44	√	X	√	MI	MI	√	√	X	4/8
45	√	√	√	X	MI	X	X	X	3/8
46	X	√	√	√	√	X	X	X	4/8
47	√	√	√	√	MI	√	X	X	5/8
48	√	X	√	√	MI	X	X	X	3/8

49	√	√	√	√	MI	X	X	X	4/8
50	√	X	√	√	MI	X	X	X	3/8
51	√	√	√	√	MI	√	X	X	5/8
52	√	X	√	√	MI	√	X	√	5/8
53	√	√	MI	MI	MI	√	√	X	4/8
54	MI	x	MI	MI	MI	X	MI	MI	0/8
55	√	√	√	x	√	x	x	x	4/8
56	√	X	√	√	√	X	X	X	4/8
57	√	√	√	√	MI	X	X	X	4/8
58	√	√	√	MI	MI	x	x	x	3/8
59	√	x	√	√	√	√	x	x	5/8
60	√	x	√	x	√	x	x	x	3/8
61	√	x	√	√	√	x	x	x	4/8

**Key words for Livelihood Assessment table:**

TA	Tangible Assets
IA	Intangible Assets
AF	Access to Food
AE	Access to Education
AHS	Access to Health Services
GNS	Gained New Skills
EA	Economic activity in agriculture
ENA	Economic activity not in agriculture
MI	Missing Response