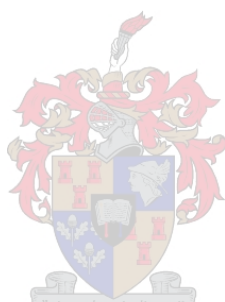


**Towards a management database to improve the  
sustainability of cattle production and its contribution  
to food security: A case of emerging beef farmers in  
Limpopo Province, South Africa**

**by**

**Obvious Mapiye**



*Thesis presented in partial fulfillment of the requirements for the  
degree of Master of Science in Sustainable Agriculture in the faculty of  
Agri-Sciences at Stellenbosch University*

Supervisor: Prof K. Dzama

Co-supervisor: Prof G. Makombe

Co-supervisor: Dr C. Mapiye

**March 2017**

## **Declaration**

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

**March 2017**

Copyright © 2017 Stellenbosch University

All rights reserved

## Abstract

The main objective of the study was to assess and recommend the need for knowledge management strategies to improve sustainability of beef production and its contribution to food security in South Africa. This was achieved by administering structured questionnaires to all the 62 farmers under the Limpopo IDC-Nguni beef cattle project between August and September, 2016. Systemic challenges and constraints affecting the growth and sustainability of the farmers were identified and characterized. A quantitative research approach was used in the study. Data analysis was conducted using descriptive statistics. Farmers indicated that they were constrained with parasites and diseases (89%), feed shortages (86%), water scarcity (82%), poor cattle breeding management (74%) and stock theft (73%). The majority of farmers also reported the challenges of drought (98%), heat waves (97%), rangeland degradation (97%) and biodiversity loss (90%). Location of the farmer was associated with perception of being confronted with production challenges such as poor cattle breeding management ( $p=0.01$ ), parasites ( $p=0.02$ ) and diseases ( $p=0.02$ ). Poor access to markets and marketing information were reported from 76% of the farmers whereas 73% and 45% reported of being confronted by high transaction costs and poor market reliability, respectively. Farmers also reported challenges such as lack of finance (94%) and poor access to extension services (81%). As a follow-up, farmers' information sources and methods of sharing messages and intervention strategies were assessed. The majority (88%) of farmers sought for management advice when confronted with challenges and constraints. Government extension officers (53%) and other farmers (30%) were indicated as the major sources of information for the farmers. About 80% of the respondents were found to be involved in the creation of interventions and extension messages, of which 63% of them indicated that they shared with other farmers while 33% shared with government extension officials. Majority of the farmers used farm-to-farm visits (56%) when sharing their own created intervention strategies and messages. In addition, 41% of the farmers indicated that they used mobile phones when sharing the intervention messages. The study concludes that the farmers were faced with a variety of challenges and constraints. When faced with challenges, most farmers were involved in the creation of intervention strategies and messages which they shared. Therefore, an opportunity for improved sustainability and food security contribution by the farmers can be explored through development and implementation of knowledge management strategies such as a management database system.

**Keywords:** Sustainability, challenges and constraints, emerging farmers, management database, intervention strategies, extension messages.

## Opsomming

Die hoofdoel van die studie was om vas te stel wat die behoefte aan kennis bestuurstrategieë rakende die volhoubaarheid van beesvleisproduksie en die bydrae tot voedselsekerheid in Suid-Afrika is, asook aanbevelings te maak oor sulke inligting bestuurstrategieë. Die studie het behels die uitstuur van gestruktureerde vraelyste, van Augustus 2016 tot September 2016, aan die 62 boere wat deel vorm van die Limpopo NOK-Nguni-bees projek. Sistemiese uitdagings en beperkings wat die groei en volhoubaarheid van die boere kon beïnvloed, is geïdentifiseer en gekenmerk. 'n Kwantitatiewe navorsingsbenadering is gebruik in die studie. Data-analise is uitgevoer met behulp van beskrywende statistiek. Boere het aangedui dat hulle vermoë beperk was deur die voorkoms van parasiete en siektes (89%), 'n tekort aan voer (85%), waterskaarste (82%), swak veeteelt bestuur (74%) en veediefstal (73%). Die meerderheid van die boere het ook berig dat uitdagings soos droogte (98%), hittegolwe (97%), agteruitgang van weiding (97%) en verlies aan biodiversiteit (90%) 'n invloed kan speel. Die ligging van die boer het verband gehou met elkeen se persepsie oor die produksie uitdagings waarmee hulle gekonfronteer is, bv. soos swak veeteelt bestuur ( $p = 0.01$ ), parasiete ( $p = 0.02$ ) en siektes ( $p = 0.02$ ). Swak toegang tot markte en bemerkingsinligting is gesien as beperkend deur 76% van die boere, terwyl 73% en 45% 'n hoë transaksiekoste en swak betroubaarheid van markte, onderskeidelik, as beperkend beskou het. Boere het genoem dat 'n gebrek aan finansies (94%) en swak toegang tot voorligtingsdienste (81%) as uitdagings beskou word. As 'n opvolg fase, is boere se inligtingbronne en metodes van die deel van boodskappe en intervensiestrategieë beoordeel. Die meerderheid boere (88%) het gebruik gemaak van en gesoek vir bestuursadvies wanneer met uitdagings en beperkings gekonfronteer was. Regering voorligtingsbeamptes (53%) en ander boere (30%) is aangedui as die belangrikste bronne van inligting vir dié boere. Sowat 80% van die respondente was gevind om betrokke te wees in die skepping van ingrypings en verspreiding van raad, waarvan 63% van hulle aangedui dat hulle raad met ander boere gedeel het, terwyl 33% raad met voorligtingsbeamptes gedeel het. Die meerderheid van die boere het plaas-tot-plaasbesoeke (56%) as deel van hul eie geformuleerde intervensiestrategieë en oordra van raad gebruik. Daarbenewens het 41% van die boere aangedui dat hulle selfone gebruik om raad en intervensiestrategieë te deel. Die studie kom tot die gevolgtrekking dat die boere in die studie in die gesig gestaar word met 'n verskeidenheid van uitdagings en beperkings. Wanneer boere aan uitdagings en beperkings blootgestel is, het die meeste boere betrokke geraak by die skepping van intervensiestrategieë wat hulle gedeel het. Daar is dus 'n geleentheid om by te dra tot beter volhoubaarheid en voedselsekerheid van die boere deur ontwikkeling en implementering van kennisbestuur strategieë soos 'n bestuur databasis stelsel.

**Sleutelwoorde:** Volhoubaarheid, uitdagings en beperkings, opkomende boere, bestuur databasis, intervensiestrategieë, voorligting boodskappe.

## Acknowledgements

Valuable cooperation and support from various people and institutions have made this study a success. Therefore, a profound gratitude and deepest appreciation is expressed to my supervisors, Prof. G. Makombe, Prof. K. Dzama, and Dr. C. Mapiye for the encouragement and expert guidance throughout the course of the study. Their drive, empathy and commitment to the growth of South Africa's cattle farming industry, with meaningful participation of the emerging sector will always inspire me. I would like to acknowledge Prof. F. Nyabadza for the inspiration. To, Mr. T. Marandure and Mr. O. Chikwanha (PhD Students, Department of Animal Sciences, Stellenbosch University), thank you for the day to day support during thesis writing. To my friendly colleagues; R. Andrews, F. Tshuma, V. van Niekerk and B. Mandigora thank you for all the constructive criticisms, debates, team work and moral support throughout the course.

I would want to acknowledge financial support provided by the Department of Science and Technology-National Research Fund (DST-NRF) Centre of Excellence in Food Security: Grant number 140102 towards research activities for this study. I am also indebted to the BEIT Trust for the bursary availed towards my tuition.

I am very grateful to Mr C. Mojapelo (Limpopo Department of Agriculture), Prof. G. Makombe (Supervisor), Prof. Mollel (University of Limpopo), and Ms. M. Nkadimeng (MSc student, Limpopo University) for their unreserved support in organizing farmers and all logistics needed during data collection. To all the emerging cattle farmers who participated in the survey from the district municipalities of; Capricorn, Vhembe, Waterberg, Mopani and Greater Sekhukhune in Limpopo Province, thank you for your time, patience and cooperation. It would be remiss if I do not express my utmost gratitude to the team who assisted me with enumeration during data collection (Rathobotha Samson, Mokgadi Phaniel and Nkgaugelo Kgasago).

My unreserved appreciation and deepest gratitude goes to Mapiye and Mwerenga families. To my dearest parents, brothers and sisters thank you for your prayers, constant love, financial and moral support through the years of my study.

Above all, due respect and appreciation is given to God for making everything possible in my studies.

## Table of Contents

<b>Declaration.....</b>	<b>i</b>
<b>Abstract.....</b>	<b>ii</b>
<b>Opsomming.....</b>	<b>iii</b>
<b>Acknowledgements.....</b>	<b>iv</b>
<b>Table of Contents.....</b>	<b>v</b>
<b>List of figures.....</b>	<b>viii</b>
<b>List of Tables.....</b>	<b>ix</b>
<b>List of Acronyms.....</b>	<b>x</b>
 <b>Chapter 1: General Introduction.....</b>	 <b>1</b>
1.1 Introduction.....	1
1.2 The Limpopo Industrial Development Corporation (IDC)-Nguni cattle project: Overview...	4
1.3 Problem statement .....	5
1.4 Justification.....	6
1.5 Study Objectives.....	8
1.6 Study Questions .....	8
1.7 Study Hypotheses .....	9
<b>References.....</b>	<b>10</b>
 <b>Chapter 2: Literature Review.....</b>	 <b>15</b>
2.1 Introduction.....	15
2.2 The concept of agricultural sustainability: Definition and its three pillars. ....	17
2.2.1 The three pillars of sustainability defined: .....	18
2.2.2 Sustainability issues around cattle farming in South Africa.....	19
2.3 The interaction between economic, ecological and social factors affecting cattle production .....	21
2.4 Challenges and constraints facing smallholder cattle producers in South Africa .....	21
2.4.1 Unavailability of feed resources .....	22
2.4.2 Cattle parasites and diseases prevalence among smallholder farmers.....	24
2.4.3 Scarcity of drinking water for cattle.....	25
2.4.4 Lack of access to markets and marketing information .....	26
2.4.5 Poor access to infrastructure .....	27
2.4.6 Poor access to government extension services .....	28

2.4.7 Stock theft .....	29
2.5 Smallholder farmer's social characteristics as constraints to sustainable cattle farming...	30
2.6 Knowledge management in the livestock sector in South Africa .....	31
2.6.1 An overview of the livestock extension system .....	31
2.6.2 Knowledge management: concepts, processes and tools .....	32
2.6.3 The use of Information and Communication Technologies (ICTs) for the creation and dissemination of agricultural knowledge and information .....	34
2.6.4 Applications of web-based applications in information creation and sharing .....	34
2.7 Summary .....	40
<b>References.....</b>	<b>41</b>

### **Chapter 3: Challenges and constraints for emerging beef cattle producers in the Limpopo Province of South Africa.....54**

3.1 Abstract .....	54
3.2 Introduction.....	55
3.3 Materials and Methods .....	56
3.3.1 Description of the study area.....	56
3.3.2 Overview of Limpopo Province .....	56
3.3.3 Target population and farmer selection .....	58
3.4 Research method and paradigm .....	59
3.5 Results and Discussion .....	60
3.5.1 Characteristics of the farmers.....	60
3.5.2 Challenges and constraints for emerging cattle farmers in Limpopo Province .....	63
3.5.2.1 Ecological and biophysical challenges.....	64
3.5.2.2 Cattle production challenges and constraints .....	66
3.5.2.2.2 Cattle feed shortages .....	68
3.5.2.2.3 Cattle parasites and diseases .....	69
3.5.2.2.4 Inadequate water supplies .....	70
3.5.2.2.5 Cattle breeding challenges.....	71
3.5.2.2.6 Stock theft .....	73
3.5.2.2.7 Cattle predation challenge.....	74
3.5.2.3 Institutional and infrastructural challenges .....	74
3.5.2.4 Cattle marketing challenges.....	79

3.6 Conclusion.....	82
<b>References.....</b>	<b>83</b>
 <b>Chapter 4: Information sources and extension sharing strategies for emerging cattle farmers in Limpopo Province, South Africa.....</b>	<b>91</b>
4.1 Abstract .....	91
4.2 Introduction.....	92
4.3 Methodology .....	93
4.3.1 The study area and sample .....	93
4.3.2 Data collection .....	94
4.3.3 Data analysis .....	94
4.4 Results and discussion .....	94
4.4.1 Acquisition of cattle management advice .....	94
4.4.2 Information sources for emerging cattle farmers .....	96
4.4.3 Sharing of own created intervention strategies by emerging cattle farmers in Limpopo Province .....	98
4.4.4 Methods adopted for sharing own created intervention strategies by emerging beef cattle farmers in Limpopo Province .....	100
4.5 Conclusion.....	102
<b>References.....</b>	<b>104</b>
 <b>Chapter 5: General Discussions, Conclusions and Recommendations.....</b>	<b>107</b>
5.1 Introduction.....	107
5.2 General discussion of results.....	107
5.3 Conclusions.....	111
5.4 Recommendations.....	112
5.5 Areas for further research.....	114
<b>References.....</b>	<b>115</b>
 <b>Appendix 1.....</b>	<b>117</b>
<b>Appendix 2.....</b>	<b>129</b>



## List of figures

<b>Figure 1.1:</b> Gross value contribution of South African agricultural industry to GDP .....	1
<b>Figure 1.2:</b> Quantity of beef and veal meat imported by South Africa since 1994.....	7
<b>Figure 2.1:</b> The three pillars of sustainability .....	18
<b>Figure 2.2:</b> Interaction between economic, social and ecological factors of production .....	21
<b>Figure 2.3:</b> Knowledge management process .....	33
<b>Figure 3.1:</b> Location of Limpopo Province and the local municipalities .....	57
<b>Figure 3.2:</b> Challenges and constraints facing emerging cattle farmers in Limpopo province, South Africa .....	64
<b>Figure 3.3:</b> Extent of the ecological and biophysical challenge faced by emerging cattle farmers in Limpopo Province, South Africa.....	65
<b>Figure 3.4:</b> Cattle breeding challenges faced by the emerging farmers.....	72
<b>Figure 4.1:</b> Methods used to share own created intervention strategies by emerging cattle farmers in Limpopo province.....	101

## List of Tables

<b>Table 3.1:</b> The distribution of Limpopo IDC-Nguni cattle farmers across the province .....	58
<b>Table 3.2:</b> Characteristics of the emerging cattle farmers in Limpopo province, South Africa ....	62
<b>Table 3.3:</b> Cattle production challenges and constraints faced by emerging cattle farmers in Limpopo province, South Africa (%) .....	67
<b>Table 3.4:</b> The institutional and infrastructural challenges and constraints faced by emerging cattle farmers in Limpopo Province, South Africa .....	75
<b>Table 3.5:</b> Marketing challenges and constraints faced by emerging cattle farmers in Limpopo province .....	79
<b>Table 4.1:</b> Different sources of information consulted for management advice by emerging cattle farmers in Limpopo Province (%). .....	96
<b>Table 4.2</b> Percentage responses by the emerging farmers on whom they shared their own created intervention strategies with (%) .....	99
<b>Table 4.3:</b> Observed p-values for chi-square tests between farmers' characteristics and mode of communication used .....	101

## List of Acronyms

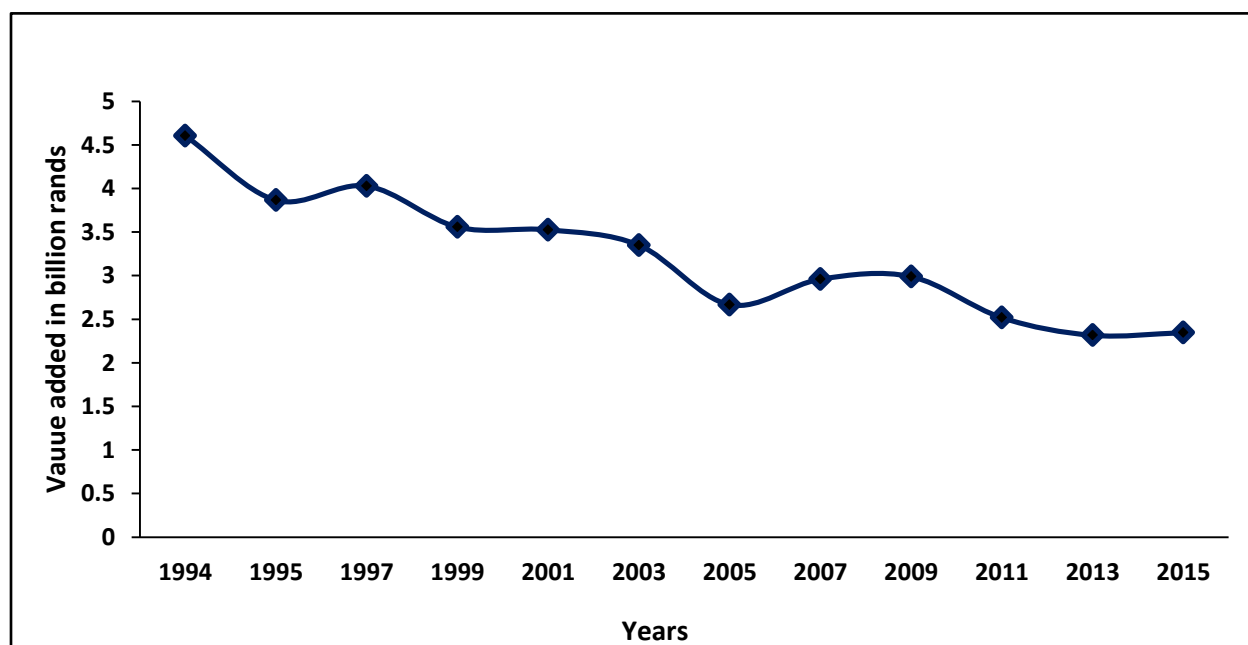
Agri-SA	Agriculture South Africa
Agri-SETA	Agricultural Sector Analysis
ARC	Agricultural Research Council
CPA	Community Property Associations
CTA	Technical centre for Agricultural and Rural cooperation
DAFF	Department of Agriculture, Forestry and Fisheries
DAPA	Decision and Policy Analysis
DFID	Department of International Development
EAC	Eastern and Central Africa
EAFF	Eastern Africa Farmers Federation
ECA	Economic Commission for Africa
EEAP	European Federation for Animal production
FAO	Food and Agriculture Organisation
FANPARN	Food Agriculture and Natural Resources Policies Analysis
GDPI	Gross Domestic Product
ICT	Information and Communication Technology
IDC	Industrial Development Corporation
IFAD	International Fund for Agricultural Development
LDA	Limpopo Department of Agriculture
LID	Livestock in Development
LRAD	Land reform for Agricultural Development
NDA	National Department of Agriculture
NDP	National Development Plan
NEPAD	New Partnership for African Development
NRF	National Research Fund
NERPO	National Emergent Red meat Producers Organisation
NPC	Non Profit Company
RSA	Republic of South Africa

SAPIA	Southern African Plant Invaders
SLAG	Settlement Land Acquisition Grant
SPSS	Statistical programme for Social scientists
SSA	Sub-Sahara Africa
SWA	Sahel and West Africa
TLUs	Tropical Livestock Units
UNECA	United Nations Economic Commission for Africa
UNDP	United Nations Development Programme
VERCON	Virtual Extension and Research Communication Network
WCED	World commission on Environmental Development
WFO	World Farmers Organisations
WWF	World Wildlife Fund

## Chapter 1: General Introduction

### 1.1 Introduction

Agriculture remains the mainstay of Africa's economy, providing livelihoods to nearly 70% of its citizens and roughly 80% of the continent's poor who live in the rural areas [Economic Commission for Africa (ECA), 2007]. It accounts for nearly 20% of Africa's Gross Domestic Product (GDP) [United Nations Economic Commissions for Africa (UNECA), 2004], 60% of its labor force and 20% of the total merchandise exports [New Partnership for African Development (NEPAD), 2003]. In countries such as South Africa, agriculture's percentage contribution to the national GDP is relatively low and is constantly dropping as the latter expands and diversifies. The contribution from agriculture has averaged 58155.05 ZAR Million between 1993 and 2016 (Trading Economics, 2016). Figure 1.1 shows the gross value contribution of the industry to National GDP since 1994. Even, given the steady decline in the contribution of agriculture to GDP, the industry contributes immensely towards employment, livelihoods and food security for the rural population (Agri-SETA, 2010).



**Figure 1.1:** Gross value contribution of South African agricultural industry to GDP

Source: Researcher (2016). Data collected from Trading Economics (2016)

Within agriculture, livestock is one of the fastest growing subsectors (Thornton, 2010). Its role and importance in many economies may be considered from several perspectives. It invariably supports more than 600 million resource poor farmers and their families on the African continent as a source of food (meat and milk) and income through sales of meat and milk, hides and skins among other livestock products [Food and Agriculture Organization (FAO), 2009]. Among the rural and resource poor people, livestock goes beyond their role in generating better livelihoods, as they are a valuable asset, store of wealth, source of draught power and manure, collateral for credit and essential security nets during disastrous epochs [Munyai, 2012; Department of Agriculture, Forestry and Fisheries (DAFF), 2014]. Livestock are also used for traditional rituals such as funerals, circumcision, veneration and appeasement of ancestors, payment for service to traditional healers, installation of spirit-mediums and exorcism of evil spirits (Mapiye *et al.*, 2009).

Production of livestock in particular cattle is widespread in Africa's different regions. In the Eastern and Central African (EAC) region, livestock is an important resource in promoting development [Eastern Africa Farmers Federation (EAFF), 2012]. Within the EAC region livestock farming provide 20 to 30% towards GDPs of the countries. It also plays a central role in inter-state trade and generates as much as 70% of cash income at farm level (EAFF, 2012). In the Sahel and West African (SWA) region, 38.2 % of the region is arid making it difficult to farm with crops. Only livestock, in particular, goats and cattle thrive in these regions making them the most important agricultural activities directly supporting the lives of poor people occupying these fragile ecological zones (Kamuanga *et al.*, 2008). In Sub Saharan Africa (SSA), close to 70 % of the rural poor are at least partially dependent on livestock to sustain their livelihoods [Livestock in Development (LID), 1999; Otte and Knips, 2005]. In this region, farming of livestock contributes almost 40% of agricultural GDPs, and in some countries the contribution surpasses 85% (FAO, 2011). Cattle are the region's predominant livestock accounting for 72% of livestock resources, expressed as Tropical Livestock Units (TLU) (FAO, 2002).

In South Africa, the livestock sector is an integral component of the country's agricultural production system contributing positively towards the country's socio-economic development. It accounts for 75% of national agricultural output, with cattle farming being the largest sub-sector (DAFF, 2012). South Africa's total gross value of agricultural production recorded a 5.3% increase in the 2014/15 production season from the previous year (DAFF, 2014). The increase was invariably attributed to animal products which had the highest contribution (49.0%) compared to 26.9% and 24.1% coming from horticultural products and field crops, respectively (DAFF, 2014). Industrial development Corporation [(IDC); 2016] stated that the contribution can be further increased if livestock, particularly cattle from the rural sector is brought into the formal economy. It is estimated that close to 40% of the 14.1 million cattle available in South Africa are owned by the smallholder sector (DAFF, 2012). The remainder, 60% is owned by well-established large scale commercial farmers [DAFF, 2012; Agricultural research Council (ARC), 2013]. Therefore, cattle are an important resource to South Africa's livestock sector and are a multifunctional livelihood strategy and food security source, especially for the rural poor (Ndoro *et al.*, 2014). They provide nearly 60% of the value of edible products (meat and milk) which comes from the livestock sector (FAO, 2006).

South Africa's beef industry is largely reflective of the entire livestock sector in that it is distinctly dualistic in nature with a highly sophisticated large scale commercial and the smallholder sector (Agri-SETA, 2010; DAFF, 2012; IDC, 2016). The smallholder sector can be further divided into two segments namely, the subsistence or communal producers and the emerging or subsistence-cum-commercial producers (DAFF, 2012; IDC, 2016). Emerging farmers are beneficiaries of the government's Land Redistribution for Agricultural Development (LRAD) programme (Ortmann and Machethe, 2003; MacLeod *et al.*, 2010; DAFF, 2012) which is one of the measures adopted to redress the historic imbalance and bridge the gap of dualism. The LRAD programme largely superseded the Settlement Land Acquisition Grant (SLAG) model which generally targeted to resettle poor and vulnerable members of the community. Conversely, LRAD programme identifies and assists better resourced and skilled previously disadvantaged (mainly black) farmers from the smallholder sector to acquire already existing

agricultural enterprises as a step to becoming commercial farmers (MacLeod *et al.*, 2010). This initiative has brought emerging cattle farmers who are currently in the transition from small commercial scale to large commercial scale. The Limpopo IDC-Nguni Cattle Development Trust in Limpopo Province is one such example of projects working with emerging cattle farmers.

## **1.2 The Limpopo Industrial Development Corporation (IDC)-Nguni cattle project: Overview**

The project is being implemented under the IDC-Nguni Cattle Development Trust which was founded in 2006. The trust is a development orientated partnership arrangement formed by the IDC, Limpopo Department of Agriculture (LDA) and the University of Limpopo (UL). The main objective of the project is to improve cattle production in the rural areas of Limpopo Province through reintroduction of the indigenous Nguni cattle bloodlines and the creation of commercial benefits for the emerging beef cattle farmers, (Bester *et al.*, 2003). The Nguni breed, native to South Africa (Tada *et al.*, 2012) is well known for its adaptability to low management regimes and low feed maintenance requirements (Mapiye *et al.*, 2009b). Nguni cattle are reported to be resistant to local parasites and diseases (Muchenje *et al.*, 2008b) and tolerant to high temperature conditions. They are highly fertile with short calving and long reproductive lifespan (Bester *et al.*, 2003).

The IDC-LDA-UL development project seeks to use the Nguni cattle to produce high-quality meat and hides under eco-friendly free-ranging conditions with less chemical interventions, thereby creating a sustainable venture while breeding and conserving the indigenous breed (IDC, 2007; DAFF-AgriNews, 2008). This innovative project was launched to empower and create commercial opportunities for the well-established and better performing farmers identified from the communal areas of the province. To qualify as a beneficiary one has to be residing within Limpopo Province as well as owning or having provable access to at least 600ha of land. The farmer should exhibit excellent cattle farming and entrepreneurship skills. The project initially selected 62 beneficiaries who were either individuals or Community Property Associations (CPAs). The trust lends to qualifying candidates; a package with an estimated value of R330 000 (Approximately USD48 000 in that period) which consisted of 30 pregnant Nguni



heifers and/cows and the appropriate breeding bull for a period of 5 years (IDC, 2007). The loan is then repaid within a period of 5 years by a herd equivalent in number and quality to the initial herd received or through payment of a sum of money equivalent to the value of a similar herd as at date of repayment. The repayment will then be given to the next beneficiary allowing the project to grow horizontally. Up to date, 11 farmers have benefited from the repayment facility and a good number of farmers have made better progress with repayment. Therefore, beneficiaries of this programme constitute part of the rapidly growing population of emerging farmers in the province (MacLeod *et al.*, 2010; DAFF, 2012) hence are a strategic component to the future of the cattle production industry in South Africa. They are a unique group distinct from commercial and communal farmers and are likely to be confronted with almost similar, challenges and constraints which are exclusive to them.

### **1.3 Problem statement**

Despite a notable horizontal expansion of programmes working with smallholder cattle farmers, vertical growth (productivity per herd) is still perceived to be very low (UNDP, 2008; DAFF, 2012; IDC, 2016). The smallholder farmers involved in the project have insufficient knowledge and skills to manage their beef herds (IDC, 2016). As a result, farmers who do not have knowledge and management skills are vulnerable to challenges and constraints facing beef production and marketing in South Africa. This ultimately affects the sustainability of smallholder beef production and its contribution towards food security relative to the commercial farmers (MacLeod *et al.*, 2010; DAFF, 2012). Some of the main challenges affecting the smallholder beef cattle sector, the communal sector in particular, were reported by Musemwa *et al.* (2008), Mapiye *et al.* (2009), Masikati (2010); Agholor (2013) and Khapayi and Celliers (2016). Few studies have been done to identify and characterise challenges and constraints that are exclusive to the emerging farmers. More importantly, the capacity of emerging farmers to create and share their own intervention/extension messages for the challenges they face has not been explored. In some incidences farmers struggle to find solutions for management challenges and constraints that might have been solved by neighbouring farmers. This is because there are no sound strategies to support and empower

emerging farmers' management abilities (Chikazunga and Paradza, 2012). The South African extension system is also labelled as weak and under resourced (MacLeod *et al.*, 2008). It tends to be bureaucratic and inefficient, as it does not fully accommodate concerns from farmers. It also does not create the sort of interactive learning space and processes that foster and encourage innovation sharing by farmers [Technical centre for Agricultural and Rural cooperation (CTA), 2012]. It is therefore important for the challenges constraining emerging farmers to be addressed systematically (Land Bank, 2011).

The use of Information Communication Technology (ICTs) such as web-based knowledge management application tools will help improve the capacity of farmers to address the challenges and constraints (Sife *et al.*, 2010). A management database system is an example of such tools. It empowers farmers to take the lead role in the creation and documentation of extension messages with the results being used for purposes of internal learning and exchange among themselves (horizontal sharing), and between the farmers and development agents (vertical sharing).

## **1.4 Justification**

Food security has become a global issue, demand for food, fuel and fibre is expected to increase by a margin of 70% by the year 2050 (FAO, 2009). South Africa is a net beef importer confirming that consumption has exceeded production despite that the number of beef animals slaughtered has been increasing over the years (IDC, 2016). Beef and veal meat imports show a downward trend, but the country is still importing as consumption increases as well. Figure 1.3 shows the quantity of beef and veal imported by the country since 1994.

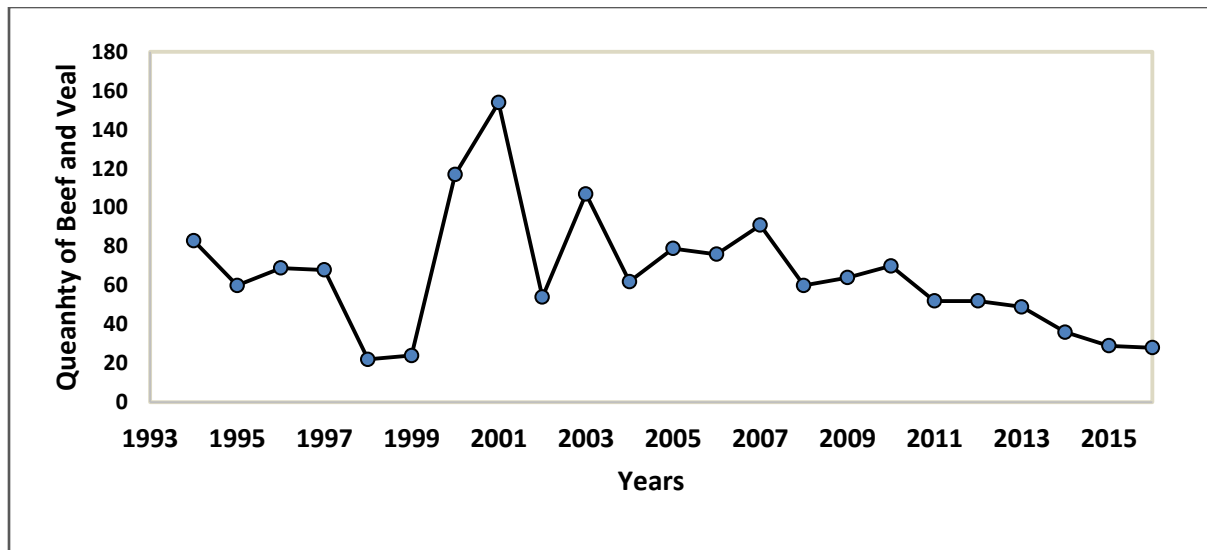


Figure 1.2: Quantity of beef and veal meat imported by South Africa since 1994

Source: Researcher (2016). Data collected from Index Mundi (2016)

It is important to acknowledge the role of smallholder cattle farmers in meeting the beef demand in South Africa. Emerging livestock, particularly cattle farmers are a strategic component of the transformation of South African agriculture (Land Bank, 2011). Therefore, in depth understanding of the challenges and constraints faced by these farmers and how they work, is necessary for designing effective support for them by various institutions. It is therefore critical to understand factors that impede them from realising their potential as the future producers of cattle based food and raw materials in the country. Also, it is the purpose of this study to explore what farmers are doing to solve challenges confronting them. This is to find out whether they are sharing with other stakeholders to improve sustainability of cattle production and its contribution to food security. The study hence recommends the use of tools such as a cattle management database (knowledge sharing platform) system as an important intervention that is designed to bring emerging cattle farmers to work as a unit by sharing management ideas. It encourages farmers to identify, share and prioritise their problems and needs but most importantly, to seek ways of solving their problems within their community rather than only waiting for the government's extension service. Thus, such initiatives which are participatory and farmer-led have received much attention (Morton and Mathewman, 1996). There have been notable efforts to shift from extension that is largely supply-driven to a model

that is demand-driven or farmer-centred (Duvel, 2004). Improved management by emerging cattle farmers may culminate into a sustainable emerging farming system that is productive, environmentally conscious and contributes positively to the national food security.

### **1.5 Study Objectives**

The main objective of the study is to assess the need and justify the role of a management database in improving sustainability of beef production and food security contribution of emerging beef cattle farmers in Limpopo Province of South Africa.

Specific study objectives were to:

1. To identify and characterize the management challenges and constraints faced by emerging beef cattle farmers in Limpopo Province;
2. To determine the sources of information and methods used for sharing messages and intervention strategies by emerging beef cattle farmers in Limpopo Province;
3. To assess the perceived impact and recommend the use of a management database for improved sustainability and food security contribution by emerging beef cattle farmers in Limpopo Province.

### **1.6 Study Questions**

1. What are the management challenges and constraints faced by emerging beef cattle farmers in Limpopo Province?
2. What are the main sources and methods of sharing intervention strategies and messages by emerging beef cattle farmers in Limpopo province?
3. What is the perceived impact of a management database on sustainability and food security contribution by the emerging beef cattle farmers?

## 1.7 Study Hypotheses

1. **H<sub>0</sub>:** Emerging beef cattle farmers in Limpopo province are not significantly confronted with cattle management challenges and constraints
2. **H<sub>0</sub>:** Emerging beef cattle farmers in Limpopo province do not have common sources of information and channels for sharing intervention strategies and messages among themselves
3. **H<sub>0</sub>:** The perceived sustainability and food security contribution by beef cattle farmers in Limpopo province will remain the same after adopting the database system.

## References

- Agholor, I. A. (2013). Analysis of Constraints of Rural Beef Cattle Cooperative Farmers: A Case Study of Ga-kibi, Norma and Mogalakwena in Blouberg. *Journal of Agricultural Science*; 5 (8):76-86.
- Agricultural Research Council (ARC). (2013). Economic Outlook Report X1V. Prepared by the Economic Services Unit: Technology Transfer Division: <http://www.arc.agric.za/Economic%20Outlook%20Reports/Economic%20Outlook%20Report%20XVI.pdf>: Accessed on 8/20/2016
- Agri-SETA. (2010). Agriculture Sector Analysis report prepared for the Department of Higher Training. Pretoria: South Africa.
- Bester, J., Matjuda, I. E., Rust, J. M. & Fourie, H. J. (2003). The Nguni: case study. In: FAO Community-based management of animal genetic resources. Rome, Italy.
- Chikazunga, D. & Paradza, G. (2012). Can smallholder farmers find a home in South Africa's food-system? Lessons from Limpopo Province. The Institute for Poverty, Land and Agriculture Studies, (PLAAS) Blog. <http://www.plaas.org.za/blog/can-smallholder-farmers-find-home-south-africa%E2%80%99s-food-system-lessons-limpopo-province>. Accessed 10 June 2016.
- CTA. (2012). Agricultural Extension: A time for change. Linking knowledge to policy and action for food and livelihoods. Technical Centre for Agricultural and Rural Cooperation ACP-EU (CTA) Wageningen, Netherlands.
- DAFF. (2012). Strategic Plan for the 2012/13-2016/17. Department of Agriculture Fisheries and Forestry, South Africa. <http://www.nda.agric.za/daaDev/topMenu/StratPlan201213-201617.pdf>: Accessed on the 2nd of April 2016.

- DAFF. (2014). A Profile of the South African Beef Market Value Chain. Department of Agriculture forestry and Fisheries 2014. Republic of South Africa, WEB.
- DAFF-AgriNews. (2008). Official Newsletter of the Department of Agriculture (DAFF). Nguni Cattle Limpopo province: <http://www.nda.agric.za/docs/agrinews/agrinewsfeb08.pdf>  
Accessed on 8/28/2016.
- Duvel, G. H. (2004). Developing an appropriate extension approach for South Africa: process and outcome. South African Journal of Agricultural Extension, 33: 1–10.
- Economic Commission for Africa (ECA). (2007). Africa Review Report on Agriculture and Rural Development (Main Report). Fifth Meeting of the Africa Committee on Sustainable Development (ACSD-5)/ Regional Implementation Meeting (RIM) for CSD-16 Addis Ababa 22-25 October 2007: United Nations Economic and Social Council
- Eastern Africa Farmers Federation (EAFF). (2012). East African Livestock Strategy.  
[http://paepard.org/osiris/files/fichier\\_ressource\\_EAFFLivewtockstrategy2708121\\_final.pdf](http://paepard.org/osiris/files/fichier_ressource_EAFFLivewtockstrategy2708121_final.pdf)
- FAO. (2002). Cattle and small ruminant production systems in sub-Saharan Africa A systematic review. Livestock Information Sector Analysis and Policy Branch, FAO Agriculture Department.  
<http://www.fao.org/ag/againfo/resources/en/publications/agapubs/AGAL-Y4176E.pdf>
- FAO. (2006). World agriculture: towards 2030/2050. Interim report, Global Perspective Studies Unit. Rome, Italy: Food and Agriculture Organization of the United Nations.  
[http://www.fao.org/fileadmin/user\\_upload/esag/docs/Interim\\_report\\_AT2050web.pdf](http://www.fao.org/fileadmin/user_upload/esag/docs/Interim_report_AT2050web.pdf).
- FAO. (2009). The state of food and agriculture – Livestock in the balance. FAO, Rome.  
<http://www.fao.org/docrep/012/i0680e/i0680e.pdf>.

- FAO. (2011). The state of food and agriculture 2010–2011. Women in agriculture: closing the gender gap for development. FAO, Rome, Italy.  
<http://www.fao.org/docrep/013/i2050e/i2050e.pdf>. Accessed on 8/24/2016
- Industrial Development Corporation (IDC). (2007). Limpopo Province Rural Communities Benefiting from Unique Nguni Cattle Project. Pretoria, South Africa.
- Industrial Development Corporation (IDC). (2016). A study on the potential product development for the commercialization and value add to beef products. APCF Terms of reference. [http://www.idc.co.za/images/2016/Rural-cattle\\_Terms-of-reference.pdf](http://www.idc.co.za/images/2016/Rural-cattle_Terms-of-reference.pdf)
- Kamuanga, M. J. B., Somda, J., Sanon, Y. & Kagone, H. (2008). Livestock and regional market in the Sahel and West Africa: Potentials and challenges.
- Khapayi, M. & Celliers P. R. (2016). Issues and constraints for emerging farmers in the Eastern Cape Province, South Africa. *African Journal of Agricultural Research*, 10(41):3860-3869.
- Land Bank. (2011). Addressing Challenges of Financing Emerging Farmers. Agricultural Economic Research and Innovation Service (AERIS), Land and Agricultural Development Research (LADR) Report No 1 / 2011.
- Livestock in Development (LID). (1999). Livestock in Poverty-Focused Development.
- MacLeod, N. D., McDonald, C.K. & van Oudtshoorn, F.P. (2010). Challenges for emerging livestock farmers in Limpopo province, South Africa, *African Journal of Range & Forage Science*, 25:2, 71-77.
- Maluleke. W, Obioha, E. & Mafokeng. J. T. (2015). Stock theft in a rural community in Limpopo, South Africa: Contributory factors and recommendations. *Bangladesh e-Journal of Sociology*, 12 (2): 109-132.



- Mapiye, C., Chimonyo, M., Dzama, K., Raats, J.G. & Mapekula, M. (2009). Opportunities for improving Nguni cattle production in the smallholder farming systems of South Africa. *Livestock Science* 124: 196-204.
- Masikati, P. (2010). Improving the water productivity of integrated crop-livestock systems in the semi-arid tropics of Zimbabwe: an ex-ante analysis using simulation modelling. [http://www.zef.de/fileadmin/webfiles/downloads/zefc\\_ecology\\_development/eds\\_78\\_masikati\\_text.pdf](http://www.zef.de/fileadmin/webfiles/downloads/zefc_ecology_development/eds_78_masikati_text.pdf).
- Morton, J. & Matthewman, R. (1996). Improving Livestock Production Through Extension: Information Needs, Institutions and Opportunities. Overseas Development Institute, London, UK.
- Muchenje, V., Dzama, K., Chimonyo, M., Raats, J. G. & Strydom, P. E. (2008b). Meat quality of Nguni, Bonsmara and Aberdeen Angus steers raised on natural pasture in the Eastern Cape, South Africa. *Meat Science*, 79: 20–28.
- Munyai, F.R. (2012). An evaluation of socio-economic and biophysical aspects of small-scale livestock systems based on a case study from Limpopo province: Muduluni village. PhD thesis. University of the Free State, Bloemfontein.
- National Department of Agriculture (NDA). (2008). Directorate: Agricultural Statistics of the National Department of Agriculture, Republic of South Africa. pp. 58-73.
- National Emergent Red Meat Producers Organisation (NERPO). (2004). Marketing infrastructure development. <http://www.nerpo.org.za>.
- Ndoro, J. T., Mudhara, M. & Chimonyo, M. (2014). Livestock Extension Programmes Participation and impact on Smallholder Cattle Productivity in Kwazulu-Natal: A Propensity Score Matching Approach. *S.A Journal of Agricultural Extension*, 42(2): 62 – 80.

- New Partnership for African Development (NEPAD). (2003). Comprehensive Africa Agriculture Development Maputo Mozambique.
- Ortmann, G. & Machethe, C. (2003). Problems and opportunities in South African Agriculture. In: L. Nieuwoudt and J. Groenewald (eds.) The challenges of change: agriculture, land and the South African economy, University of Natal Press, Natal, South Africa.
- Otte J. & Knips V. (2005). Livestock Development for Sub-Saharan Africa Pro-Poor Livestock Policy Initiative. A Living from Livestock.  
[http://www.fao.org/docs/up/easypol/572/pplpi-which\\_poor-to-target\\_195en.pdf](http://www.fao.org/docs/up/easypol/572/pplpi-which_poor-to-target_195en.pdf)
- Sife, A. S., Kiondo, E. & Lyimo-Macha, J G. (2010). Contribution of mobile phones to rural livelihoods and poverty reduction in Morogoro Region, Tanzania. The Electronic Journal on Information Systems in Developing Countries (EJISDC) 42 (3): 1-15
- Tada, O., Muchenje, V. & Dzama, K. (2012). Monetary Value of Nguni cattle and socio-economic profiles of farmers in the low-input communal production system of Eastern Cape Province, South Africa. African Journal of Business Management 6(45):11304–11311.
- Thornton, P.K. (2010). Livestock production: recent trends, future prospects. Philosophical Transactions of Royal Society B: Biological Sciences, 365: 2853–2867
- Trading Economics. (2016). South Africa GDP from Agriculture.  
<http://www.tradingeconomics.com/south-africa/gdp-from-agriculture>
- United Nations Economic Commission for Africa (UNECA). (2005). Economic Report on Africa, Meeting the challenges of unemployment and poverty in Africa.
- United Nations Population Division (UNPD). (2008). The 2006 revision and world urbanization prospects: the 2005 Revision. Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, World Population Prospects.

## Chapter 2: Literature Review

### 2.1 Introduction

In South Africa, smallholder agriculture has been recognized as the vehicle through which the goals of reducing food security and poverty, and increasing rural development can be achieved (DAFF, 2012; Pienaar and Traub, 2015; IDC, 2016). However, such suppositions on the role of the smallholder sector remains subject to debate with researchers such as Tshuma (2012) and Larson *et al.* (2014), having asked whether rural development strategies should chiefly depend on smallholder farming or not, for employment opportunities and poverty alleviation. According to NPC (2011), the South African National Development Plan (NDP) mandated the smallholder sector to drive development in the rural areas for improvement of livelihoods. DAFF (2012) also supported the notion that smallholder farmers do have the potential to drive and support livelihoods of the rural poor in South Africa. However, strategies targeting the development of the smallholder farmers should identify and acknowledge factors such as diverseness of the smallholder sector (Pienaar and Traub, 2015). This is because, the use and application of the term “smallholder” has been seen to have a general suggestion that farmers in this sector are relatively homogenous (Cousins, 2010). However, this tends to obscure class-based variances between farmers in this sector hence causes misleading assumptions about common interests in development planning (Cousins, 2010). This issue can pose challenges when determining the kind of support to be given to farmers in that sector, and this might have caused previous programs to be ineffective in stimulating poverty reduction and rural development (Aliber and Hall, 2012). Therefore, such an understanding complements efforts that disaggregate smallholder farmers into communal and emerging farmers. Emerging farmers, as discussed in the introductory chapter of this study sit on the nexus of South Africa’s dualistic agriculture (Ortman and Machethe, 2003) characterized by subsistence farmers on one end and commercial farmers on the other end (DAFF, 2012). The presence of emerging farmers in South Africa’s cattle farming industry has been recognized in literature (MacLeod *et al.*, 2010; DAFF, 2014, Land Bank, 2011).

Agitation for more development investment and support for emerging cattle farmers has been gathering momentum and the need to render more support has been recognized as the best way to improve their standards (Ortman and Machethe, 2003; Tshuma, 2012; Agholor, 2013). The Land Bank (2011) stated that, assistance towards the development of the emerging farmers is an overarching objective of the public policy and a critical economic requirement for South Africa. For the past two decades, there has been an increase in support by the South African government towards emerging farmers to assist them develop into commercial farmers (DAFF, 2010; National Treasury, 2010). Apart from government support, research is being conducted on the commercialization of emerging farmers with one of the objectives being to identify factors limiting their transition into commercial farming (Khaphayi and Celliers, 2016). Results are showing that emerging farmers have been excluded from mainstream agriculture (Chikazunga and Paradza, 2012) and most of them are still faced with a variety of challenges and constraints (Frequin et al., 2012; Aliber and Hall, 2012).

Challenges and constraints specific to the emerging cattle farming sector needs to be identified and characterized before support strategies are implemented (Khaphayi and Celliers, 2016). Also, it is important to acknowledge the fact that emerging farmers do not have experience of operating at a commercial scale. Their perceptions about the challenges and constraints confronting them are therefore based on their experience as communal smallholder farmers. They are still transitioning to an understanding of constraints in an emerging to commercial farmer context. Therefore, this chapter reviews challenges and constraints affecting smallholder cattle farmers in general and specifically as they relate to the emerging farmers.

In studies that have been conducted so far, emerging farmers are reported to be confronted by challenges such as poor roads, lack of transportation to the markets from the farms, poor access to finance, lack of marketing skills and information, poor market infrastructure, and high transaction costs, lack of agricultural implements to better production, as well as low education levels (Land bank, 2011; Khapayi and Celliers, 2016; DAFF AGRI-News, 2016). MacLeod *et al.* (2010) cited; lack of land tittle, variability of climate, and poor access to extension support and poor knowledge of rangelands and management of animals as the major challenges confronting the farmers. However, National Emergent Red Meat Producer's Organization (NERPO) (2004),

reported severe shortage of skills among emerging farmers as a major constraint to their growth. Consequently, these challenges and constraints affect the sustainability of the smallholder cattle farming system.

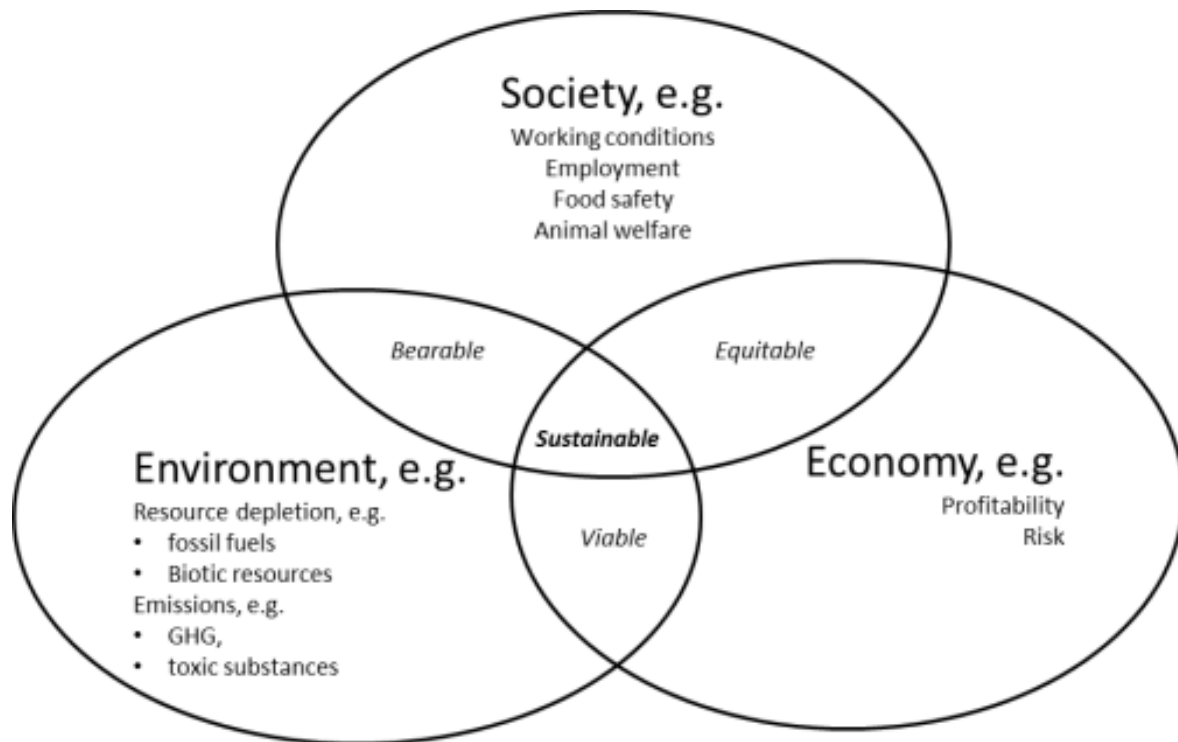
## **2.2 The concept of agricultural sustainability: Definition and its three pillars.**

The use of the word ‘sustainability’ has increased tremendously in the last decades (Kebreab, 2013). Therefore, the global agenda on sustainable agriculture is on a high note with strategies such the need to produce enough food for the growing population without further destruction to the environment being discussed. The concept of sustainability emerged in the 1970’s and has since been used to strengthen agricultural production systems by trying to address environmental and social concerns brought on by modern, industrial agriculture. Sustainability has been defined by many institutions, researchers and policy makers. Although it is a feature that many users rate highly in any given system, its exact definition remains elusive. Nevertheless, the most adopted definition is by the United Nations at the World Commission on Environment and Development in 1987 (Smithers *et al.*, 1993). The commission defined sustainable development as “meeting the needs of the present without compromising the ability of future generations to meet their own needs” (WECD, 1987). In agricultural terms it can be referred to as an agri-food system that is economically viable and meets the societal needs for safe and healthy foods, while preserving natural resources and the value of the environment for future generations [Maryland Development Plan (MDP), 2007]. Narrowing down to livestock farming, the European Federation for Animal production (EFAP, 2015) defined sustainability with a systems farm management perspective. It was defined as a system that is based on a commitment to continuous improvement, with performance gaps being identified and addressed, at the same time acknowledging the need uphold an appropriate balance of the three interdependent pillars of sustainability.

Such a broader understanding in terms of the contextualization of sustainability showed a shift from the initial focus on environmental issues to embrace first economic and then social issues (DFID, 2002). Therefore, in smallholder to emerging cattle farming systems this context can be

viewed in terms of their elasticity in buffering shocks and stresses (resilience) and their ability to move forward (persistence). Shocks and stresses are the challenges and constraints that affect them meeting the sustainability goals.

As implied in most of the definitions, the concept of sustainability has three major pillars which are inter-reliant and mutually reinforcing namely; economic/profitability, environmental/ecological, and social/cultural (MDP, 2007) as depicted in figure 2.1.



**Figure 2.1:** The three pillars of sustainability

Source: Donnelly *et al* (2014. Pg 38).

### 2.2.1 The three pillars of sustainability defined:

*Environmental/Ecological* – the main issues involve the need to reduce negative ecological and health externalities, to enhance and use local ecosystem resources, and preserve biodiversity. Therefore, environmentally sustainable farming practices and interventions such as soil

conservation; land preservation can protect farming land and more importantly the local ecosystem (MDP, 2007).

*Economic/Profitability* – DFID (2002) asserted that economic perspectives on agricultural sustainability strive to assign value to ecological assets, and also to include a longer time frame in economic analysis. Therefore, economically sustainable practices help farmers to raise profits, reduce costs, and lessen financial risk (MDP, 2007).

*Social/Cultural* – there are many concerns about the equity of technological change. At the local level, agricultural sustainability is associated with farmer participation, group action and promotion of local institutions, culture and farming communities. Socially/culturally sustainable practices help to preserve farming culture and cultural artifacts, as well as creating strong community ties between farms and local residents (MDP, 2007). At the higher level, the concern is for enabling policies that target poverty reduction.

### **2.2.2 Sustainability issues around cattle farming in South Africa**

The perceived impact of cattle farming on the environment, climate change and societal welfare development needs to be understood. It is therefore important that, such issues are explored when designing strategies to improve the growth of emerging farmers as they are transitioning to being commercial farmers where these issues are currently subjected to a serious debate.

Agricultural production and all food production systems have an impact on climate change and environmental degradation (Meissener *et al.*, 2013). Global warming mainly influenced by greenhouse gases (GHG) has been reported to be threatening agriculture especially in the arid and semi-arid tropics (DFID, 2002). Livestock farming and changes in land use are being identified as the key sources to greenhouse gas (GHG) (methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) emissions (Scollan *et al.*, 2010), pollution, destruction to ecosystems and decline in biodiversity [World Wildlife Fund (WWF), 2010].

Sufficient genetic diversity and well maintained ecosystems improves the successful functioning and sustainable utilization of natural resources. Therefore, Meissner *et al.* (2013) asserted that the need to maintain biodiversity of flora and fauna species together with the related ecosystems has become a global concern. This has seen livestock production as the largest user of land resources which engages closely biodiversity, soil conservation and systems functioning of ecosystems (Scollan *et al.*, 2010). South Africa is not spared, given that close to 70% of its agricultural land is farmed under livestock (DAFF, 2006; WWF, 2010). Livestock degrades land, depletes water and biodiversity and causes pollution if the production systems in use are not well managed (Meissner, 2013). Besides plants species and other fauna, farm animal genetic resources are also an issue (DAFF, 2007). This is due to the loss of diversity through the introduction of huge number of exotic breeds with better productivity traits compared to local breeds. However, there is need for emerging farmers to understand that domestic animal diversity is important.

Harrison (1964) reported that during the early 1960s, the matter of whether farm animals were getting humane care started to be questioned. Currently, this is gradually getting attention globally with international guidelines for cattle use and care in livestock practices on farms, in transit, in sale pens, in feedlots, and also in intensive housing systems being put in place. The idea of animal welfare has emerged as one of the key public concerns regarding animal agriculture (Thompson *et al.*, 2011). In such a way, observing animal welfare issues become a component of sustainability and hence becomes part of different cattle farming systems. An understanding of this challenge allows the emerging farmers to uphold animal welfare and sustainability as a continuum. This will therefore help them to identify ways of improving cattle welfare and sustainability of their production systems.

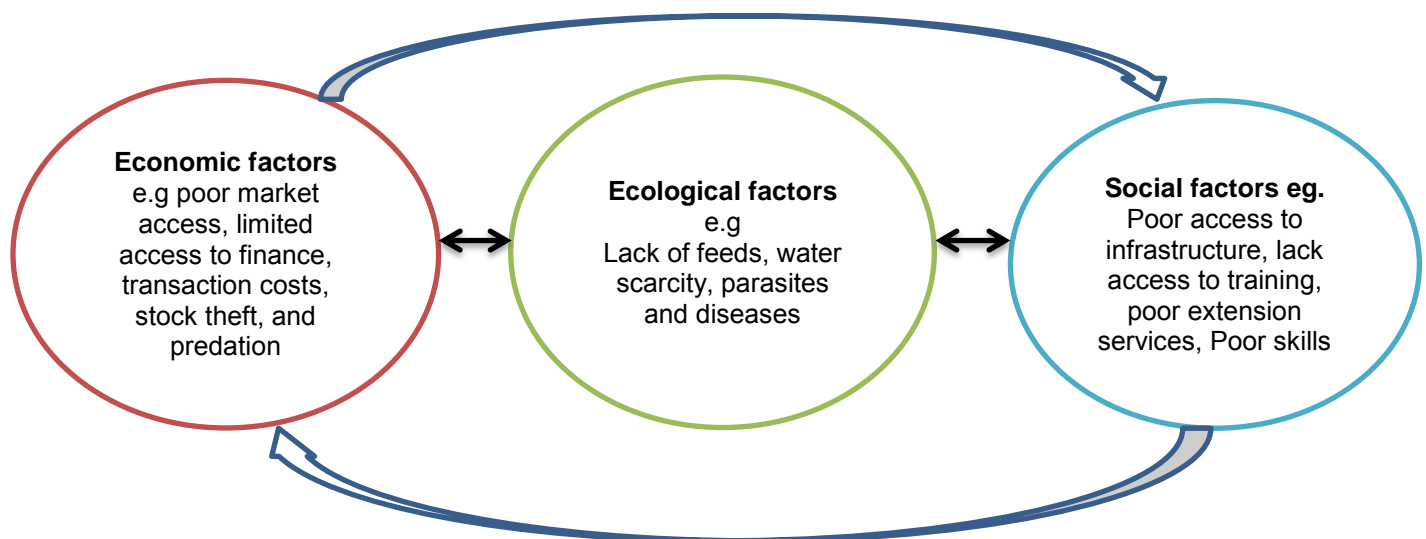
Kebreab (2013) argued that efforts and proposed ways to achieve sustainability are likely to be viewed differently by various stakeholders. It is notable that the demand for meat products that are produced in an alternative way to the conventional intensive system has increased significantly around the global markets in recent years (Shongwe *et al.*, 2007). Already some consumers believe that ecologically friendly or non-intensively produced meat (such as organic



meat) has higher nutritional value and tastes better than conventionally produced meat (Muchenje *et al.*, 2008). This is a clear indication that the power of how to produce and what to supply on the market is progressively shifting from supply side to the consumer.

### 2.3 The interaction between economic, ecological and social factors affecting cattle production

The economic, social and ecological related challenges and constraints confronting smallholders are interconnected. Therefore, ecological challenges may affect productivity of the farmer while economic profitability is linked to welfare growth of the society. Social factors on the other hand affect the ecological and economic performance of the farming systems. This system must be regarded as a whole, and any challenge or constraint should not be given less or more significance relative to others. Figure 2.2 illustrates some key connections.



**Figure 2.2:** interaction between economic, social and ecological factors of production

### 2.4 Challenges and constraints facing smallholder cattle producers in South Africa

DAFF (2012) stated that weakening of the smallholder sector agricultural performance is a major driving cause of poverty among such farming communities. Research on several aspects of the smallholder livestock production sector in South Africa has shown that productivity is still low and unsustainable (Ainslie, *et al.*, 2002; Montshwe, 2006; DAFF, 2012; IDC, 2016) hence the

sector has not reached its full potential. Therefore, support and ultimate recovery of the smallholder sector may offer the greatest prospects for rural populations to escape from poverty (DAFF, 2012) and hence improve sustainability of cattle farming. To improve sustainability of the sector, a systematic perspective which starts with understanding and profiling of the challenges and constraints facing the farmers before providing advice is necessary (IDC, 2016). However, the implication of each of the challenges and constraints might vary depending on production systems, climatic conditions as well as farmers' socio-economic conditions; hence research support is crucial (Mapiye, 2010). Invariably, such an in depth review assists in preparing policies, development strategies, programmes and models aimed at supporting and enhancing the transition of smallholder livestock farmers into commercial farmers (Khapayi and Celliers, 2016). This will hence improve the sustainability and food security contribution from smallholder cattle farming. Smallholder cattle farming in South Africa is faced with various challenges and constraints that affect its sustainability and contribution towards food security relative to commercial farmers (Baloyi, 2010; DAAF, 2012). Some of the main challenges and constraints are reviewed under this section.

#### **2.4.1 Unavailability of feed resources**

Lack of feeding resources has been identified as a serious constraint to cattle productivity (Harding *et al.*, 2007) among the smallholder producers. Tolera *et al.*, (2012) classified cattle feed resources used by smallholder farmers as natural pastures/rangelands, crop residues, improved pasture and forage and industrial processed feed products. Rangelands are the most commonly used feed resources for ruminants in the tropics (Pen, 2010; Mutibvu, *et al.*, 2012) and particularly in South Africa (Mapiye, *et al.*, 2009). Environmental issues such as global warming threaten feed availability especially in the arid and semi-arid tropics and expected impacts will be in the form of frequent droughts, poor rainfall distribution and high temperature (DFID, 2002). Average temperature are expected to rise by 1.5 °C to 2 °C in Southern Africa and the region may become drier (Meissener, *et al.*, 2013). Also, rainfall projections are already confirming significant reductions of up to 40mm/annum in the eastern parts of Limpopo and Mpumalanga, the south-western Cape and the Cape south coast

(Meissener *et al.*, 2013). Therefore, quantity and quality of rangelands feed resources vary with ecological factors such as season. It usually declines substantially during the dry season and this is a common challenge in South Africa's drier zones (Masikati, 2010). Limpopo is one such an area where most ruminants in rural areas feed on low quantity roughages during the dry seasons. Land degradation threatens the productivity of existing farmland and pastures with between 5 and 12 million hectares being lost due to severe degradation every year in developing countries (Pretty and Koohafkan, 2002). Livestock farming is one of the major causes of degradation especially in incidences of overgrazing which pre-dispose the soils to erosion.

Social issues such as farmers' cattle feeds and feeding management skills may determine the quantity and quality of feed resources available for feeding the animals. The availability of feeds is likely to be a major problem when farmers have poor feeds and feeding management skills (Pen, 2010). Munyai (2012) reported lack of knowledge on rangeland management and stocking rates. That leads to a decline in vigor and the eventual death of preferred species (biodiversity loss) in South Africa's smallholder farming communities. Also, social issues such as communal ownership and the allocation of rangelands rights by traditional leaders (Cousins, 1996) allows individuals to have free access to rangeland resources hence leading to lack of individual control. Lack of individual control by farmers has consequently led to poor management and protection of the natural grazing lands and complicates the introduction of improved management practices (Cousins, 1996).

In Limpopo Province cattle feed shortage is a severe constraint to communal and emerging cattle farmers (DAFFnews, 2016). The challenge is ascribed to drought conditions prevailing in the province which has resulted in farmers losing their livestock due to starvation (DAFFnews, 2016, SABCNews, 2016). LDA (2016) has cited the shortage of funding to purchase supplementary feeds for the cattle during drought periods. The allocated R50 million for 2015/2016 has seen emerging farmers receiving supplementary feeds for their cattle in some severely affected districts in the province. Further research on the development of alternative feed resources and feeding strategies as well the capacity of farmers to preserve and conserve

feed resources in the province is necessary and more importantly how to share such information among farmers.

#### **2.4.2 Cattle parasites and diseases prevalence among smallholder farmers**

The prevalence of parasites and diseases constitute a major constraint to cattle production in the smallholder sector (Agholor, 2013). Animal parasites and diseases are highly prevalent and cause major impacts to livestock production in the tropical and subtropical regions despite being widespread globally (Masika, 1997). This is attributed to favorable climatic conditions and vegetation types that exist in the region compared to temperate regions. South Africa is located in the subtropical region and its cattle farming, particularly in the smallholder sector is greatly constrained by parasites and diseases.

Research showed that most farmers in the smallholder sector perceive ticks as the most important ecto-parasite that affects animal production and health (Dold and Cocks, 2001; Rajput *et al.*, 2006). According to DAFF (2008) ticks causes loss of blood, retardation in growth and loss of weight, irritation due to biting (tick worry) and hence reduced feed intake. Also by piercing the animal to suck blood, ticks cause damages to hides and skins, introduces toxins and predispose cattle to secondary infections and hence reduces animal health (Mtshali *et al.*, 2004, DAFF, 2008). In South Africa one of the main tick-borne diseases with a significant economic impact on cattle production in the smallholder sector is Cowdriosis (*ehrlichia ruminantium*) with common name Heart water.

Apart from external parasites, common internal parasites such as round worms and flukes cause major challenges in smallholder cattle farming. Livestock Health and Production Group (LHPG), (2014) stated that there was a notable increase in cases of internal parasites infestations in the country with new reports of wire worm and bankrupt worm have been reported. Musemwa *et al.* (2008) reported that cattle diseases and parasites prevalence is one of the most important factors has caused a decline in cattle productivity in South Africa's rural areas. Thus, animal health concerns affect the number and quality of animals and its products to be sold and in many cases increase morbidity and mortality hence they are barriers to trade

(Chawatama *et al.*, 2005; Mwacharo and Drucker, 2005). One of the major causes of parasites and disease transmission between different communities is uncontrolled movement of animals and animal products (Musemwa *et al.*, 2008). Despite cattle parasites and diseases being a challenge for smallholder farmers in Limpopo, the extent of the challenge to the emerging farmers has not been researched. There is scope for research to establish the problematic parasites and diseases confronting emerging farmers in the province and extent of the challenge imposed.

### **2.4.3 Scarcity of drinking water for cattle**

Major sources of water for cattle in the smallholder farming system include rivers (perennial and seasonal), dams, and boreholes (Amenu *et al.*, 2011). However, some of these sources are not reliable as they do not last throughout the year. Water from rivers and dams become turbid during the rainy season while some of these sources dry up during the off-rain period (Mutibvu *et al.*, 2012). Scarcity of water resources is increasing at a global scale and the severity of this development is expected to be high (Amede *et al.*, 2009). Climate change has largely influenced the state of global water security. This is depicted by frequent changes in rainfall distribution patterns coupled with frequent flooding and drought incidences (IFAD, 2009b). Moreover, Amede *et al.* (2009) argued that the incessant scarcity of water in Sub Saharan Africa is caused by the expansion of agricultural production, climate variability and more importantly inappropriate land use. Such incidences of water scarcity pose a huge constraint to cattle production (Mutibvu *et al.*, 2012).

The level of water use varies considerably with countries, production systems and management level of farmers (Ogunkoya, 2014). According to IFAD (2009b) smallholder farmers are seen as a potential danger to water resources due to poor management and bad farming practices such as destruction of vegetation close to water points which leads to siltation of water points. Poor understanding and appreciation of livestock-water interactions has led to low productivity, affected better decisions on water resource management and weakened the perception of good returns from water by farmers across sub-Saharan Africa (Munyai, 2012). The challenge of

water scarcity for emerging farmers has not been comprehensively studied in research work in Limpopo Province. Information regarding the constraint specifically for the emerging cattle farmers has only been reported by news agents such as eNCA (2016), South African Broadcasting Corporation (SABC) news (2016) and News24 (2016). Impact of the challenge to sustainability of cattle farming in the emerging sector in the province should be established from scientific research.

#### **2.4.4 Lack of access to markets and marketing information**

Markets have remained important means for ensuring effective integration of smallholder producers into the mainstream of national economies, especially in less developed countries (Jari and Fraser, 2009; Obi *et al.*, 2011). They provide direct opportunities for farm production to contribute towards poverty alleviation among smallholder cattle farmers through cash income realized from sales. They also drive production as farmers strive to meet demands offered in order to fetch better returns from sales. However, the existence and efficiency of these markets in many developing countries cannot be guaranteed (Obi *et al.*, (2011). Thus, Jari and Fraser, (2009) reported that, smallholder farmers do not have proper access to the markets hence; markets are failing to effectually perform their duties.

The South African beef cattle marketing industry has developed from a regulated environment to one that is completely uncontrolled since 1994 (Agholor, 2013). This has seen the industry having many marketing networks for livestock, particularly cattle such as the feedlot, auctions, speculators, abattoirs, butcheries as well as private sales (NDA, 1998). However, Obi *et al.* (2011) argued that, despite the significant investment and changing of the marketing system, smallholder farmers are still not able to sell on the formal markets. This is because, the already established commercial farmers are well connected and do have access to information and resources hence controls the markets. It is therefore difficult for the subsistence and emerging farmers to compete with the established farmers for market access (Jari and Fraser, 2009). Therefore, it seems deregulation of the markets has posed restraints that debar smallholder farmers' market access (Agholor, 2013).

Apart from accessing the markets, access to marketing information, allows the farmers to make rational and relevant decisions (Langaat *et al.*, 2016). This will put them on a better position when negotiating with buyers during transactions and consequently prevent them from exploitation by better informed buyers (Coetzee *et al.*, 2004). Poor access to agricultural information by communal farmers is one of the major factors that have largely encumbered agricultural development in developing countries (Bailey *et al.*, 1999). In a study conducted by Bailey (1999) marketing information needed by communal farmers includes prevailing market conditions, product quality and quantity demanded, product price and other opportunities that exist on the markets. Montshwe (2006) argued that in South Africa's smallholder sector the lack of reliable information by farmers is severe. The challenges of poor access to markets and marketing information by emerging cattle farmers were identified in studies conducted by Baloyi (2012); Sikhweni and Hassan (2013); Soji *et al.* (2015).

#### **2.4.5 Poor access to infrastructure**

Infrastructure is essential in facilitating production, distribution, processing, consumption and trade of agricultural products, thereby contributing towards food security. According to Baloyi, (2010) and African Monitor (2012), inadequate and unreliable infrastructure services are common challenges in the majority of rural communities in Africa. Lack of community production and marketing infrastructure (NERPO, 2004; Ngeno, 2008) has constrained cattle production among the smallholder farmers located in the communal areas of South Africa (NDA, 2008; DAFF, 2014). This has limited the expansion of the farmers in terms of income and growth of the farming businesses. Poor roads and road networks, for example, limits the capacity of farmers to transport inputs, produce and to access information. High transaction costs are also key elements limiting the progression of smallholder cattle farmers and it is largely attributed to lack of infrastructure (Machethe, 2004).

Production infrastructure directly influences the farmers' capacity to produce on the farm. It includes; irrigation facilities, dip tanks, energy, cattle handling facilities, fences, feedlots, information and communication technology (ICT) and water facilities (Ngeno, 2008; African

Monitor, 2012; Agholor, 2013). Marketing infrastructure supports the access to markets, distribution and exchange of produce and these include; sale pens, loading and off-loading ramps, abattoirs, ICT and roads (NERPO, 2004; Ngeno, 2008; Agholor, 2013). Lack of access to these facilities poses severe restraints to the marketing of cattle and cattle products (Mahabile *et al.*, 2002). Poor access to infrastructure is not only because the structures are unavailable but can also be ascribed to the non-functional state of the facilities. Monsthe *et al.* (2005) and Musemwa *et al.* (2008) found out that some of the smallholder cattle farming communities in South Africa have marketing facilities however the infrastructure is in poor state or is non-functional. It is therefore important for the public and private sectors in South Africa to support smallholder livestock farmers with adequate infrastructure support services to ensure successful participation in high-value markets (Baloyi, 2010).

Musemwa *et al.* (2008) suggested that smallholder farmers are likely to be constrained more by marketed-related challenges such as poor infrastructure as relative to other challenges such as parasites and diseases due resistance and tolerance

#### **2.4.6 Poor access to government extension services**

Extension services are among the most crucial services for rural people in developing countries (Akpalu, 2013). Investments in extension constitute a huge proportion of government spending in many developing countries. The South African agricultural extension service is constantly challenged by researchers to positively impact on food security, advance rural development through agricultural activity and hence increase employment opportunities (van Niekerk *et al.*, 2011). Therefore, government has continued to fund agricultural extension for improvement of cattle productivity and its multi-functionality in the smallholder sector (Ndoro *et al.*, 2014). However, access to extension agents by the smallholder farmers in South Africa is very poor (Akpalu, 2013; Munyai, 2012). Chikazunga and Paradza (2012) argue that there is no strong government extension system available to support the smallholder sector in South Africa. Mbo'o-Tchouawou and Colverson (2014) identified some of the major problems affecting the whole extension support services in the rural areas. These challenges include poor availability



of funds for supporting public extension and lack of extension resources (MacLeod *et al.*, 2010), bureaucratic structures, lack of commitment by smallholder farmers and more importantly lack of appropriate strategies for cooperative research and passable extension methods. Ndoro *et al.* (2014) reported that limited success of the extension programmes requires the need for revamping the extension model by making it more demand-driven and focusing on the needs of the farmers. Van Niekerk *et al.* (2011) proposed about five core activities that are required to improve the country's extension service. These include; facilitated training, integrated support systems, innovation, improved communication systems and capacity development; with all the activities having sub-activities. In relation to emerging cattle farmers in Limpopo, the challenge of poor access to extension is not well covered in literature. However, in a study by MacLeod (2010), the challenge was indicated. There is need to explore the level of the challenge in the province by looking at issues such as the current extension to farmer ratio, accessibility of the extension agents by the farmers and the level of transformation towards the farmer-centered approaches.

#### **2.4.7 Stock theft**

Stock theft has remained one of the problematic challenges confronting cattle farmers in the smallholder areas of South Africa (Ngeno, 2008; Ogunkoya, 2014). It causes severe economic losses and social hardships hence increases poverty among farmers (Khoabane and Black, 2012; Agholor, 2013). Maluleke (2015) reported that, despite a 31.2% overall decline in stock theft crimes reported to South Africa Police Services between 2005 and 2012, the challenge is still a reality in the face of livestock farmers. Stock theft challenge could be attributed to the fact that most smallholder farms are located in the communal areas where poverty and unemployment are very high (Khoabane and Black, 2012; KwaZulu-Natal Department of Community Safety & Liaison, 2010) leading to many people involved in cattle pilfering. However, this could be linked to poor fencing structures used by smallholder farmers (Ngeno, 2008) which allows cattle to easily move out of the boundaries. The lack of formal livestock registration or identification programmes and facilities which help in identifying animals is one of the challenges that predispose cattle to theft. Stock theft challenge for emerging cattle farmers in Limpopo Province

was discussed more in the context of smallholder farmers in general. A study by Sikhweni and Hassan (2013) tried to explore on stock theft at the emerging cattle farming level in the province. However, more research into issues such as the adoption and use of stock theft mitigation technologies and improved traceability measures is encouraged. The use of knowledge management and sharing strategies allows farmers to be well communicated and this may help to reduce theft and pilfering issues.

## **2.5 Smallholder farmer's social characteristics as constraints to sustainable cattle farming**

Characteristics such as education, age, gender, household size may have an influence on the decisions made by farmers and development of their farming enterprises (Guzman and Santos, 2001). Moloi (2008) asserted that farmer's income often differs according to farmer's characteristics such as education level, age of household head, household size and household size. According to Land Bank (2011), educational level enables farmers to effectively manage their farming operations. This implies that better educated farmers have more room for succeeding in the farming business. It is important to link these farmers' characteristics to availability of other factors such as infrastructure and institutional arrangements (Moloi, 2008). Wye (2003) acknowledged; appropriate training, socioeconomic conditions, and accessibility to extension services as factors that affect access to markets by smallholder farmers. Provided, the free market situation that prevails in South Africa, Moloi (2008) indicated that emerging farmers with low levels of education and receiving poor support will face challenges related to market access. Thus, education plays a key role as it assists smallholder farmers to understand and interpret information on the market, having improved production and marketing skills, and more importantly the ability of to communicate their business ideas to others (Montshwe *et al.*, 2005; Mohammed & Ortmann, 2005).

Age is a very important attribute concerning efficiency and decisions made by farmer .Older farmers possess more experience compared to young farmers who has a risk-taking attitude (Makhura, 2001). Ngqangweni and Delgado (2003) found out that older farmers were more

likely to invest in livestock compared to young farmers in Limpopo. However, age may affect the efficiency of farmers despite the farmer showing interest. Therefore, Land Bank (2011) asserted that the middle-aged farmers are likely to be more successful compared to older farmers. This was consistent with findings by Makhura (2001), who indicated that despite older farmers being found to be more likely to participate in markets, they significantly sold less compared to younger farmers. However, for a farmer who has been engaged in farming for a long time, the chance of success is higher (Land Bank, 2011).

Household size in the context of subsistence to emerging scale determines the productivity and hence overall income. Mathonzi (2000) found out that household size negatively impacted on farm income especially for households with a large size and majority of the members were not participating in the business. Women play a vital role in advancing agricultural development and food security in the world. They participate in many aspects of rural life e.g marketing of produce, tending animals, collecting water and wood for fuel, and caring for family members. There is still a huge gap in the process of promoting gender mainstreaming knowledge especially in the underdeveloped world. In Africa, although most agricultural activities are carried out by women [FAO, 2011, World Farmers Organization (WFO), 2016], large-stock, especially cattle are largely owned by males (Mapiye *et al.*, 2009). Therefore, the South African government is currently promoting and advocating the participation and involvement of women in all economic spheres, including agriculture and cattle farming.

## **2.6 Knowledge management in the livestock sector in South Africa**

### **2.6.1 An overview of the livestock extension system**

The agricultural sector has a mandate to improve rural development and this is through support service such as the provision of livestock extension services to the smallholder farmers. For this reason, the agricultural extension support service becomes an important part of the envisioned transformation process of the smallholder livestock industry in South Africa (Akpalu, 2013). The broad functions of the extension services department include; provision of technical advice and

training on application of technology in farming, promotion of farmer-to-farmer extension, participatory knowledge gathering and sharing, and timely provision of secondary data for soils, climate, prices and other services. Therefore, an effective extension support service should involve efficient and timely access by farmers to appropriate information.

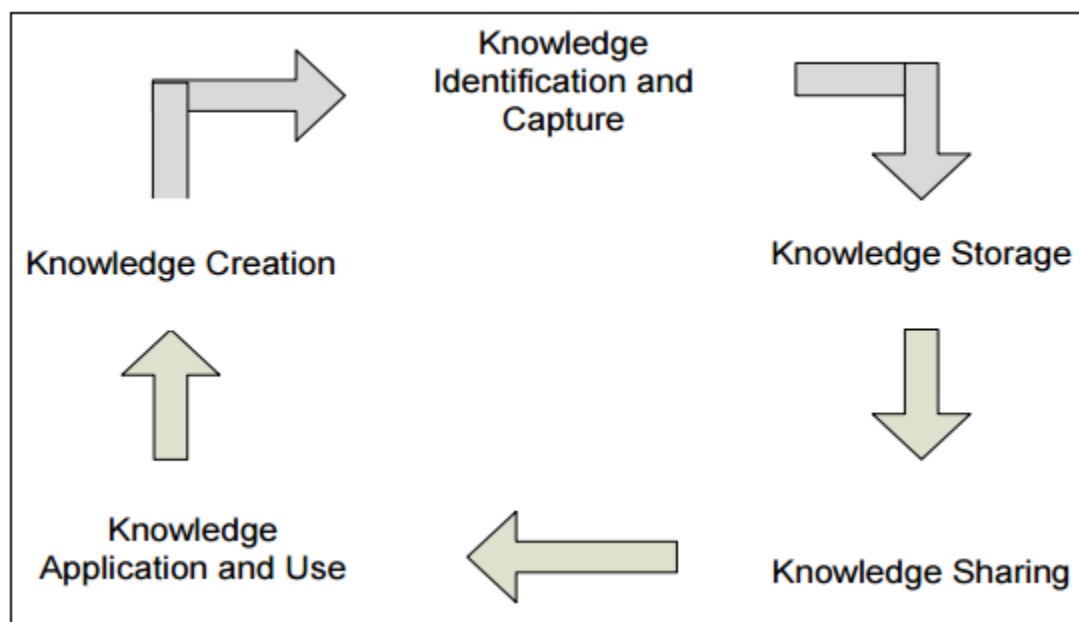
Historically during the Apartheid era, the extension system was prepared to service the white commercial farmers (Akpalu, 2013). This has led to the restructuring of the department of agriculture in 1994 leading to the introduction of provincial departments of agriculture for improved support towards the smallholder farmers. However, even after restructuring, the appropriate role of the extension support remained questionable throughout the country (Williams *et al.*, 2008). Moreover, there is a widespread concern that the agricultural extension service in South Africa is failing to provide enough support which is needed to realize growth of the livestock industry (Gwala, 2013). This is attributed to poor resources support (MacLeod *et al.*, 2010), weak or absence of management and lack of commitment (Gwala, 2013). According to FAO (2013), the frequency of farm visits by extension personnel to farming projects is associated with the availability of resources, staff and the nature of agricultural activity.

The limited success of extension programmes signifies the need for making the extension service delivery more demand-driven or exploring alternative agricultural extension approaches that focus more on the specific needs of farmers (Ndoro *et al.*, 2014). Besides the need to use new approaches to agricultural extension, the introduction of complementary strategies and tools that allow farmers to create, process and share extension messages on their own may be necessary.

### **2.6.2 Knowledge management: concepts, processes and tools**

United Nations Development Programme (UNDP) (2012) defined knowledge management as the fact or condition of knowing something with a considerable degree of familiarity acquired through experience, association or contact. Knowledge comprises the cumulative experiences, attitudes, and skills developed to enable the person to consistently, systematically and effectively perform a function (Seidman and McCauley, 2005). It is the fourth production factor

after labor, land and capital and is important in the agricultural sector (UNDP, 2012) as it determines the management ability of the farmer. Knowledge management is required in the development of smallholder livestock production in South Africa. It allows for the integration of explicit and tacit knowledge among farmers. Explicit knowledge being all aspects of formal, systematic, recorded, communicated and shared knowledge that is made accessible through a variety of information delivery systems. On the other hand tacit knowledge is regarded as highly personal, produced by doing, trial, error, reflection and revision (Nonaka and Takeuchi, 1995). According to Cong *et al.* (2007) knowledge management embraces processes and practices associated with the creation, acquisition, sharing and use of knowledge, skills and expertise follows a circular flow which continuously updates itself and does not stop as depicted in figure 2.3.



**Source: Cong *et al.* (2007. Pg 253)**

**Figure 2.3:** Knowledge management process

There must be sufficiently better knowledge than the existing one and systems of transmitting the knowledge for the circular flow in Figure 2.2 to take place well (NDP, 2012). It is important to realize that making appropriate knowledge accessible to farmers assists in improving production, productivity and positive returns (UNDP, 2012). So, if the smallholder cattle farming

in South Africa are not supported by appropriate agricultural knowledge and modern information management programmes, the sector is likely to remain trapped in low productivity.

### **2.6.3 The use of Information and Communication Technologies (ICTs) for the creation and dissemination of agricultural knowledge and information**

There has been significant progress in ICTs around the world. Sife *et al.* (2010) argued that ICTs have infiltrated nearly all segments of the society. This invariably includes the livestock, in particular, the cattle farming industry. Masika (2012) stated that there is need to bring in innovation to enhance use of mobile technology for farming as is what happens to banking through e-banking services. In farming, ICTs seem perfectly suited to the chore of improved interaction among farmers or stakeholders since they can expand communication, collaboration, and ultimately innovativeness among the growing array of actors in agriculture (Sife *et al.*, 2010). ICTs, especially mobile phones, can drive participatory communication, including communication from those on the margins of traditional research-extension processes. They are expected to play a significant role in supporting the many reforms that are needed to develop subsistence and emerging farmers. Thus, many developing economies want to effectively meet food security needs, improve market development, and reduce climate change challenges (Christoplos, 2010).

### **2.6.4 Applications of web-based applications in information creation and sharing**

Due to the expansion of telecommunication networks, the speed, reliability, and accuracy of information exchange through text, voice, and applications between farmers and other stakeholders has also increased (Rudgard, 2011). ICTs are believed to have alleviated the problems inherent in interactions among people for instance farmers in dispersed locations and hence improved knowledge sharing and multi-stakeholder engagement. The use of web-based databases as knowledge sharing platforms by smallholder farmers is expected to improve productivity among these farmers.

As digital literacy and the availability of ICTs increases in South Africa (Gillwald *et al.*, 2012), farmers, extension staff and other stakeholders in the cattle farming industry can make use of the management database to communicate at a small fee. Such, a semi-private arrangement can widen the availability of cattle farming information in rural areas and reduce pressure on public extension agents (Rudgard, 2011). ICTs have proved to have great potential in transforming the way agricultural extension is systematized and delivered and this includes interactions with farmers. Such potential has seen some developing countries moving quickly by enabling farmers to interact or share ideas in real time (or close to it) with their extension agents. Rudgard (2011) asserted that before the use of ICTs as channels of communications many farmers had to wait for a very long time for extension agents to respond to their consequences and give advice and often that advice would not be able to address their immediate concerns. The following communication management platforms exemplify some of the ICT applications that have been used effectively to necessitate interactions and sharing of technical knowledge between researchers, farmers and advisory services in different countries.

#### 2.6.4.1 Data sharing and use of ICTs in agriculture: Case study of small farmer groups in Colombia

**Project AESCE (Sharing Experiences for Site Specific Agriculture)**

The Decision and Policy Analysis (DAPA) Program and The Fruit Growers' Association of Colombia (ASOHOFrucol) project, financed by the Colombian National Fund for the Promotion of Horticultural and Fruit Production (FNFH), are data sharing platforms that were designed to assist fruit growers in decision making through sharing of multiple types of information, including tacit knowledge, from multiple sources. ASOHOFrucol chose four crops (mango, citrus, plantain and avocado) to pilot the exchange of knowledge between fruit growers in 12 departments of Colombia with an online platform. The project promoted three principles: (i) a culture of measurement based on the maxim that "what you don't measure you cannot manage"; (ii) collective knowledge is more powerful than individual; and (iii) modern ICTs facilitate information exchange and dialogue.

An essential feature of this framework is that farmers themselves had to participate in the capture and transmission of data concerning both their farms and production experiences. Furthermore, in order to take advantage of collective knowledge, the data from individual farms had to be standardized and compiled in databases so that it can be analyzed as an ensemble and the knowledge generated returned to the farmers for interpretation as an aid to decision making.

Source: Howland *et al.*, (2015)



#### 2.6.4.2 Informing extension agents through ICT management database: A case of VERCON in Egypt



The screenshot displays the VERCON website interface. At the top, a banner features a logo of a computer monitor with a graph and the text "Virtual Extension & Research Communication Network". Below the banner, the page is organized into three main columns.

**Left Column (Navigation Menu):**

- The VERCON Community**
- Browse Extension Docs.**
- Consult the Expert**
  - Wheat Expert System
  - Rice Expert System
  - Bean Expert System
  - Grapes Expert System
  - Tomato Expert System
- Search DBs**
  - Extension Documents
  - Economics and Statistics
  - Growers Problems
- Contact us**

**Middle Column (What is VERCON?):**

**What is VERCON ?**

The Virtual Extension and Research Communication Network (VERCON) aims to harness the potential of the Internet and apply it to strengthening and enabling linkages among the research and extension components of the national agricultural knowledge and information system. The overall goal of VERCON is to improve, through strengthened research-extension linkages, the agricultural advisory services provided to Egyptian farmers and in particular to resource poor farmers in order to increase production in food and agriculture with the goal of raising farm incomes.

**Right Column (VERCON Login):**

**VERCON Login**

Username

Password

[Arabic](#) [Login](#)

If you're a new user, please [Click Here](#) to create a user name and password

**Collaborators**

- Food And Agriculture Organization (FAO)
- Central Lab. for Agricultural Expert Systems (CLAES)
- Economic Affairs Sector
- Agricultural Extension and Rural Development Research Institute
- Central Administration of Agricultural Extension Services (CAAES)
- Central Administration for Agricultural Research & Experimental Stations
- Agricultural Directorate of Kafr El-Sheikh
- Armon Extension Center
- Khademia Extension Center

**News**

- News
- Airing times of the Land Secrets program
- Training courses
- Conferences
- Workshops/Seminars

Egypt launched a Virtual Extension and Research Communication Network (VERCON) in 2000 to develop and strengthen links among the research and extension components of the national agricultural knowledge and information system. VERCON was established to harness the

potential of the Internet and apply it in strengthening and enabling linkages among the research and extension components of the national agricultural knowledge and information system. The overall goal of VERCON is to improve, through strengthened research-extension linkages, the agricultural advisory services provided to Egyptian farmers and in particular to resource poor farmers in order to increase production in food and agriculture with the goal of raising farm incomes.

VERCON introduced and tested several innovative communication tools. One of the most useful tools is the Farmers' Problems Database, created explicitly to address farmer's problems. The web interface enables extension agents to pose questions on behalf of farmers seeking solutions to agricultural problems; they can also examine answers to questions already posed to researchers. Content is classified into four main categories: production, administration, environment, and marketing.

The online database and tracking system enable farmers' questions to flow from provincial extension centers to the national extension directorate and research system. Farmers approach extension centers with problems, and if they cannot be solved using online resources such as extension bulletins or agricultural expert systems, the extension agent develops a full description of the problem and his/her proposed solution, which is forwarded to a specialized researcher who provides advice to address it (Beltagy *et al.*, 2009). The problems and solutions are added to the online database to assist other users of the network who face similar problems.

Aside from addressing farmers' problems, the system provides valuable information to track farmers' problems, including their incidence and significance. The system makes farmers' problems more visible and quantifiable for research planners, and chronic problems can be addressed in research projects. Since 2006, over 10,000 problems and their solutions accumulated in the interactive database, and over 26,000 farmers benefited from the system (FAO 2008).

Sources: Rudgard (2011); [http://www.fao.org/sd/2001/KN1007\\_en.htm](http://www.fao.org/sd/2001/KN1007_en.htm); [http://www.vercon.sci.eg/Vercon\\_en/vercon.asp#](http://www.vercon.sci.eg/Vercon_en/vercon.asp#).

#### 2.6.4.3 The use of a web-based tool to facilitate research collaboration by the Nile Basin Development Challenge (NBDC) in Ethiopia

NBDC uses web-based collaboration tools and approaches. These are frequently described as “Web 2.0” or “social media” and they are used to facilitate research collaboration among stakeholders. The key features of such tools are that they are web-based, free or very low cost, and very easy to use; they encourage interactions between people; and they offer ways to integrate different types of information from different perspectives.

The “Web 2.0” tools are used by the Nile Basin Development Challenge (NBDC) (<http://www.nilebdc.org>) in Ethiopia. The NBDC initiative is funded by the CGIAR challenge Program on Water and Food to work with numerous national partners and a group of international centers to improve the resilience of rural livelihoods in the Ethiopian highlands. Web-based applications are used in the project to support interaction and sharing among the project team members and to communicate messages to wider audiences and stakeholders:

The project has a shared wiki space where project members’ document activities and plans. This space has been used, for example, to share meeting agendas and reports, discuss issues, and share files.

The project has a private conversation space on Yammer (<https://www.yammer.com/>), a social networking site for corporate purposes, where project members share updates, questions, and announcements.

The project has a DSpace (<http://www.dspace.org/>) document repository where all public reports and resources from the projects are indexed and made accessible.

A blog is used as a website with regular stories and updates from the project.

Updates and news are spread across social networking sites like Facebook and Twitter.

The project uses social media tools like Flickr to share photos, slide share to publish presentations and posters online, and Blip.tv to publish video and film. Such a web-based approach also requires complementary face-to-face, print, and offline tools and approaches to really engage with the rural communities “on the ground.”

Source: Rudgard (2011).

## 2.7 Summary

Cattle production in the smallholder is generally characterized by many challenges and constraints. These include shortage of feeding and water resources, parasites and diseases prevalence, poor access to markets and marketing information, lack of production and marketing infrastructure, poor access to extension services and cattle theft. Efficiency of the government agricultural extension system is highly questionable. Given such constraints that characterize the smallholder sector in general, it is therefore necessary to investigate challenges associated with the emerging cattle farming sector in South Africa. Also, an assessment of the level of knowledge creation among emerging farmers, their sources of information and communication methods needs to be done. This is in order to develop better strategies to improve the sustainability (ecological, economic and welfare development) of beef farming. There, are new alternatives such as the use of ICT based applications to support knowledge creation and sharing among farmers themselves. Since models of such systems are being implemented in some countries, emerging farmers in South Africa need to be exposed to such developmental strategies for improved cattle production.

## References

- African Monitor. (2012). Rural Infrastructure in Africa: Unlocking the African moment. Development support Monitor-paper series No. 1, 2012.
- Agholor, I. A. (2013). Analysis of Constraints of Rural Beef Cattle Cooperative Farmers: A Case Study of Ga-kibi, Norma and Mogalakwena in Blouberg. *Journal of Agricultural Science*; 5 (8):76-86.
- Ainslie, A., Kepe, T., Ntsebeza, L., Ntshona, Z. & Turner, S. (2002). Cattle ownership and production in the communal areas of the Eastern Cape, South Africa. Research Report no. 10. University of the Western Cape.
- Akpula, D. A. (2013). Agriculture extension service delivery in a semi-arid rural area in South Africa: The case study of Thorndale in The Limpopo Province. *African Journal of Food, Agriculture, Nutrition and development*, 13(4): 8034-8057.
- Aliber, M. & Hall, R. (2012). Support for smallholder farmers in South Africa: Challenges of scale and strategy. *Development Southern Africa*, 29(4):548-562.
- Amede, T., Descheemaeker, K., Peden, D. & van Rooyen, A. (2009a). Harnessing benefits from improved livestock water productivity in crop–livestock systems of sub-Saharan Africa: synthesis. *The Rangeland Journal*, 31:169–178.
- Amenu, K., Markemann, A., oßler, R. R., Siegmund-Schultze, M. & Z´arate, A. V. (2011). Perceived Feed and Water Constraints for Livestock Production in Lume and Siraro Districts, Ethiopia.
- Bailey, D., Barrett, C.B., Little, P.D. & Chabari, F. (1999). Livestock markets and risk management among East African pastoralists: A review and research agenda, Utah University, USA.

- Baloyi, J. K. (2010). An analysis of constraints facing smallholder farmers in the Agribusiness value chain: A case study of farmers in the Limpopo Province, Department of Agricultural Economics Extension and Rural Development, Faculty of Natural and Agricultural Sciences, University of Pretoria.
- Beef daily magazine. (2016). Vet's Opinion: Three Beef Industry Challenges That Won't Go Away Soon. <http://beefmagazine.com/blog/three-beef-industry-challenges-won-t-go-away-soon>
- Chawatama, S., Mutisi, C. & Mupawaenda, A.C. (2005). The socio-economic status of smallholder livestock production in Zimbabwe: a diagnostic study. *Livest. Res. Rur. Dev.* 17(12). <http://www.cipav.org.co/lrrd/lrrd17/12/chaw17143.htm>.
- Chikazunga, D. & Paradza, G. (2012). Can smallholder farmers find a home in South Africa's food-system? Lessons from Limpopo Province. The Institute for Poverty, Land and Agriculture Studies, (PLAAS) Blog. <http://www.plaas.org.za/blog/can-smallholder-farmers-find-home-south-africa%E2%80%99s-food-system-lessons-limpopo-province>.
- Christoplos, I. (2010). Mobilizing the potential of rural and agricultural extension. Rome, Italy: Food and Agriculture Organization (FAO) of the United Nations and the Global Forum for Rural Advisory Services. <http://www.fao.org/docrep/012/i1444e/i1444e.pdf>.
- Coetzee, L., Montshwe, B.D. & Jooste, A. (2004). The Marketing of Livestock on communal lands in the Eastern Cape Province: constraints, challenges and implications for the extension services. *South African Journal of Agricultural Extension*, 34 (1): 81-103.
- Cong, X., Li-Hua, R., & Stonehouse, G. (2007). Knowledge management in the Chinese public sector: empirical investigation, *Journal of Technology Management in China*, 2 (3): 250 - 263.
- Cousins, B. (1996). Livestock production and common property struggles in South Africa's agrarian reform. *Journal Peasant Studies*, 23: 166–208.

- Cousins, B. (2010). What is a 'Smallholder'? Class Analytic Perspective on Small-scale Farming and Agrarian Reform in South Africa. *Reforming Land and Resource Use in South Africa: Impact and Livelihoods*, 6:86-111.
- DAFF. (2012). Strategic Plan for the 2012/13-2016/17. Department of Agriculture Fisheries and Forestry, South Africa. <http://www.nda.agric.za/doaDev/topMenu/StratPlan201213-201617.pdf>: Accessed on the 2nd of April 2016
- DAFF. (2006). Livestock Development Strategy for South Africa 2006-2015. Investing in the potential of the livestock sector resource base for lasting animal agriculture. Plus, a companion document: Natural Resource Base Implementation Framework for the Livestock Development Strategy. Pretoria.
- DAFF. (2007). National Plan for Conservation and Sustainable use of Farm Animal Genetic Resources. Report submitted for the 2015/16 Strategic Output of the Department of Agriculture, Forestry and Fisheries. South Africa.  
<http://www.nda.agric.za/doaDev/sideMenu/geneticResources/docs/National%20Plan.pdf>.
- DAFF. (2008). The effects of ticks on animals. Resource Centre, Directorate Agricultural Information Services, Pretoria, South Africa.  
[http://www.nda.agric.za/docs/Infopaks/Livestok\\_EffectTik.pdf](http://www.nda.agric.za/docs/Infopaks/Livestok_EffectTik.pdf) .Accessed on 12/11/2016
- DAFF. (2014). Economic Review of the South African Agriculture. The Directorate: Statistics and Economic Analysis, Department of Agriculture, Forestry and Fisheries, Pretoria, South Africa. [http://www.agrisa.co.za/wp-content/uploads/2015/10/Economic-Review-2014\\_15-Final.pdf](http://www.agrisa.co.za/wp-content/uploads/2015/10/Economic-Review-2014_15-Final.pdf) Accessed on the 26th of June 2016
- DAFFnews. (2016). General Cele deliberates on Drought, Limpopo province. *Essential tips to overcome the impact of drought*. DAFFnews- Official newsletter of the Department of Agriculture, Forestry and Fisheries.  
<http://www.daff.gov.za/docs/agrinews/febnews16.pdf>. Accessed on 12/11/2016

DFID. (2002). Sustainable Agriculture. Resource Management Keysheet 10. DFID: London, UK.

Dold, A.P. & Cocks, M.L., 2001. Traditional veterinary medicine in the Alice District of the Eastern Cape Province, South Africa. *South African Journal of Science*, 97 (9 & 10): 375-379.

Donnelly, K. A. M., Olsen, P., Vidarsson, J. R. & Ziegler, F. (2014). Supply chain expectations for tool to calculate sustainability of white fish products at a batch level. Nofima. <https://nofima.no/filearchive/Rapport%2043-2012.pdf>

ENCA. (2016). Thousands of livestock being killed in Limpopo due to drought. Online article reported on Thursday 7 January 2016 - 4:11pm. Africa News Agency, South Africa. <https://www.enca.com/south-africa/five-thousand-livestock-killed-limpopo-due-drought>.

European Federation for Animal Production (EAAP). (2015). Sustainable livestock production in Europe: A question of food security climate and innovation. EU- Policy paper. [http://www.eaap.org/wp-content/uploads/2015/11/Sustainable\\_livestock\\_A4\\_AW\\_261015\\_LoRes.pdf](http://www.eaap.org/wp-content/uploads/2015/11/Sustainable_livestock_A4_AW_261015_LoRes.pdf).

FAO. (2008). "Report of the 2ndExpert Consultation on International Information Systems for Agricultural Science and Technology, Rome, 23–24 September 2007." Rome. [http://www.iaald.org/docs/iisast2\\_report.pdf](http://www.iaald.org/docs/iisast2_report.pdf).

FAO. (2009). The state of food and agriculture- Livestock in the balance. Rome, Italy, Food and Agriculture Organisation of the United Nations. <http://www.fao.org/docrep/012/i0680e/i0680e.pdf>.

FAO. (2010). A review of experiences of establishing emerging farmers in South Africa. Case lessons and implications for farmer support within land reform programmes. Food and Agriculture Organization of the United Nations Rome.



- Franzel, S. Carsan, S., Lukuyu, B., Sinja, J. & Wambugu, J. (2010). Fodder trees for improving livestock productivity and smallholder livelihoods in Africa, *Current Opinion in Environmental Sustainability*, 6: 98–103.
- Fraser, D. (2008b) *Understanding Animal Welfare: the Science in its Cultural Context*. Wiley-Blackwell, Oxford.
- Frequin, S., Anseeuw, W., and D'haese, M. (2012). *Demystifying contract farming: evidence from rural South Africa*. Department of Agricultural Economics. Ghent University. Belgium.
- Gilwald. A., Moyo, P. & Stork C. (2012). *Understanding what is happening in ICT in South Africa. A supply- and demand side analysis of the ICT sector*. International Development Research Centre.  
[http://www.researchictafrica.net/publications/Evidence\\_for\\_ICT\\_Policy\\_Action/Policy\\_Paper\\_7\\_-\\_Understanding\\_what\\_is\\_happening\\_in\\_ICT\\_in\\_South\\_Africa.pdf](http://www.researchictafrica.net/publications/Evidence_for_ICT_Policy_Action/Policy_Paper_7_-_Understanding_what_is_happening_in_ICT_in_South_Africa.pdf).
- Guzman, J. & Santos, F. (2001). The booster function and entrepreneurial quality: An application to the province of Seville. *Entrepreneurship and Regional Development*, 13: 211-228
- Gwala, L. (2013). *Effect of Agricultural Extension Services on Beneficiaries of the Nguni Cattle Project: The case of Ncera and Kwezana villages, Eastern Cape Province, Dessertetaion*, MSc Agricultural Extension, Department of Agricultural economics, University of Fort Hare
- Harding, M., Quirke, D. & Werner, R. (2007). *Cattle and buffalo in Cambodia and Laos, The economic and policy environment for small-holders*. Project final report, ACIAR, Australia.  
<http://aciarc.gov.au/files/node/5196/Final%20Report%20PLIA-2006-012%20part%202.pdf>.
- Harrison, R. (1964). *Animal Machines: the New Factory Farming Industry*. Vincent Stuart Ltd, London.

- Herrero, M., Grace, D., Nsuki, J., Johnson, N., Enahoro, D., Silvestri, S. & Rufino, M.C. (2013). The role of livestock in developing countries. *International Journal of Animal Bioscience*, 7:3-18.
- Howland, F., Muñoz, L, A., Staiger-Rivas, S., Cock, J. & Alvarez, S. (2015). Data sharing and use of ICTs in agriculture: working with small farmer groups in Colombia. *Knowledge Management for Development Journal* 11(2): 44-63 <http://journal.km4dev.org/>
- International Fund for Agricultural Development (IFAD). (2009b). Livestock and climate change. Livestock thematic papers.
- Jari, B. & Fraser, G.C.G. (2009). An analysis of institutional and technical factors influencing agricultural marketing amongst smallholder farmers in the Kat River Valley, Eastern Cape Province, South Africa. *African Journal of Agricultural Research*, 4(11):1129 – 1137
- Khapayi, M. & Celliers P. R. (2016) Issues and constraints for emerging farmers in the Eastern Cape Province, South Africa. *African Journal of Agricultural Research*, 10(41):3860-3869.
- Khoabane, S. & Black, P. (2012). On the economic effects of livestock theft in Lesotho: An asset-based approach. *Journal of Development and Agricultural Economics* Vol. 4(5), pp. 142-146, Available online at <http://www.academicjournals.org/JDAE>.
- Kouba, M. (2003). Quality of organic animal products. *Livestock Production Science*. 80: 33-40.
- Land Bank. (2011). Addressing Challenges of Financing Emerging Farmers. Agricultural Economic Research and Innovation Service (AERIS), Land and Agricultural Development Research (LADR) Report No 1 / 2011.
- Langat, R., Litondo, K. O. & Ntale, J. F. (2016). Information Communication Technologies and marketing decisions among small scale farmers in Kenya: Review of evidence, *International Journal of Economics, Commerce and Management*, United Kingdom, 4 (4):1167-1180.

- Larson, D., Otsuka, K., Matsumoto, T. & Kilica, T., (2014). Should African rural development strategies depend on smallholder farms? An exploration of the inverse-productivity hypothesis. *Agricultural Economics*, 45:355-367.
- Livestock Health and Production Group (LHPG). (2014). Livestock Diseases Trends. Monthly report on livestock disease trends in South Africa, Livestock Health and Production Group (LHPG) of the South African Veterinary Association (SAVA). <http://www.farmersweekly.co.za/animals/cattle/livestock-disease-trends-october-2014/> Accessed on 12/11/2016.
- MacLeod, N, D., McDonald, C.K. & van Oudtshoorn, F.P. (2010). Challenges for emerging livestock farmers in Limpopo province, South Africa, *African Journal of Range & Forage Science*, 25 (2): 71-77.
- Mahabile, M., Lyne, M.C. & Panin, A. (2002). Factors affecting the productivity of communal and private livestock farmers in Southern Botswana: A descriptive analysis of sample survey results. *Agrekon* 41(4):326–336.
- Makhura, M. T. (2001). Promoting market participation in small-scale agriculture in the Northern Province. An outline paper presented at a seminar organised by NIEP, LAPC and the University of Pretoria on market access. Agrivillage, Northern Province Department of Agriculture, Pietersburg.
- Mapiye, C., Chimonyo, M., Dzama, K., Raats, J.G. & Mapekula, M. (2009). Opportunities for improving Nguni cattle production in the smallholder farming systems of South Africa. *Livestock Science* 124: 196-204.
- Mapiye, C., Chimonyo, M., Dzama, K., Strydom, P.E. & Muchenje, V. (2010). Meat quality attributes of Nguni steers supplemented with *Acacia* karroo leaf-meal. *Meat Science*, 8(4): 621-627

- Masika, P. J., Sonandi, A. & Van Averbek, W. (1997). Tick control by small-scale cattle farmers in the central Eastern Cape Province, South Africa. *Journal of the South African Veterinary Association* (1997) 68(2): 45–48 (En.). Farming Systems Research and Extension Unit, ARDRI, University of Fort Hare, Private Bag X1314, Alice, 5700 South Africa.
- Mathonzi, T.M. (2000). Effects of market orientation on income and food security of Small-scale irrigation Farmers in South Africa's Northern Province. Master's Thesis , University of the North, South Africa.
- Mbo'o-Tchouawou & Colverson, K. (2014). Increasing access to agricultural extension and advisory services: How effective are new approaches in reaching women farmers in rural areas? International Livestock Research Institute (ILRI).  
[http://www.fsnnetwork.org/sites/default/files/PR\\_extension%20services.pdf](http://www.fsnnetwork.org/sites/default/files/PR_extension%20services.pdf).
- MDP. (2007). The 2007 Census of Agriculture: Sustainability Practices on Maryland's Farms. [http://www.mdp.state.md.us/msdc/census\\_agriculture/2007/Sustainability/CensAgriculture2007\\_Sustainability.pdf](http://www.mdp.state.md.us/msdc/census_agriculture/2007/Sustainability/CensAgriculture2007_Sustainability.pdf). Accessed on 13/12/2016
- Meissner, H., Scholtz, M. & Palmer, A. (2013). Sustainability of the South African livestock sector towards 2050. Part 1: worth and impact of the sector. *South African Journal of Animal Science*, 43(3):282-297.
- Moloi, M. J. (2008). A Comparison of Socio-economic Characteristics that Determine the Farm Income of Emerging Livestock and Horticultural Farmers in South Africa. MSc Thesis, Unpublished. Department of Agricultural Economics University of Limpopo.
- Montshwe, D.B. (2006). Factors affecting participation in mainstream cattle markets by small-scale cattle farmers in South Africa. MSc Thesis, University of Free State, RSA.
- Mtshali, M.S., de Waal, D.T. & Mbat, P.A., (2004). A sero-epidemiological survey of blood parasites in cattle in the north-eastern Free State, South Africa. *Onderstepoort Journal of Veterinary Research*, 71:67-75.

- Muchenje, V., Dzama, K., Chimonyo, M., Strydom, P.E., Hugo, A. & Raats, J.G., (2008). Sensory evaluation and its relationship to physical meat quality attributes of beef from Nguni and Bonsmara steers raised on natural pasture. *Animal* 2 (11): 1700-1706
- Munyai, F.R. (2012). An evaluation of socio-economic and biophysical aspects of small-scale livestock systems based on a case study from Limpopo province: Muduluni village. PhD thesis. University of the Free State, Bloemfontein.
- Musemwa, L., Mushunje, A., Chimonyo, M., Fraser, G., Mapiye, C. & Muchenje, V. (2008). Nguni cattle marketing constraints and opportunities in the communal area of South Africa. *African Journal of Agricultural Research*, 3(4):239-245.
- Mutibvu, T, Maburutse, B., E. Mbiriri, D., T, & Kashangura, M., T. (2012) Constraints and opportunities for increased livestock production in communal areas: A case study of Simbe, Zimbabwe. *Livestock research for Rural Development* 24(9).
- Mwacharo, J.M. & Drucker, A.G. (2005). Production objectives and management strategies of livestock-keepers in Southeast Kenya: implications for a breeding programme.
- National Emergent Red Meat Producers Organisation (NERPO). (2004). Marketing infrastructure development. <http://www.nerpo.org.za>.
- Mohammed, M.A., & Ortmann, G.F. (2005). Factors Influencing Adoption of Livestock Insurance by Commercial Dairy Farmers in Three Zibatat of Eritrea. *Agrekon*, 44(2):172-186.
- National Treasury (South Africa) & Gordhan, P. (2010). Budget speech, 2010. National treasury. <http://www.treasury.gov.za/documents/national%20budget/2010/speech/speech2010.pdf>.
- Ndoro, J. T., Mudhara, M. & Chimonyo, M. (2014). Livestock Extension Programmes Participation and impact on Smallholder Cattle Productivity in Kwazulu-Natal: A Propensity Score Matching Approach. *South African Journal of Agricultural Extension*, 42(2): 62 – 80.

- Nqeno, N. (2008). Reproductive Performance of Cows in Sweet and Sour Veld Types Under Communal Production Systems in the Eastern Cape Province of South Africa. MSC Thesis, Department of Livestock and Pasture Science, University of Fort Hare.
- Ngqangweni, S., & Delgado, C. (2003). Decision on livestock keeping in the semi-arid areas of Limpopo province. Working paper. University of Pretoria. Pretoria.  
<http://ageconsearch.umn.edu/bitstream/18037/1/wp020029.pdf>.
- Nonaka, I. & Takeuchi, H. (1995). The Knowledge Creating Company. USA: Oxford University Press.
- NPC. (2011). National Development Plan: Vision for 2030. Pretoria: National Planning Commission.  
<http://www.poa.gov.za/news/Documents/NPC%20National%20Development%20Plan%20Vision%202030%20-lo-res.pdf>.
- Obi, A., van Schalkwyk, H., D. & Tilbur, A. (2011). Market access, poverty alleviation and socio-economic sustainability in South Africa. In H. D. van Schalkwyk, J. A. Groenewald, G. C. G. Fraser, A. Obi and A. van Tilburg (Eds.), *Unlocking markets to smallholders: Lessons from South Africa* (pp. 13-33). Wageningen: Wageningen Academic Publishers.
- Ogunkoya F, T. (2014). MSC Dissertation: Socio-Economic factors that affect livestock numbers: A case study of smallholder cattle and sheep farmers in the Free State province of South Africa, University of South Africa, South Africa.
- Ortmann, G. & C. Machethe, (2003). Problems and opportunities in South African Agriculture. In: L. Nieuwoudt and J. Groenewald (eds.) *The challenges of change: agriculture, land and the South African economy*, University of Natal Press, Natal, South Africa, pp. 47-62.
- Pen, M., Savage, D., Stur, W., Lorn, M. & Seng, M. (2010). Cattle feeding and management practices of Small-holder Farmers in Kampong Cham Province, Cambodia. *IJERD – International Journal of Environmental and Rural Development*, 1(1): 132-138.

- Pienaar, L. & Traub, L., N. (2015). Understanding the smallholder farmer in South Africa: Towards a sustainable livelihoods classification. , No 212633, 2015 Conference, August 9-14, 2015, Milan, Italy, International Association of Agricultural Economists, <http://EconPapers.repec.org/RePEc:ags:iaae15:212633>.
- Pretty, J.N. & P. Koohafkan. (2002). Land and Agriculture: From UNCED Rio to WSSD Johannesburg. FAO: Rome, Italy.
- Rajput, Z.I., Hu, S., Chen, W., Arijio, A.G. & Xiao, C. (2006). Review: Importance of ticks and their chemical and immunological control in livestock. Journal of Zhejiang University Science B, 7(11): 912-921.
- Rudgard, S. Ballantyne, P., Del Castello, R., Edge, P., Hani, M., Maru, A., Morras, E., Nichterlein, K., Porcari, K. & Treinen, S. (2011). ICTs as enablers of agricultural innovation systems, Module 6 from ICT in agriculture: Connecting smallholders to knowledge, networks, and institutions. [https://cgspace.cgiar.org/bitstream/handle/10568/12469/ictinagriculturesourcebook\\_module6.pdf](https://cgspace.cgiar.org/bitstream/handle/10568/12469/ictinagriculturesourcebook_module6.pdf)
- SABC News. (2016). Limpopo agriculture department out of funds to assist farmers. Online article reported on Saturday 2 April 2016 07:37. <http://www.sabc.co.za/news/a/3b2438004c409c5ba966bdf68d25dd2f/Limpopo-agriculture-dept-out-of-funds-to-assist-farmers-20160204>. Accessed on 12/11/2016
- Seidman and MacCauley. (2005).\_Optimizing Knowledge Transfer and Use. Cerebyte, Inc. <http://www.cerebyte.com/articles/Optimizing%20Knowledge%20Transfer.pdf>.
- Scollan, N., Moran, D., Kim, E. J. & Thomas C. (2010). The environmental impact of meat production systems. A report on the international meat secretariat. <http://www.meat-ims.org/old-site/IMSReview-final-20710.pdf>.

- Shongwe, M.A., Jooste, A., Hugo, A., Alemu, Z.A. & Pelsner, A., 2007. Will consumers pay for less fat on beef cuts? The case in Bloemfontein, South Africa. *Agrekon*, 46(4)475-493.
- Sife, A. S., Kiondo, E. & Lyimo-Macha, J G. (2010). Contribution of mobile phones to rural livelihoods and poverty reduction in Morogoro Region, Tanzania. *The Electronic Journal on Information Systems in Developing Countries (EJISDC)* 42(3) 1-15.
- Smithers, J. & Smit, B. (1993). *Sustainable Agriculture: Interpretations, analysis and Prospects*. Department of Geography and Land Evaluation Group. University of Guelph. Canadian Journal of Regional Science. Guelph, Canada.
- Soji, Z., Chikwanda, D., Chikwanda, A.T., Jaja, A. I., Mushonga, B. & Muchenje, V. (2015). Relevance of the formal red meat classification system to the South African informal livestock sector. *South African Journal of Animal Science*. 45 (3): 263-277.
- Thompson, P.B., Appleby, M., Busch, L., Kalof, L., Miele, M., Norwood, B.F. & Pajor, E. (2011) Values and public acceptability dimensions of sustainable egg production. *Poultry Science*, 90: 2097–2109.
- Tolera, A., Yami, A. & Alemu, D. (2012). Livestock feed resources in Ethiopia: Challenges, Opportunities and the need for transformation. Ethiopia Animal Feed Industry Association, Addis Ababa, Ethiopia.
- Tshuma, M. C. (2012). A review of the poverty and food security issues in South Africa: Is agriculture the solution? *African Journal of Agricultural research*, 7(28): 4010-4020.
- UNDP. (2012). Promoting ICT based agricultural knowledge management to increase production and productivity of smallholder farmers in Ethiopia, Development Brief.
- Van Niekerk, J. A., Stroebel, A., Van Rooyen, C. J., Whitfield, K. P. & Swanepoel, F. J. C. (2011). Towards redesigning the Agricultural extension service in South Africa: views and



proposals of extensionists in the Eastern Cape, South African journal of Agricultural Extension, 39 (2): 57 – 68.

Williams, B., Mayson, D., de Satgé, R., Epstein, E. & Semwayo, T. (2008). Extension and small holder agriculture: Key issues from a review of the literature. Sustainable Development Specialists, Phushlisani. <http://www.phuhlisani.com/oid%5Cdownloads%5CPhuhlisani%20extension%20reviewD1.pdf>.

World Commission on Environmental Development (WCED). (1987). Our Common Future. Oxford University Press: Oxford, UK.

World Farmers Organization (WFO). (2016). The role of women in Agriculture. <http://www.wfo-oma.com/women-in-agriculture/articles/the-role-of-rural-women-in-agriculture.html>

World Wild Fund (WWF). (2010). Agriculture in South Africa: Facts and Trends. World Wildlife Fund, Stellenbosch. [www.wwf.org.za](http://www.wwf.org.za).

Wye, C. (2003). Overcoming Informational constraints: Improving horticultural marketing and technical information flows to smallholders, literature review. Empirical College, London

## **Chapter 3: Challenges and constraints for emerging beef cattle producers in the Limpopo Province of South Africa**

### **3.1 Abstract**

Systemic challenges and constraints affecting the growth and development of emerging beef cattle farmers were identified and characterized. All the 62 farmers under the Limpopo IDC-Nguni cattle project were included in the survey (census approach) and individually interviewed at their farms. Data were collected using structured questionnaires. The sample was dominated by males (87%). Close to half (47%) of the respondents had tertiary education. The majority (80 %) of the farmers were adults (above 45 years) with close to 60% of them farming on leased land. All farmers were faced with at least one ecological challenge. Large proportions were confronted with challenges of drought (98%), heat waves (97%), rangeland degradation (97%) and biodiversity loss (90%). Responses from the farmers showed that cattle parasites (92%) and diseases (89%), feed shortage (86%) and inadequate water for cattle (82%), were the main ecologically-related challenges faced. About 45% of the farmers who were faced with cattle feed shortage ranked it as a 'high' challenge while 25% and 30% ranked the same challenge as 'slightly high' and 'very high', respectively. Chi-square test results showed that there was an association between location of the farmer and the perception of being confronted with ecological challenges such as poor cattle parasites ( $p=0.02$ ) and diseases ( $p=0.02$ ). More than 80% of the farmers reported that they were faced with poor access to extension services, training, financial support, community production and marketing infrastructure. Poor access to markets and marketing information were reported by 76% of the farmers. About 45% of the farmers ranked it as a 'very high' challenge. The study concludes that emerging beef cattle farmers are faced with a variety of management challenges and constraints; therefore it is important to improve policies, strategies and tools that sustainably improve their productivity.

**Key words:** Emerging farmer, Sustainability, Challenges, Constraints

### 3.2 Introduction

South Africa's livestock farming sector, in particular, cattle production at the subsistence (communal) and subsistence-cum-commercial (emerging) level is constrained by a variety of factors. A number of research studies have been conducted with the goal of broadening the understanding of these factors (Khaphayi and Celliers, 2016). Some of the main challenges identified to be confronting cattle farmers, especially communal and emerging in general include; poor access to land and water, lack of access to marketing channels and extension services, high transaction costs, small herd sizes, and risks associated with animal diseases, drought and theft (Montshwe, 2006; Musemwa *et al.*, 2008; DAFF, 2012; Khaphayi and Celliers, 2016). These are some of the key constraints hindering smallholder farmers from transitioning into commercial farmers. Despite that a lot of these challenges and constraints have been identified for smallholder farmers in general by these studies; there is still a remarkable scarcity of comprehensive information describing a systematic picture of the challenges and constraints that affect emerging farmers (Khaphayi and Celliers, 2016). Since, the advent of the LRAD programme, the South African government introduced policies and programmes and also increased its budget for supporting the growth and development of emerging farmers (DAFF, 2010; Aliber and Hall, 2012). Despite such efforts and commitment, Frequin *et al.* (2012) and Aliber and Hall (2012) argued that there is not enough evidence that these efforts have been effective. In addition, there is growing evidence that productivity by subsistence and emerging cattle farming sector is still very low and unsustainable (DAFF, 2012; UNDP, 2012). Failure of several attempts by the government to integrate emerging farmers into the commercial agricultural economy has increased the need for well-grounded information of the challenges and constraints that affects emerging farmers. Given the importance of the topic the objective of the current study was to identify and characterize challenges and constraints facing emerging beef cattle farmers in Limpopo Province, South Africa.

### **3.3 Materials and Methods**

#### **3.3.1 Description of the study area**

The study was carried out in the Limpopo Province of South Africa. The province is administratively subdivided into 5 municipal districts, which are further divided into 25 local municipalities. This study focused on 14 local municipalities where the Limpopo IDC-Nguni cattle farmers are located (Table 3.1). The Limpopo IDC-Nguni cattle programme was described in chapter one.

#### **3.3.2 Overview of Limpopo Province**

Limpopo Province is located in the northern-most part of South Africa. It is delimited by Zimbabwe to the North, Botswana to the West, Mozambique to the East as well the provinces of Gauteng, Mpumalanga and Free State to the South [Republic of South Africa (RSA), 2015]. The province is situated in a dry savannah sub region, characterized by open grassland with scattered trees and bushes and a subtropical type of climate [Limpopo Department of Agriculture (LDA), 2014]. Limpopo has three distinct climatic regions: arid (Lowveld), semi-arid (middle, Highveld) and the sub-humid (the escarpment) regions which receive maximum rainfall of up to 700mm (LDA, 2015]. Generally, the province receives summer dominant precipitation with annual rainfall totals ranging from about a minimum of 350-400 mm to a maximum of 600-1000 mm over most of the province (Anon, 2007; LDA, 2015). The province experiences long sunny days and dry weather conditions on most days with average temperatures rising up to 27°C and 20°C in summer and in winter, respectively (Tshiala *et al.*, 2011). The map of South Africa showing Limpopo province and the map of Limpopo province depicting the local municipalities where the study was conducted is presented in Figure 3.1 below.



production mixes (LDA, 2015). Cattle production is a major livestock activity and is predominantly carried out in the arid and semi-arid western and northern parts of the province (LDA, 2002).

### 3.3.3 Target population and farmer selection

The target population comprised ‘emerging beef cattle farmers’ under the Limpopo IDC-Nguni Cattle project. A ‘Census approach’ was employed and all the 62 farmers under the project participated in the study. Table 3.1 shows the distribution of the farmer who participated in the current study.

**Table 3.1:** The distribution of Limpopo IDC-Nguni cattle farmers across the province

District Municipalities	Local Municipalities	Number of farmers
<b>Capricorn</b>	Aganang	3
	Blouberg	3
	Lepelle-Nkumpi	1
	Molemule	9
	Polokwane	10
<b>Greater Sekhukhune</b>	Elias Motsoaledi	3
	Ephraim Mogale	1
	Fetak Gomo/Greater Tubatse	2
	Lephalale	3
	Mogalakwena	13
<b>Waterberg</b>	Mookgophong/Modemolle	10
<b>Mopani</b>	Maruleng	1
<b>Vhembe</b>	Makhado local	3
<b>TOTAL</b>		62

### **3.4 Research method and paradigm**

A quantitative research approach was used in the study. Sukamolson (2007) defined quantitative research approach as a numerical representation and manipulation of observations in order to describe and explain the phenomena reflected by those observations. Quantitative research approach maintains the assumption of an empiricist paradigm (Creswell, 2003). It involves the use of data to test existing theories against observations recorded for the natural world. The research process itself was therefore independent of the researcher hence data acquired was used to objectively measure reality (Williams, 2007). The process started with a statement of the problem and involves the development of a hypothesis, a review of literature, and a quantitative analysis of data. In this study, the approach was used to collect data that was largely numeric and the researcher used descriptive statistical models as the methodology of data analysis.

#### **3.4.1 Data collection**

Data were obtained through personal observations and by interviewing 62 emerging beef cattle farmers using pre-tested structured questionnaires between August and September 2016. Four enumerators were recruited and trained by the researcher to assist in administering the questionnaires. The Limpopo IDC-Nguni cattle livestock manager assisted with farmer location and introductions of the purpose of the study to the respondents. The questionnaires were designed in English but during the interviews the questions were translated into local languages (Sipedi and Tshivenda) for the farmer to understand and respond comfortably. The head of each farm was interviewed and in cases where such a person was not available on the scheduled time of interview, arrangements were made for a follow-up interview. The respondents' demographic profiles and farm characteristics were recorded. Data were collected on the farmers' perceptions about the challenges and constraints faced. For each challenge and constraint, the respondents were asked whether they were confronted by it. If the response was 'yes' the respondent was asked to give the extent or level of the challenge using a Likert scale which included three levels, namely; neutral, slightly high, high and very high'.

### 3.3.2 Statistical Analysis

Data analysis was conducted using Statistical Package for Social Sciences (SPSS) version 24.0. Descriptive statistics and charts were used to present the results. Trochim (2006) articulated that descriptive statistics are used to describe the basic features of the data in a study. Together with simple graphics analysis, they form the basis of the quantitative analysis of this study. The Chi-square was used to test for association between farmer characteristics (gender, age, educational level and location) and their perceptions for the challenges reported. The test is 2-sided (non-directional) and was conducted at 95% confidence level ( $p < 0.05$ ). Cramer's V is a chi-square based measure of association which was used to measure the strength of the association described by the Chi-square test. The measure is defined as:

$$V = \sqrt{\frac{\phi^2}{t}} = \sqrt{\frac{\chi^2}{nt}}$$

**Source:** (Cohen, 1988)

Where  $t$  represents the smaller of the number of rows minus one or the number of columns minus one. For example, if  $r$  is the number of rows, and  $c$  is the number of columns, then  $t = \text{minimum } (r - 1, c - 1)$ . Cramer's V equals 0 when there is no relationship between the two variables, and has a maximum value of 1. A large value of Cramer's V indicates a strong relationship between the variables. Thus, 0.1=Small strength; 0.3=Medium strength and 0.5=Large strength. These standards were used by Fort Collins Science Centre, adopted from Cohen (1988).

## 3.5 Results and Discussion

### 3.5.1 Characteristics of the farmers

Table 3.2 presents the farmers socio-economic attributes including age, gender, education, household size, land ownership and total farm sizes (ha). These characteristics provide an overview of the socio-economic environment in which the farmers operate. The results show that



just over half (55%) of the respondents had household sizes ranging between 3 and 6 members with the mean house hold size being 6. In terms of gender, about 87% of the farmers were males. In Africa, although most agricultural activities are carried out by women (FAO, 2011; Montpellier Panel, 2012; WFO, 2016), large-stock, especially cattle are largely owned by males (Mapiye *et al.*, 2009). Majority of the farmers were adults given that 64% were between the age of 46 and 65 years while nearly one-fifth were above 65 years. This implies that youths [14-35 years (Brown, 2012)] were not actively involved in cattle farming in the province. This is one of the dynamics that characterizes a wider of Africa and in particular South Africa's communal farming systems (Brown, 2012). Twomlow *et al.* (2006) argued that such distribution establishes one of the major constraints to the widespread adoption and application of new agricultural technology. Therefore, NERPO (2004) suggested the need for the new South African government to support the inclusion of more young people into the farming industry.

**Table 3.2:** Characteristics of the emerging cattle farmers in Limpopo province, South Africa

Variable	Options provided	Response %
<b>Household size<sup>1</sup></b>	Below 3	6
	3-6	54
	7-10	36
	Above 10	4
<b>Age of the household head<sup>1</sup></b>	Below 35	4
	36-45	9
	46-55	23
	56-65	42
	Above 65	23
<b>Educational level of household head<sup>1</sup></b>	No formal education	2
	Primary education	21
	Secondary education	30
	Tertiary education	47
<b>Land ownership<sup>2</sup></b>	Private/Own	16
	Communal	15
	Leased	61
	Tribal	8
<b>Farm sizes (ha)<sup>2</sup></b>	Less than 700	21
	701-1400	33
	1401-2100	27
	2101-2800	7
	Above 2801	12

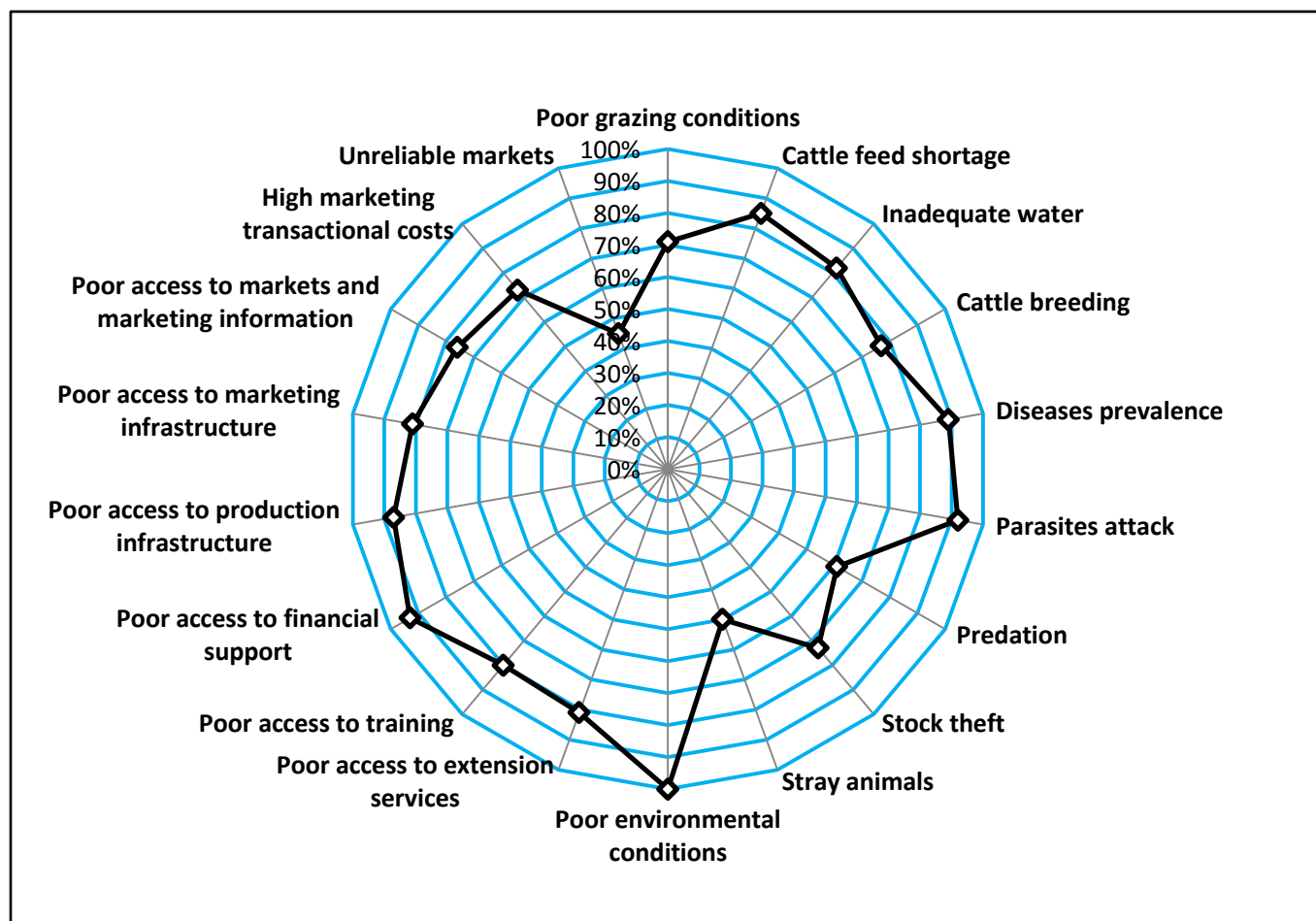
**Characteristic<sup>1</sup>** -Sample size includes 53 farmers because 9 respondents belong to CPA (group of farmers) hence characteristics of a single household head could not be identified for the groups.

**Characteristic<sup>2</sup>**-Sampe size include all 62 farmers

Table 3.2 shows that the educational level of the emerging cattle farmers was substantially high with half of the farmers having a tertiary qualification (diploma or, degree) and the mean number of years spent learning being approximately 18 years. A bigger proportion of these farmers (61%) were farming on leased land, while roughly 16% were farming on privately owned farms. Nearly 80% of the farmers had farm sizes which were less than 2000ha. However, the farm sizes ranged from 85 ha to 27000 ha.

### **3.5.2 Challenges and constraints for emerging cattle farmers in Limpopo Province**

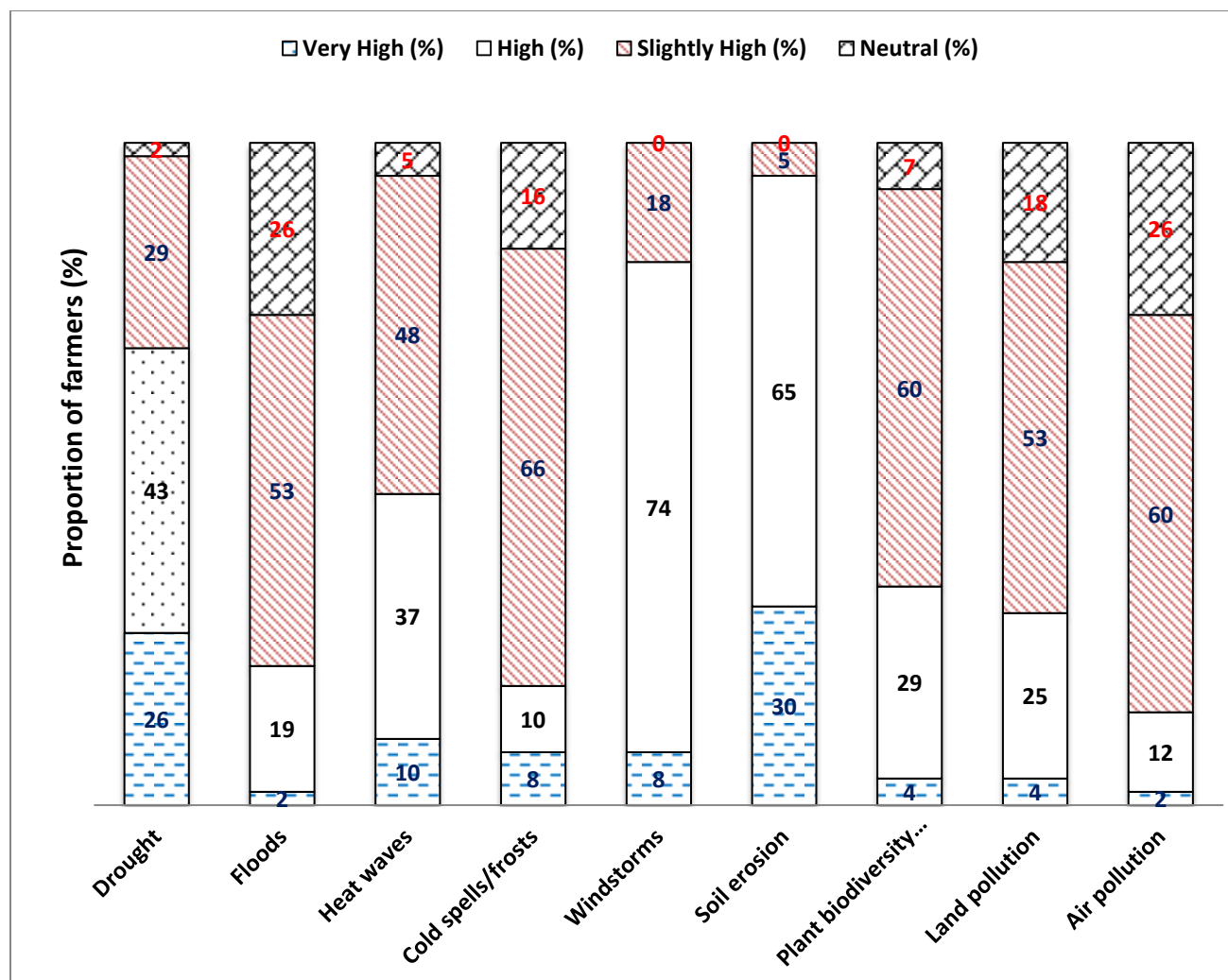
Figure 3.2 shows the challenges and constraints that were reported by emerging farmers in the study areas. These challenges concur with those documented as affecting the growth and sustainability of smallholder cattle farming in general (MacLeod *et al.*, 2010; Masikati, 2010; Munyai, 2010; DAFF, 2012). In this study, farmers were asked to identify challenges and constraints confronting them as well as to state the perceived extent of each challenge reported. The challenges and constraints were classified into ecological, economic and social.



**Figure 3.2:** Challenges and constraints facing emerging cattle farmers in Limpopo province, South Africa

### 3.5.2.1 Ecological and biophysical challenges

Overall, all respondents reported that they were confronted by at least one environmental challenge. The main ecological challenges reported were drought (98%), heat wave or very high temperatures (97%), soil erosion (97%) and biodiversity loss (90%). High frequencies on climatic related challenges such as heat stress and drought could be associated with the farmers' experience and knowledge about the subtropical conditions that characterize the province. Specific challenges and respective perceptions about the extent of the ecological and biophysical challenges are presented in Figure 3.3.



**Figure 3.3:** Extent of the ecological and biophysical challenges faced by emerging cattle farmers in Limpopo Province, South Africa

The challenge of drought was ranked by 43% of the respondents as a 'high' challenge. The results on drought challenge are in consistent with findings by Mpandeli *et al.* (2015) in a study conducted in Sekhukhune district, Limpopo Province. These authors reported that smallholder farmers were negatively impacted by drought occurrences in the district and the province at large since early 1980s. Drought was also found to be severe in a study conducted by Ogonkoya (2014) in the Free State province where 96% of the respondents ranked the challenge as the most prevalent factor affecting cattle production. In Limpopo, drought does not only affect the crops and livestock but also affect natural vegetation (Mpandeli *et al.*, 2015). This will hence affect availability of feeds resources and shelter for the animals. Heat stress is one of the challenges

reported by the farmers in the current study. About 37% of the interviewees ranked the extent of heat stress as a 'high' challenge. Schultze *et al.* (2007) asserted that heat stress is an important factor to be considered when farming with cattle. It affects acid-base balance, regulates hormonal activity and immune response of the animals hence ultimately affecting feed intake (Ogunkoya, 2014). In the same study by Ogunkoya (2014), very small proportion (at least 2%) of smallholder cattle producers reported to be faced with the challenges of flooding and heat stress. Land degradation is one of the constraints to cattle farming highlighted by emerging farmers in the current study. Results for challenges were not consistent with findings by Marandure (2015) who reported that 48% of the farmers from Gxwalibomvu, Eastern Cape province indicated that erosion conditions within their rangelands were better. However, in the same study about 46% of the farmers from Ncorha indicated that their natural pasture was heavily eroded. Also in the current study, heat waves and biodiversity loss were reported by most of the respondents (48% and 68%) as 'slightly high,' challenges, respectively. Contrary to this, Marandure (2015) showed that 80% of the respondents interviewed from the study areas reported that the state of biodiversity was good. This could be attributed to the fact that Limpopo region is heavily infested by bush encroachers (Sickle bush) and other invasive species such as Slangbos that suppress other species causing loss of biodiversity (SAPIA News, 2013; LDA, 2015) compared to the Eastern Cape region.

The current incidences and severity of environmental related natural disasters such as droughts, floods, heat waves and winds storms which posed significant impacts on ecosystems and global livestock production is caused by climate change (Ogungoya, 2014).

### **3.5.2.2 Cattle production challenges and constraints**

Table 3.3 shows the nine production challenges and constraints that were identified in the survey areas. Frequencies and respective magnitude of the challenges and constraints as perceived by the famers are presented.

**Table 3.3:** Cattle production challenges and constraints faced by emerging cattle farmers in Limpopo province, South Africa (%)

Challenge/ Constraint faced	% of farmers faced with Challenge or Constraint	Pearson Chi-square (p)values of the association between challenges faced and farmers characteristics				Extent of challenge or constraint				
		District	Gender	Age	Education	Very High (%)	High (%)	Slightly High (%)	Neutral (%)	Total (%)
Cattle feed shortage	86	0.703	0.231	0.648	0.186	30	45	25	0	100
Parasites attack	92	0.016***	0.637	0.875	0.814	16	42	40	2	100
Diseases prevalence	89	0.018***	0.637	0.192	0.814	7	40	53	0	100
Inadequate water	82	0.106	0.739	0.010***	0.895	28	23	47	2	100
Cattle breeding	77	0.010***	0.226	0.784	0.457	6	48	46	0	100
Stock theft	73	0.448	0.790	0.148	0.572	31	22	47	0	100
Poor grazing conditions	71	0.505	0.074	0.093	0.942	14	66	20	0	100
Predation	63	0.457	0.764	0.781	0.296	38	26	36	0	100
Stray animals	50	0.406	0.037***	0.327	0.865	29	7	64	0	100

\*\*\* Significant at (p&lt;0.05)

### 3.5.2.2.1 Poor cattle grazing conditions

Rangelands were the chief source of feed for cattle for all the farmers. The type and condition of rangelands could be associated with animal body condition (Mapiye *et al.*, 2009; Ogunkoya, 2014; Nalubwama *et al.*, 2014). Table 3.3 shows that 71% of the farmers reported that poor condition of rangelands were a challenge in the studied areas. About 66% of the farmers who reported this challenge were farming on leased land and majority (45%) of them had farm sizes of less than 1000ha. For those farmers who reported poor grazing condition as a challenge, about two thirds indicated the extent of the challenge as 'high', while 14% reported it to be 'very high'. A large proportion (80%) of the farmers argued that the main cause of the rangeland condition challenge was caused by poor availability and distribution of rainfall in the province. The condition was reported to deteriorate rapidly in the hot and dry season. This was also reported in a study conducted by Muchenje *et al.* (2007b). Also, severe encroachment of rangelands with indigenous tree species such as Sickle bush (*Dichrostachys cinerea*) and Bankrupt bush or Slangbos (*Seriphium plumosum*) were reported as some of the factors leading to poor grazing conditions. LDA (2015) reported that the rangelands resources in the province were severely degraded resulting in the province having the highest rangeland degradation index in South Africa (LDA, 2015). Bush encroachments reduce or suppress the herbaceous species and causes loss of biodiversity and more importantly reduce rangeland grazing capacity (SAPIA News, 2013). The chi-square test results ( $p > 0.05$ ) showed that there was no association between the perception of rangeland condition as a challenge and farmer characteristics (district, gender, age and education).

### 3.5.2.2.2 Cattle feed shortages

Majority of the farmers who were farming on leased land (66%), private (14%) and tribal (9%) were grazing animals on their individual farms compared to those under the community property association who had to share grazing lands. Shortage of feed was indicated as a challenge to cattle production by more than 85% of the respondents with 30% of them reporting that the challenge was 'very high'. The severity of the challenge was reported to be high during the dry



season. About 84% and over two-thirds of the farmers who agreed to be confronted by the feed shortage challenge were males and adult farmers (over 55 years). The finding that feed shortage and poor rangeland condition challenges were severe during the dry season is consistent with results obtained by Mapiye *et al.* (2009). In the study, drought was ranked one of the most important constraints to cattle production in the smallholder farming systems of South Africa. Majority of the farmers (75%) linked cattle feed shortage to incessant drought occurrences while 11% ascribed it to lack of capital to purchase supplements. Nalubwama *et al.* (2014) reported feed shortage as a challenge for smallholder ruminant producers and the challenge was attributed to heavy dependence on rangelands with limited feed conservation and supplementation strategies by the farmers. However, in a study by Mutibvu *et al.* (2012), feed shortage challenge was reported to be associated with factors such as lack of knowledge, poor extension support and ignorance by the farmers. Feed availability in terms of quantity and quality may be considered a key limiting constraint to improved livestock production in developing countries (Munyai, 2010). Based on Chi-square test, farmer attributes; age, location, gender and educational status were not associated ( $p>0.05$ ) with their perception of the feed shortage challenge.

### **3.5.2.2.3 Cattle parasites and diseases**

Table 3.3 shows that diseases and parasites were a common challenge among the respondents. In fact, about 92% and 89% of the respondents reported that they were confronted with parasites and diseases challenges, respectively. Mapiye *et al.* (2009) found significantly high but lower proportion (65%) of the farmers who were faced with parasites and diseases challenge in a study conducted in the Eastern Cape. Results from the study also concurs with findings by Agholor (2013) who mentioned that overall, 50% of rural beef cooperative farmers in Ga-kibi, and Mogalakwena in Blouberg perceived parasites and diseases (tick borne diseases) as constraints to cattle production in their areas. However, considering that farmers in this study were also using a local breed (Nguni), these results are not consistent with an assertion by Musemwa *et al.* (2008) that Nguni farmers are likely to face less production related problems because the breed is resistant to tick-borne diseases. Also, Table 3.3 shows that, about 50% of the farmers perceived

the level of diseases constraint as 'slightly high' whereas 40% perceived it as 'high'. More farmers (16%) ranked parasite challenge as 'very high' compared to only 7% for diseases. The challenge of parasites and disease is largely associated with increased morbidity and mortality which reduces production (Mwacharo and Drucker, 2005) under various production systems and rangelands types (Mapiye *et al.*, 2009). Animal health related issues are barriers to trade in livestock and their products (Musemwa *et al.*, 2008).

Location had an influence on the farmers' perceptions of cattle parasites ( $p=0.02$ ) and diseases ( $p=0.02$ ) as challenges. At least 80% of the farmers who reported to be faced with the challenges where from only two districts namely Capricorn and Waterberg and the remainder were from the other three districts. This could be attributed to previous disease outbreaks in the districts which might have affected majority of the farmers. However, there was no association between farmer's perceptions of parasites and diseases as challenges with age, gender and educational level of the farmers ( $p>0.05$ ).

#### **3.5.2.2.4 Inadequate water supplies**

About 82% of the farmers reported that they were confronted by the challenge of water shortage. About 27% of the farmers perceive water shortage as a 'very high' challenge while 47% perceived it as a 'slightly high' challenge. Few farmers fetched water for cattle drinking from sources as far as 20 km from their farms. Findings obtained for this challenge are consistent with results presented by Agholor (2013). In that study, about 50% of the beef cooperative farmers in Mogalakwena local municipality in Limpopo Province concurred that the challenge of water stress was high and remained unabated in their areas. The situation of water shortage was described by Thornton (2010) as not only affecting livestock drinking water sources but also livestock feed production and rangeland yield. Elsewhere, findings from a study by Mutibvu *et al.* (2012), in the Nkayi district of Zimbabwe posits that access to water for cattle production was ranked the third most important challenge by the smallholder farmers.

Within the current study areas, the availability of adequate water throughout the season was reported as a serious constraint to cattle production. This is atypical of whole country where the resource has become a huge national crisis. South Africa is ranked among the 30 driest countries in the world with an average annual rainfall of about 40% less than the world average figure (RSA, 2015). Agri-SA (2016) reported that the current water scarcity situation in South Africa and particularly in provinces such as Limpopo has resulted in huge livestock mortalities. Therefore, Amenu *et al.* (2011) indicated that shortage of water resources is expected to worsen particularly in regions where rainfall amounts has started to decline significantly due to climate change effects.

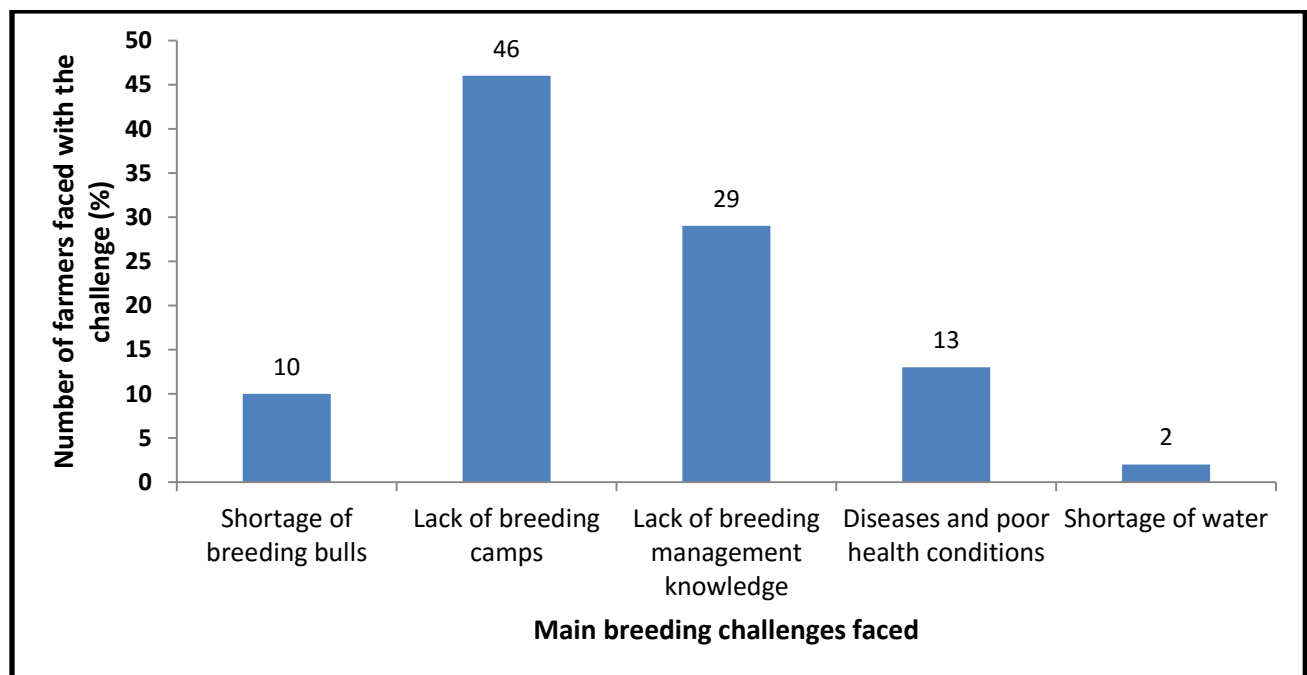
There was an association between farmers' perception of water shortage challenge and age of the household head ( $p=0.01$ ). A large proportion of the farmers who reported the challenge were above the age of 45 years (87%) compared to 9% and 4% who were between 35 and 45 years and below 35 years, respectively. The strength of the association with age was large (Cramer's  $V=0.5$ ). This may imply that adult farmers may have a higher appreciation of the importance the challenge due to their experience and background knowledge on the scarcity of water in Limpopo Province compared to young farmers. However, 40% of the farmers who reported not to be faced by the challenge were below 50 years.

#### **3.5.2.2.5 Cattle breeding challenges**

Seventy-seven percent of the farmers reported that that they were constrained by various cattle breeding challenges. Close to 50% of those confronted by the challenge perceived the extent of the challenge as 'high', while 46% reported it as 'slightly high'. Poor breeding practice was ranked third technical constraint to cattle production in both communal and small-scale production systems in a study conducted by Mapiye *et al.* (2009). In the current study, location was associated ( $p=0.01$ ) with the farmers' perception to report poor cattle breeding management as a challenge and the strength of the association with location was large (Cramer's  $V=0.465$ ). Out of the five districts, the majority of farmers who reported this challenge were located in two districts, namely; Capricorn (46%) and Waterberg (45%) while only (9%) were from Greater

Sekhukhune and Vhembe Districts. This is explained by the fact that majority of the farmers in these districts acquired farms with poor fencing structures hence they are not able to control breeding.

Proportions of farmer who reported for cattle breeding challenges are presented on Figure 3.4. These challenges were lack of breeding camps, lack of cattle breeding management skills, cattle breeding diseases and conditions and shortage of breeding bulls.



**Figure 3.4:** Cattle breeding challenges faced by the emerging farmers

Lack of breeding camps was cited by 46% of the farmers as the main cause of poor cattle breeding management. Most farmers reported that their fences were old and broken. Therefore the state of their fences was affecting the implementation of controlled breeding programmes. Lack of well fenced camps affects reproductive management as farmers fail to institute a structured breeding season (FAO, 2011). This may result in calving incidences during the winter seasons when the quantity and quality of feed from the grazing lands is lowest (Muchenje, *et al.*, 2007b). Lack of fenced camps was also reported by (Nitter, 2000) as a leading factor to poor animal breeding. In this study, about 29% of the respondents pointed out they did not have

enough knowledge around general cattle breeding management. This supports an assertion by Khapayi and Celliers (2016), that majority of smallholder farmers in general fail to have a systematic breeding program for their herds because they lack breeding management skills. A very small proportion (10%) had challenges in selection and culling of breeding animals while others (13%) presented animal breeding related problems and shortage of breeding bulls as some of the factors affecting their breeding management. However, Mutibvu *et al.* (2012) find out that farmers in the District of Nkayi, Zimbabwe had knowledge of selection of animals for breeding purposes and largely used indigenous breeds in their breeding programs.

#### **3.5.2.2.6 Stock theft**

Findings from the survey demonstrated that 73% of the respondents were faced with cattle theft challenge in their farming communities (Table 3.3). More than half of the farmers who reported this challenge had tertiary education (diploma or degree), farm sizes below 1000ha with 62% of them farming on leased land. About 31% of the farmers perceived the extent of the challenge as 'very high', while 22% and 47% reported it at a 'high' and 'slightly high', respectively. Ogunkoya (2014) reported that above half of smallholder cattle farmers in the Free State province ranked stock theft and pilfering as a widespread challenge. Stock theft challenge could be attributed to the fact that the farms were located in the communal areas where poverty and unemployment was very high (Khoabane and Black, 2012; KwaZulu-Natal Department of Community Safety & Liaison, 2010). Also, Ngeno (2008) reported that stock theft was a common challenge in most of the communities in the Eastern Cape. However, the study attributed the challenge to poor fencing facilities which resulted in cattle straying out of the boundaries. In the same study, few farmers cited the involvement of law enforcement officials in organized crimes which resulted in suspects being released without being charged. Based on Chi-square test conducted, perception of being faced with stock challenge was not associated with the farmer's characteristics; district, gender, age and education ( $p=0.45, 0.79, 0.15, 0.57$ ). Stealing of cattle is a huge challenge that can negatively affect the growth of cattle herds in the country (Ogunkoya, 2014). Despite a lot of initiatives such as branding, ear tagging, police and community awareness and patrol

programmes, stock theft is still a challenge in South Africa's rural farming communities. Agholor (2013) reported that stock theft causes economic losses and hardships to the farmers.

#### **3.5.2.2.7 Cattle predation challenge**

Besides stock theft, diseases and parasites challenges, farmers in the study areas also lost their cattle due to predation from wild animals such as leopards and jackals targeting calves and sick animals (Table, 3.3). About 63% of the farmers reported that they were faced with cattle predation challenge. A substantial proportion (38%) of the farmers reported predation as a very high challenge. A similar finding with higher proportion was reported by (Kgathi *et al.*, 2012) for Shorobe village, Northern Botswana where 63% of the respondents reported to be facing the challenge. In a study by Sikhweni and Hassan (2013) with small-scale farmers living adjacent to Kruger national Park in Limpopo, about 11% of the farmers reported to be faced with challenge. Elsewhere in Africa, Holmern *et al.* (2007) reported that 27% of the respondents from seven villages surrounding the Serengeti National Park in Tanzania indicated that they had lost 4.5% of their livestock due to predation. There was no significant association ( $p>0.05$ ) between the farmers' perception about being faced with predation challenge and farmers characteristics such as district, age, education and gender. Higher proportions of farmers reporting to be faced with the challenge in this study could be associated with a lot of game and wildlife activities being carried out in parallel to livestock farming in the province.

#### **3.5.2.3 Institutional and infrastructural challenges**

In this study, farmers were asked to identify challenges and constraints confronting them as well as to state the perceived extent of each challenge reported. Results are presented in Table 3.4. Overall, Khapayi and Celliers (2016) asserted that, the provision of support services remain one of the major key interventions in the development and commercialization of rural agriculture for food security, poverty alleviation and income generation of emerging farmers.

**Table 3.4:** The institutional and infrastructural challenges and constraints faced by emerging cattle farmers in Limpopo Province, South Africa

Challenge/ Constraint faced	% of farmers faced with Challenge or Constraint	Pearson Chi-square ( <i>p</i> ) values of the association between challenges faced and farmers characteristics				Extent of challenge or constraint				
		District	Gender	Age	Education	Very High (%)	High (%)	Slightly High (%)	Neutral (%)	Total (%)
Poor access to financial support	94	0.935	0.487	0.775	0.257	45	38	16	2	100
Lack of production infrastructure	87	0.09	0.013***	0.139	0.142	20	54	226	0	100
Poor access to extension services	81	0.305	0.739	0.664	0.105	20	38	42	0	100
Lack of marketing infrastructure	81	0.166	0.838	0.568	0.860	24	52	24	0	100
Poor access to training	80	0.534	0.124	0.664	0.199	12	5	45	2	100

\*\*\* Significant at ( $p < 0.05$ )

### 3.5.2.3.1 Access to financial support by the farmers

More than 90% of the respondents reported that they were failing to access financial support (Table 3.4). About (45%) of them ranked the challenge as 'very high'. About 62% of these farmers were farming on leased lands and close to 90% had farm sizes between 85ha and 2000ha. MacLeod *et al.* (2008) argued that many of the farmers who benefited from government developmental initiatives such as the LRAD programme lack financial skills. Perception of the extent of poor access to financial support was significantly ( $p=0.04$ ) associated with the farmers' educational levels. About 45% of the farmers who indicated that the challenge was very high had tertiary education while those with secondary, primary and no formal education were 25%, 30% and none, respectively. The strength of the association with education was medium to large (Cramer's  $V= 0.45$ ). This implies that the more educated the farmer were, the higher they contemplated extent of financial challenges they were facing.

### 3.5.2.3.2 Lack of access to production infrastructure

Access to production infrastructure was reported as a huge constraint towards the development of the cattle business in the study area. About 87% of the respondents reported that they did not have access to production infrastructure. Farmers reported lack of boundary fencing, unavailability of dipping infrastructure (dip tanks and spray races) and feedlots as major infrastructural challenges. This is consistent with findings by Ngeno (2008) that poor infrastructure (dams, dipping tanks, cattle handling facilities) was one of the major constraints confronting smallholder farmers under the sweet and sour veld in different communal production systems in Eastern Cape, South Africa. Farmers in the same study areas ranked absence of fences as the most constraint limiting cattle production. Farmers in the current study reported that absence of and/or poor condition of fences was affecting their grazing and breeding management programmes. These results are also consistent with findings by Ndebele *et al.* (2007) who reported that 65% of the communal and small scale cattle farmers in the Gwayi smallholder farming area of Zimbabwe were faced with lack of and poor state of fencing infrastructure.



In this study, slightly above half (54%) of the respondents who were faced with this challenge ranked it as 'high'. Gender was significantly ( $p=0.01$ ) associated with the perception of lack of production infrastructure as a challenge. The strength of the association with gender was medium to large (Cramer's  $V=0.34$ ). Thus, more males (91%) reported to be confronted by lack of access to production infrastructure compared to fewer females (9%). This association can be ascribed to the fact that males were largely responsible for the day-to-day maintenance of physical production infrastructure hence are more likely to see it as a challenge compared to women.

### **3.5.2.3.3 Poor access to agricultural extension services**

Results from the current study showed that majority (81%) of the farmers face poor support from government's extension and veterinary services (Table, 3.4). About 20%, 38% and 42% ranked extent of the challenge as 'very high', 'high' and 'slightly high', respectively. These results are consistent with findings by Macleod *et al.* (2010) who reported that unavailability of government extension services is a serious challenge confronting emerging livestock farmers in Limpopo Province. Munyai (2012) reported that South Africa's veterinary service department is failing to offer services in some areas, especially in rural areas. In that study very high livestock mortality rate was attributed to non-existent of government extension and veterinary services in the areas. Also, Moloi (2008) reported that out of the 202 sample of emerging farmers only 4% agreed to have full access to extension services. This implies that there is no strong support system available to support previously disadvantaged farmers (Chikazunga and Paradza, 2012), causing such farmers to be unable to take advantage of the various opportunities that the South African government has been instituting (Moloi, 2008).

Anon (2006) asserted that, lack of technical information and agricultural support services from technical specialists were one of the pressing issues highlighted in the review of LDA agricultural extensions services. However, findings from this study showed that not much has been done to curb the challenge. The Chi-square results show that there was no association between farmers'

perception of poor access to extension support as a challenge and characteristics such as gender, age, district and education, respectively.

#### **3.5.2.3.4 Lack of access to community marketing infrastructure**

More than 80% of the farmers are faced with difficulties in accessing marketing infrastructure (Table 3.4). Majority (52%) of them ranked this challenge as 'high' while 24% ranked it as 'very high'. This conforms to findings by Agholor (2013) in a study conducted in the districts of Ga-kibi, Mogalakwena and Noma where 68%, 11% and 21% of the beef cooperative farmers reported that marketing infrastructures were not available in their farming areas, respectively. NERPO (2004) reported that unavailability of marketing infrastructural facilities such as sale pens, loading and off-loading ramps are major constraint to small-scale farmer's marketing of cattle in South Africa. Musemwa *et al.* (2008) asserted that smallholder farmers who are farming with indigenous breeds such as Nguni are likely to be more affected by marketing constraints such as poor availability of marketing infrastructure than production challenges. Lack of such infrastructure seriously affects marketing of cattle (Mahabile *et al.*, 2002). In this study, farmers in some areas reported that they have the infrastructure but the physical structures are old and non-functional. Monsthwe *et al.* (2005) and Musemwa *et al.* (2008) found out that for some of the communities that have marketing facilities; the infrastructure is in poor state or non-functional.

#### **3.5.2.3.6 Poor access to training**

About 80% of the respondents reported that they were faced with poor access to training (Table 3.4). The challenge was ranked by 12 of them as 'very high' while the majority (45%) ranked it as a slight challenge. In a study conducted by Khaphayi and Celliers (2015), the need for farmers to acquire more skills around production and the development of marketing strategies was recommended. According to the Chi-square test conducted there was no association between perception of poor access to training and the farmer characteristics.

### 3.5.2.4 Cattle marketing challenges

In the study, four items were used to identify marketing challenges and constraints faced by the emerging cattle farmers (Table, 3.5).

**Table 3.5:** Marketing challenges and constraints faced by emerging cattle farmers in Limpopo province

Challenge/ Constraint faced	% of farmers faced with Challenge or Constraint	Pearson Chi-square (p)values of the association between marketing challenges faced and farmers characteristics				Extent of challenges or constraints				
		District	Gender	Age	Education	Very High (%)	High (%)	Slightly High (%)	Neutral (%)	Total (%)
Poor access to markets and marketing information	76	0.257	0.687	0.114	0.852	45	38	16	2	100
High transactional costs	73	0.175	0.790	0.535	0.900	20	54	26	0	100
Unreliable markets	45	0.858	0.808	0.836	0.000***	20	38	42	0	100

\*\*\* Significant at (p<0.05)

#### **3.5.2.4.1 Access to markets and marketing information**

About 76% of the respondents reported to be confronted with poor access to markets and marketing information constraints. Forty-five percent of these farmers reported the challenge as 'very high' whereas 38% reported it a 'high' challenge. Lack of timely and reliable marketing information is regarded as a severe challenge in South Africa's smallholder farming community (Montshwe, 2006). Findings from this study are consistent with results by Baloyi (2010) which shows that the majority (76%) of the farmers interviewed in both study areas indicated that they did not have access to market information such as prices and products on demand. Furthermore, Khapayi and Celliers (2016) reported that many emerging farmers in the country are faced with difficulties in penetrating formal agricultural markets and this has resulted in them lacking interests in these markets. Musemwa *et al.* (2008) ascribed lack of access to market information in the smallholder sector to poor availability and use of information sources such as radios, televisions and internet. They further indicated that for those with access to these sources of information, they may fail to comprehend the information since most adverts are done in English or Afrikaans. Apart from that poor access to markets and marketing information can be linked to the inequality that exists between the emerging farmers and the already established commercial farmers. Emerging farmers are being out competed by the commercial farmers in terms of product quality and quantity supplied hence are always sidelined from the tight market value chains. This may imply that deregulation of the agricultural markets in South Africa marginalized emerging cattle farmers from participating in the formal markets.

According to FANRPAN (2001) market access, especially the input and output markets is an important prerequisite for the transition of the agricultural sector from subsistence to commercial production. Also, access to market information is one of the most essential stages in marketing any commodity. Therefore, results from this study imply that farmers are unlikely to participate in formal marketing because they are not well informed of what is happening in these markets (Khapayi and Celliers, 2016). Conclusively, it can be speculated that lack of access to market information by

the emerging farmers is one of the factors posing restraints that debar them from accessing better markets.

#### **3.5.2.4.2 Marketing transactional costs**

A substantial number of respondents (73%) identified market transactional costs as a challenge. Transactional costs are barriers to the efficient participation of farmers in different markets (Musemwa, 2008). It is one of the major factors constraining growth of smallholder farmers in South Africa (DAFF, 2012; Makhura, 2001). Results from the current study shows that majority of the farmers (56%) described the extent of the challenge as 'high' while 18% indicated that it was 'very high'. Farmers in the study areas reported that transport cost to the market constitutes a very huge proportion of the total marketing costs incurred. However, this is linked with factors such as distance to the markets and lack of own transport by the farmers. Such results are consistent to findings by Machethe (2004) where relative distance from markets, poor infrastructure, high marketing margins, inappropriate information were reported to have caused increases in transactional costs. Chi-square results showed that the perception of transactional costs as a marketing challenge was not associated with any of the farmer characteristics such as gender, age, educational level and location (district).

#### **3.5.2.4.3 Lack of market reliability**

Results indicated that slightly less than half (45%) of the farmers were faced with market unreliability challenge. This is consistent with previous results by Khapayi and Celliers (2016) which showed that 45% of the interviewed farmers reported challenges of poor reliability, timeliness and biasedness from the markets. Lack of reliable markets was mentioned by DAFF (2012) as one of the main constraints generally affecting smallholder livestock farmers in South Africa. About 11% of the farmers faced with the challenge indicated the extent of the challenge as very high, while the majority (46%) ranked it as a slightly high challenge. The Chi-square result

( $p=0.01$ ) showed that there was a significant association between farmers' educational level and perception of being faced with lack of market reliability challenges. Majority of the farmers who were educated reported being confronted by the challenge compared to less educated farmers. Distribution of responses showed a gradual increase from (20%) primary education, (24%) secondary education to (56%) tertiary education implying that perception of the challenge was not by chance. The strength of association with education was medium (Cramer's  $V=0.33$ ). The challenge of poor market reliability has forced some farmers to switch from formal markets to informal markets in the study areas. However, Ainslie *et al.* (2002) argued that such developments have driven the farmers into the hands of speculators or middlemen who always take advantage of knowing their situations.

### 3.6 Conclusion

Results showed that emerging cattle farmers in Limpopo Province are confronted by production, environmental, marketing, and institutional and infrastructure challenges and constraints. The major challenges include poor grazing conditions, feed shortages, water scarcity, drought, pest and disease, lack of breeding camps, inadequate production and market infrastructures, inadequate market access and access to marketing information, unreliable markets, high transaction costs, poor access to extension, lack of financial support as well as stock theft, predation and straying of animals, in that order. It is therefore, important for the government to take a leading role in trying to provide appropriate solution measure to these challenges. Apart from such government initiatives, assessment of the need to improve management skills of the individual farmers by the use of technological tools and models that facilitate creation and hence sharing of extension messages among them is encouraged.

## References

- Agholor, I. A. (2013). Analysis of Constraints of Rural Beef Cattle Cooperative Farmers: A Case Study of Ga-kibi, Norma and Mogalakwena in Blouberg. *Journal of Agricultural Science*; 5 (8):76-86.
- AGRI-SA. (2016). A raindrop in the drought: Report to the Multi-stakeholder Team to the drought Agri SA report on the current Drought Crisis
- Ainslie, A., Kepe, T., Ntsebeza, L., Ntshona, Z. & Turner, S. (2002). Cattle ownership and production in the communal areas of the Eastern Cape, South Africa. Research Report no. 10. University of the Western Cape.
- Aliber, M. & Hall, R. (2012). Support for smallholder farmers in South Africa: Challenges of scale and strategy. *Development Southern Africa*, 29(4):548-562.
- Amenu, K., Markemann, A., Obler, R. R., Siegmund-Schultze, M. & Z'arate, A. V. (2011). Perceived Feed and Water Constraints for Livestock Production in Lume and Siraro Districts, Ethiopia
- Anon. (2007). *Pietersburg: The Columbia Encyclopedia*, 6th edition 2007. Columbia University Press.
- Baloyi, J. K. (2010). An analysis of constraints facing smallholder farmers in the Agribusiness value chain: A case study of farmers in the Limpopo Province, Department of Agricultural Economics Extension and Rural Development, Faculty of Natural and Agricultural Sciences, University of Pretoria.
- Brown, L. (2012). Supporting the participation of young people in agriculture and rural development, KB Knowledge Brief, National Youth Development Agency (NYDA), South Africa.

- Chikazunga, D. & Paradza, G. (2012). Can smallholder farmers find a home in South Africa's food-system? Lessons from Limpopo Province. The Institute for Poverty, Land and Agriculture Studies, pp. 3-4 (PLAAS)
- Cohen, J. (1988). Statistical power and analysis for the behavioral sciences (2nd ed.), Hillsdale, N.J., Lawrence Erlbaum Associates, Inc.
- Creswell, J. (2003). Research design: Qualitative, quantitative and mixed methods approaches (2nd ed.). Thousand Oaks, CA: SAGE Publications
- DAFF (2012). Strategic Plan for the 2012/13-2016/17. Department of Agriculture Fisheries and Forestry, South Africa.  
<http://www.nda.agric.za/doaDev/topMenu/StratPlan201213-201617.pdf>:  
Accessed on the 2nd of April 2016
- DAFF. (2012). A framework for the development of smallholder farmers through cooperatives development, Directorate Co-operative and Enterprise Development, Pretoria, South Africa.
- Department of Agriculture, Forestry and Fisheries (DAFF). (2010). Integrated Growth and Development Plan 2011-2031. [Online] Available
- FAO. (2011). The role of women in Agriculture. Agricultural Development Economics Division. ESA Working Paper No. 11-02 [www.fao.org/economic/esa](http://www.fao.org/economic/esa)
- FARNPAN. (2001). Agricultural policy making in Southern Africa: Issues and challenges
- Frequin, S., Anseeuw, W. & D'haese, M. (2012). Demystifying contract farming: evidence from rural South Africa. Department of Agricultural Economics. Ghent University. Belgium.
- Holmern, T., Nyahongo, J. & Roskat, E. (2001). Livestock loss caused by predators outside the Serengeti National Park, Tanzania. Biological Conservation, 135:518-526.



- Kgathi, D.L., Mmopelwa, G., Mashabe, B. & Mosepele, K. 2012. Livestock predation, household adaptation and compensation policy: a case study of Shorobe Village in northern Botswana. *Agrekon*, 51(2):22-37.
- Khapayi, M. & Celliers P. R. (2016). Issues and constraints for emerging farmers in the Eastern Cape Province, South Africa. *African Journal of Agricultural Research*.
- Khoabane, S. & Black, P. (2012). On the economic effects of livestock theft in Lesotho: An asset-based approach. *Journal of Development and Agricultural Economics* Vol. 4(5), pp. 142-146, Available online at <http://www.academicjournals.org/JDAE>.
- KwaZulu-Natal Department of Community Safety & Liaison. (2010). Rural Safety in KwaZulu-Natal, Pietermaritzburg, South Africa.
- Limpopo Department of Agriculture. (2002). Livestock research and innovation strategy: Terms of reference. Limpopo Provincial Department of Agriculture.
- Limpopo Department of Agriculture. (2012). Livestock research and innovation strategy: Terms of reference. Limpopo Provincial Department of Agriculture: Polokwane.
- Limpopo Department of Agriculture. (2015). Annual report 2012. Polokwane: DoA. <http://www.lida.gov.za/Pages/default.aspx>
- Machethe, C.L. (2004). Agriculture and poverty in South Africa: Can agriculture reduce poverty? Paper delivered at the United Nations Development Programme, Human Science Research Council & Development Bank of Southern Africa Conference on Overcoming Under-Development in South Africa's Second Economy, Pretoria, 22-26 October.

- MacLeod, N. D., McDonald, C.K. & van Oudtshoorn, F.P. (2010). Challenges for emerging livestock farmers in Limpopo province, South Africa, *African Journal of Range & Forage Science*, 25:2, 71-77.
- Mahabile, M., Lyne, M.C. & Panin, A. (2002). Factors affecting the productivity of communal and private livestock farmers in Southern Botswana: A descriptive analysis of sample survey results. *Agrekon* 41(4):326–336
- Mapiye, C., Chimonyo, M., Dzama, K., Raats, J.G. & Mapekula, M. (2009). Opportunities for improving Nguni cattle production in the smallholder farming systems of South Africa. *Livestock Science* 124: 196-204.
- Marandure, T. (2015). Sustainability of smallholder cattle production and its vertical integration into the formal beef market value chain in South Africa, MSc Sustainable Agriculture, Stellenbosch University, South Africa.
- Masikati, P. (2010) Improving the water productivity of integrated crop-livestock systems in the semi-arid tropics of Zimbabwe: an ex-ante analysis using simulation modelling.
- Moloi, M. J. (2008). A Comparison of Socio-economic Characteristics that Determine the Farm Income of Emerging Livestock and Horticultural Farmers in South Africa. MSc Thesis, Unpublished. Department of Agricultural Economics University of Limpopo
- Montpellier Panel. (2012). Women in Agriculture: farmers, mothers, innovators and educators. London: Agriculture for Impact.
- Montshwe. D.B. (2006). Factors affecting participation in mainstream cattle markets by small-scale cattle farmers in South Africa. MSc Thesis, University of Free State, RSA.
- Mpandeli, S. Nesamvuni, E., and Maponya, P. (2015). Adapting to the Impacts of Drought by Smallholder Farmers in Sekhukhune District in Limpopo

province, African Journal of Agricultural sciences; Vol. 7, No. 2; 2015, Canadian Center of Science Education.

- Muchenje, V., Chimedza-Graham, R., Sikhosana, J. L. N., Assan, N., Dzama, K. & Chimonyo, M. (2007a). Milk yield of Jersey × Nguni and Jersey × Tuli F1 and F2 cows reared under smallholder farming conditions. South African Journal of Animal Science 8:7-10  
<http://www.sasas.co.za/scientific/muchenje%2007.pdf>
- Munyai, F.R. (2012). An evaluation of socio-economic and biophysical aspects of small-scale livestock systems based on a case study from Limpopo province: Muduluni village. PhD thesis. University of the Free State, Bloemfontein.
- Musemwa, L., Mushunje, A., Chimonyo, M., Fraser, G., Mapiye, C. and Muchenje, V. (2008). Nguni cattle marketing constraints and opportunities in the communal area of South Africa. African Journal of Agricultural Research, 3(4):239-245.
- Mutibvu, T., Maburutse, B., E. Mbiriri, D., T. & Kashangura, M., T. (2012). Constraints and opportunities for increased livestock production in communal areas: A case study of Simbe, Zimbabwe. Livestock research for Rural Development 24(165).
- Mwacharo, J. M. & Drucker, A. G. (2005). Production objectives and management strategies of livestock-keepers in Southeast Kenya: implications for a breeding programme. Tropical Animal Health and Production. 37(8):635-52.
- Nalubwama, S., Vaarst, M., Kabi, F., & Kiggundu, M. (2014b). Animal Husbandary Practices Of Smallholder Organic Farmers In Uganda: Challenges And Future Prospects Animal Husbandry Practices Of Smallholder Organic Farmers In Uganda: Challenges And Future Prospects. In G. Rahmann & U. Aksoy (Eds.) Building Organic Bridges, Johann Heinrich von Thünen-Institut, Braunschweig, Germany, 4, Thuenen Report, no. 20, pp. 1123-1126

- National Emergent Red Meat Producers Organisation (NERPO). (2004). Marketing infrastructure development. <http://www.nerpo.org.za>.
- Ndebele, J. J., Muchenje, V., Mapiye, C., Chimonyo, M., Musemwa, L., & Ndlovu, T. (2007). Cattle breeding management practices in the Gwayi smallholder farming area of South-Western Zimbabwe, *Livestock Research for Rural Development*, 19 (12)
- Ngeno, N. (2008) Reproductive Performance of Cows in Sweet and Sour Veld Types Under Communal Production Systems in the Eastern Cape Province of South Africa. MSC Thesis, Department of Livestock and Pasture Science, University of Fort Hare.
- Nitter, G. (2000). Developing Crossbreeding structures for extensive grazing systems Utilising only indigenous animal genetic resources. In: Galal S, Boyazoglu J and Hammond K (editors), *Workshop on Developing Breeding Strategies for Lower Input Animal Production 22-25 September 1999, Bella, Italy*. ICAR Technical Series No. 3. pp. 179-206
- Ogunkoya, F. T. (2014). MSC Dissertation: Socio-Economic factors that affect livestock numbers: A case study of smallholder cattle and sheep farmers in the Free State province of South Africa, University of South Africa.
- Oni, S. A., Nesamvuni, A. E., Odhiambo, J. J., O., & Dagada, M. C. (2012). Executive Summary of a Study of the Agricultural Industry in Limpopo.
- Republic of South Africa. (2015). Government on Water Scarcity and Drought. Government media briefing. <http://www.gov.za/speeches/government-water-scarcity-and-drought-13-nov-2015-0000>. Accessed on the 12th of June 2016.
- Schultze, M.S., Rischkowsky, B., Da Veiga, J.B. & King, J.M. (2007). Cattle are cash-generating assets for mixed smallholder farms in the East Amazon. *Journal of the Agricultural System*, 94:738-749

- Sikhweni, N. P. & Hassan, R. (2013). Opportunities and challenges facing small-scale cattle farmers living adjacent to Kruger National Park, Limpopo Province. *Journal of Emerging Trends in Economics and Management Sciences*
- Southern African Plant Invaders Atlas (SAPIA News). (2013). Indigenous bush encroachers and alien invaders—what is the difference? Agricultural Research Council (ARC) -Plant Protection Research Institute; Working for Water; Department of Environmental Affairs, South Africa.
- Statistics South Africa. (2015). Mid-year population estimates, Statistical Release P0302. Pretoria, South Africa
- Sukamolson, S. (2007). *Fundamentals of quantitative research*: Bangkok, Thailand: EJTR. Retrieved from
- Thornton, P.K. (2010). Livestock production: recent trends, future prospects. *Philosophical Transactions of Royal Society B: Biological Sciences*, 365, 2853–2867
- Trochim, W.M. (2006). *Descriptive statistics*. Research Measures Knowledge Base.
- Tshiala, F.M., Olwoch, J.M. & Engelbrecht, F.A. (2011). Analysis of temperature trends over Limpopo Province, South Africa. *Journal of Geography and Geology*.
- Twomlow, S.J., Steyn, J.T. & du Preez, C.C. (2006). Dry-land farming in southern Africa. In: Petersen, G.A., Unger, W.P., Payne, W.A. (Eds.), *Dry-land Agriculture*, second ed. Agronomy Monograph No. 23 American Society of Agronomy, Madison, Wisconsin.
- United Nations Development Programme (UNDP). (2012). *Africa Human Development Report 2012. Towards a Food Secure Future*. Regional Bureau for Africa (RBA), UN Plaza, New York, USA.

Williams, C. (2007). Research Methods. Journal of Business & Economic Research, Volume 5, Number 3 65, Grand Canyon University.

World Farmers Organization (WFO). (2016). The role of women in Agriculture. <http://www.wfo-oma.com/women-in-agriculture/articles/the-role-of-rural-women-in-agriculture.html>.

## **Chapter 4: Information sources and extension sharing strategies for emerging cattle farmers in Limpopo Province, South Africa**

### **4.1 Abstract**

Information sources, methods of sharing own created intervention strategies and messages employed by emerging beef cattle farmers in Limpopo province were assessed. All the farmers under the Limpopo Industrial Development Corporation (IDC)-Nguni cattle project were subjected to individual interviews using structured questionnaires. Data were collected and analyzed using descriptive statistics and chi-square tests of association. The majority (88%) of the farmers seek management advice when confronted with challenges and constraints. Chi-Square test results show that farmers' ability to seek advice after being confronted with a challenge was found to be associated with location ( $p=0.03$ ) and education ( $p=0.02$ ). Government extension officers (53%) and other farmers (30%) were indicated as the major sources of information used by the farmers. About 80% of the respondents were found to be involved in the creation of interventions and extension messages. About 63% of them indicated that they shared the messages with other farmers while 33% shared with government extension officials. Majority of the farmers used farm-to-farm visits or face-to-face interactions (56%) when sharing their own created intervention strategies and messages. In addition, a significant proportion (41%) of the farmers indicated that they used mobile phones when sharing the intervention strategies and messages. Besides, government extension being the major source of information used, farmers also created their own interventions which they largely communicated to other farmers by means of farm to farm visits and mobile phones. There is scope for improved sustainability and food security contribution by emerging beef farmers. This is through improvement in sources of information, ability to create interventions and the use of effective communication methods and tools when sharing extension messages.

**Key words:** Intervention strategies, extension messages, knowledge sharing, emerging farmers

## 4.2 Introduction

Support for the development of smallholder livestock farming has been a priority for the South African government since the attainment of independence [Department of Agriculture Forestry and Fisheries (DAFF), 2010; Frequin *et al.*, 2012; Alliber and Hall, 2012]. Some of the initiatives gave birth to the development of the emerging farming sector which is mainly composed of previously disadvantaged black majority farmers. Research shows that farmers in the smallholder sector continue to be weighed down by low productivity (UNDP, 2008; and DAFF, 2012). Instinctively, this limits their full production potential and the expected contribution towards food security, poverty alleviation and overall development of the country's agricultural industry.

Agricultural information has a broad and multidimensional role towards agricultural development. According to Mittal and Mehar (2013), agricultural information endows farmers with the capacity to respond in the face of different types of management risks, market incentives and competition more proficiently. Agricultural information can be accessed from different sources (Mital and Mehar, 2013) and can also be disseminated using various methods or channels (Sokoya, 2014). Adetayo and Eunice (2013) mentioned that smallholder farmers in developing countries largely depend on public extension services for agricultural information. Apart from the government extension services, other sources of agricultural information include informal sources such as face-to-face interactions with other farmers, extension agents, friends and relatives and formal sources such as television and radio programs (Sarvanan, 2011; Mittal and Mehar, 2013). These methods are used to disseminate scientific, technical and socioeconomic agricultural knowledge to farmers and also assisting in the adoption of improved technology. Access to agricultural information by farmers is connected with skills acquisition which helps improve farming practices, optimizes production and sustains the environment (Mtega *et al.*, 2016).

South Africa's smallholder in particular emerging livestock farmers face several management challenges and constraints (Baloyi, 2010; DAFF, 2012) and this could be



attributed to lack of appropriate information to assist them to address the challenges (Ortman and King, 2007). It has become so difficult for the smallholder and emerging farmers to continuously rely on the public extension system. The system is generally labeled as weak Chikazunga, (2012), under resourced (MacLoed *et al.*, 2010), bureaucratic and inefficient (CTA, 2012). Farmers fail to access information that can effectively improve their production and marketing capacity as well as improving the sustainability of cattle farming. Therefore, Adetayo and Eunice (2013) expressed the need for devising modalities that will help improve efficiency of extension and for it to be more responsive to farmers' needs. Mittal and Mehar (2013) acknowledge the growth and use of modern Information and Communication Technology (ICT) based agricultural extension services by farmers since the year 2000. This is primarily through mobile phones and internet connections. They emphasized that ICTs helped strengthen the agricultural extension services and dissemination of information and also by enabling farmers to be constantly connected to various sources of information. Therefore, the study assessed the information sources and extension message sharing systems used by emerging cattle farmers in Limpopo Province.

### **4.3 Methodology**

The research study adopted a quantitative methodology which is based on a post-positivist paradigm. The descriptive design was adopted.

#### **4.3.1 The study area and sample**

The study was done in Limpopo Province of South Africa. Surveys were conducted with emerging cattle farmers located in 14 local municipalities of the province. All 62 farmers under the IDC-Nguni cattle participated in the survey. Description of the province, distribution of the farmers (Table 3.1) and farmer characteristic were discussed in chapter 3.

### **4.3.2 Data collection**

Data for this study were collected through the use of questionnaire administered to 62 farmers between August and September 2016. Questionnaires were designed in English but during survey, they were administered in local languages (*Sepedi or Venda*) to help farmers respond comfortably. Farmer's responses on the sources of information and extension sharing strategies used were captured.

### **4.3.3 Data analysis**

Data were analyzed using SPSS version 24. Descriptive statistics with frequency counts and percentages were used in the analysis. Association between perceptions of respondents and characteristics such as education, location (district) and age were done using chi-square test as described in chapter 3.

## **4.4 Results and discussion**

### **4.4.1 Acquisition of cattle management advice**

All farmers were asked whether they seek management advice after confronted with cattle management challenges or constraints. About 88% of the respondents agreed that they sought advice to help address the management problems they faced. Chi-square test results indicated an association between seeking advice and location ( $p=0.03$ ), (Table 4.1). Thus, the proportion of the respondents who reported seeking advice was substantially high in Capricorn and Waterberg districts compared to other three districts. The strength of the association with location was low (Cramer's  $V=0.11$ ). The association could be explained by the fact that majority of the farmers were located in these two districts and there farms were closer to provincial extension offices and other previously established farmers. Therefore, the farmers were likely to consult for advice because they were close to substantial sources of information.

Educational level of the respondents was also found to be associated with the decision taken by farmers to seek advice in case of a challenge or constraint ( $p=0.02$ ). Results showed that among the respondents, the proportion of those who

reported to have sought management advice was lowest amongst those with no formal education (4%) compared to those with tertiary education (47%). This may be attributed to the fact that education helps them to understand the importance of the challenges constraining them. Therefore, more educated farmers are likely to seek for advice compared to those who are less educated. Also, educated farmers do have the capability to explore and use all available information sources hence are likely to be frequent information seekers than less educated farmers. In a study conducted by Cole and Fernando (2012), more educated Indian farmers were found to be more frequently seeking from a mobile-phone based agricultural consulting service compared to less educated. However, all respondents from the study areas indicated that they did not exclusively rely on only one source. This could be because sources of information were not always readily available and the available sources might not have been able to provide all the information needed.

#### 4.4.2 Information sources for emerging cattle farmers

Farmers were asked about the different sources on information they used. Table 4.1 summarises the results.

**Table 4.1:** Different sources of information consulted for management advice by emerging beef cattle farmers in Limpopo Province (%).

Source of Information	Cattle management Challenge/Constraint areas				Overall Source
	Production	Animal protection	Marketing	Institutional & Infrastructural	
Government extension agents	54	13	50	67	53
Other farmers	33	54	30	19	30
Government Vet officer	8	0	0	11	7
Police	0	30	0	0	4
Cattle buyers	0	0	19	0	3
Private extension agents	3	0	0	0	1
Input dealers	2	0	0	1	1
Other Sources	0	3	0	2	1
Total	100	100	100	100	

*Observed p values for chi-square tests between farmers' characteristics and dependent variables pertaining to source of advice/Information*

	Pearson chi-square value (p)			
	District	Gender	Education	Age
Did you seek advice	0.030***	0.760	0.002***	0.396
Source of advice	0.375	0.001***	0.842	0.786

\*\*\* Significant at ( $p < 0.05$ )

Over half (53%) of the farmers consulted government extension officers for advice when faced with cattle management challenges (Table 4.1). A study by Stone and Terblanché (2012) found that 75% of the farmers in the subtropical regions of South Africa use extension services as sources of information. Motiang and Webb (2015) also support these findings. They reported a very high proportion (87%) of the

smallholder cattle farmers in Dr Ruth Segomotsi Mompati District Municipality, North West Province who indicated that they relied on extension officers for information. Similar results were also reported in studies conducted by Ahmad *et al.*, (2007) in some villages of Pakistan. Adetayo and Eunice (2013) also found that about 90% of the respondents indicated extension officers as main sources of information in Nigeria. In this study, above three quarters of the farmers who reported having used particular sources were males compared to less than a quarter for females. Based on the Chi-Square test, gender was significantly associated with the farmers' ability to choose a particular source of information ( $p=0.01$ ). The strength of the association between gender and choice of information source was low (Cramer's  $V=0.22$ ). The dominance by males in the choice of sources of information may be associated to gender roles and responsibility whereby women could have been more associated with household and within farms chores than outside issues. This supports an assertion by Okonya and Krosche (2014) where in Sudan, Malawi, Nigeria, and Kenya they observed that the association of gender and access to agricultural information sources, fewer women were not involved because their involvement in household chores gives them little time to receive extension services, unlike their male counterparts.

Despite extension officers being labeled the most contacted source of information, most farmers indicated that communication was through telephone or they had to travel and meet them at their station offices. This implies that the interaction between the farmers and the government extension agents is not being conducted at the source of the challenge, the farm. Similarly, Rees *et al.* (2000) indicated that majority of the farmers relied on government extension as an important source of information but they were dissatisfied by the quality and frequency of their interactions with the extension personnel. In this study, the situation could be largely attributed to lack of social and geographical closeness as well as insufficient support towards the extension delivery process. MacLeod *et al.* (2010) mentioned that South Africa's agricultural extension, in particular in the Limpopo Province, is failing to meet the growing number of emerging farmers due to the current debilitating lack of support resources. However, the continuous belief by farmers to

rely on extension as a source of information is suggestive of the fact that improvement in skills and resource allocation towards extension may lead to better performance of emerging cattle farmers.

Table 4.1 shows that the other main source of advice reported to have been used by the respondents were other farmers (30%). Motiang and Webb (2015) also reported that other farmers (48%) and established commercial farmers (47%) were important sources of information. They asserted that South Africa's public extension system is supported by model farmers who are giving formal and informal advice to other farmers. Therefore, complementary use of these two sources of management information could help improve the resilience of the overall extension system.

Disaggregated results, presented in Table 4.1 above show that respondents depended much on government extension than other farmers when faced with production (54%), marketing (50%), institutional (48%) and infrastructural (66%) management issues. On the contrary, about (54%) identified other farmers as their main source of information when faced with animal protection management challenges and constraints. Small proportions of respondents reported that they sought advice from cattle buyers (19%) and the South African police (30%) to help solve marketing and animal protection problems, respectively. Interestingly, none of the farmers reported using formal sources such as mobile phones, internet, radios and print media. This provides scope for improvement in the sources of information.

#### **4.4.3 Sharing of own created intervention strategies by emerging cattle farmers in Limpopo Province**

Farmers were asked to provide individuals and or organisations they shared the interventions they created (Appendix 2) with. Table 4.2 presents the results. Chi-square tests of association between farmer characteristics and sharing of extension messages are also presented in the Table 4.2.

**Table 4.2** percentage responses by the emerging farmers on whom they shared their own created intervention strategies with (%)

<i>Own created extension messages shared with</i>	<i>Challenge/Constraint area</i>				<i>Overall Source used</i>
	<i>Production</i>	<i>Animal protection</i>	<i>Marketing</i>	<i>Institutional &amp; Infrastructural</i>	
<b>Other farmers</b>	62	68	67	59	<b>63</b>
<b>Government extension</b>	34	26	27	38	<b>33</b>
<b>Government Veterinary</b>	2	0	0	3	<b>1</b>
<b>Cattle buyers</b>	2	0	6	0	<b>1</b>
<b>Police</b>	0	6	0	0	<b>1</b>

*Observed p values for chi-square tests between farmers' characteristics and dependent variables pertaining to sharing of own created intervention strategies*

	<i>Pearson chi-square value (p)</i>			
	<i>District</i>	<i>Gender</i>	<i>Education</i>	<i>Age</i>
<b>Sharing of Interventions</b>	0.007***	0.429	0.032***	0.101
<b>Whom the intervention was shared to</b>	0.001***	0.001***	0.347	0.821

\*\*\* Significant at ( $p < 0.05$ )

The study showed that 95% of the farmers shared the intervention strategies and messages they created. Majority of those who indicated that they shared the messages had tertiary education (45%) with nearly two thirds being between the ages of 46 and 65 years. Based on the Chi-square test, there was a significant association between the decision to share own created intervention knowledge and location ( $p=0.07$ ) (Table 4.2). The proportion of the respondents who reported sharing the created intervention knowledge was substantially higher in Waterberg (45%) and Capricorn (36%) districts and very low in Vhembe (4%) and Mopani (20%) districts. The strength of the association with location was small (Cramer's  $V=0.14$ ). However, the decision to share own created intervention strategies was found not to be associated with age and educational status of the respondents ( $p=0.10$ ,  $0.43$ ). This implies that the percentage distribution of age and education among the farmers did not have an influence on the decision taken on whether to share interventions or not.

Current findings demonstrated that majority (63%) of the respondents reported that they communicated the intervention strategies and messages they created with other farmers. At least two thirds of them were above 56 years and only 9% being females. Interestingly, about 33% of them communicated their interventions back to the government extension officers. Chi-square test shows a significant association ( $p=0.01$ ) between gender and whom the farmers shared their interventions with (Table 4.2). For example the majority (89%) who shared their interventions with government extension agents were males. The strength of the association with gender was medium to high (Cramer's  $V=0.26$ ).

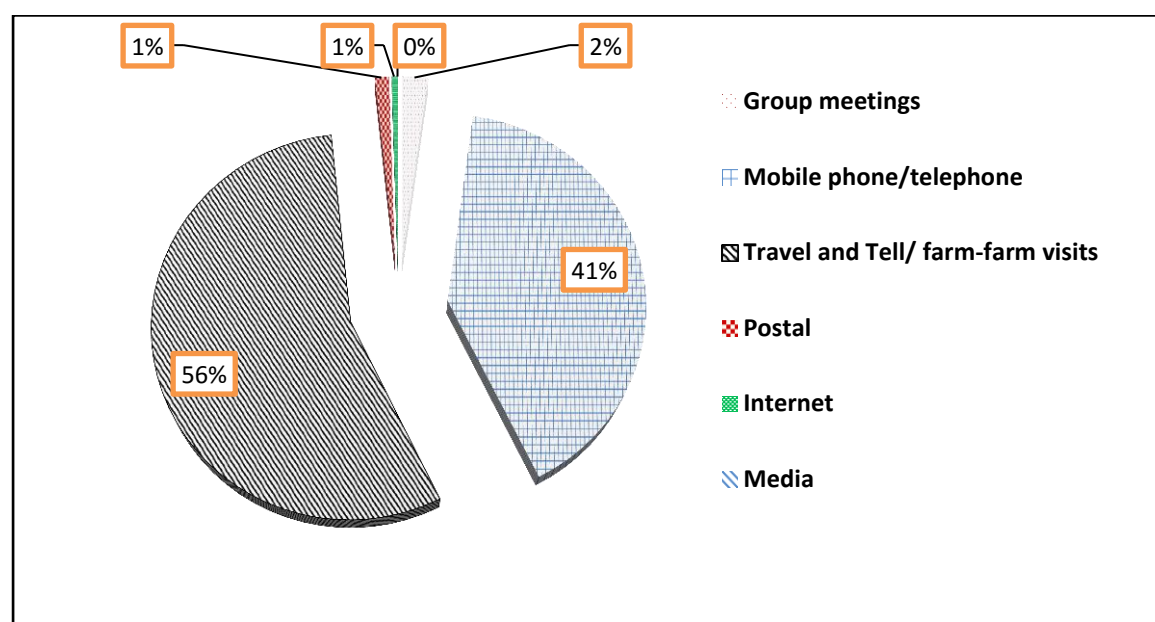
Apart from that, results showed that farmer-to- farmer sharing of own created intervention strategies dominated in management areas such as animal protection (68%), marketing (67%) as well as institutional and community infrastructure where it was slightly lower (59%). Very few of the respondents reported to have shared their interventions with the veterinary services, cattle buyers and police. The results that farmers shared extension messages to other farmers is consistent with findings by Mtega *et al.* (2016) where majority of the farmers agreed to have shared information with other farmers.

#### **4.4.4 Methods adopted for sharing own created intervention strategies by emerging beef cattle farmers in Limpopo Province**

Farmers were asked to identify methods they used to disseminate intervention strategies and messages they created. Choice of communication methods was significantly associated with the respondents educational status ( $p=0.01$ ). The strength of the association with education was small (Cramer's  $V=0.12$ ). The distribution of farmers who indicated that they used the travel and tell and mobile phones to communicate extension messages was largely from those with tertiary level (42%) compared to those with no more than primary level of education (24%). Further to this, Chi-square results also showed an association between communication methods reported and age of the farmers ( $p=0.01$ ). The strength of the association was small (Cramer's  $V= 0.12$ ). Thus, the percentage distribution of



farmers who chose a particular communication method increased gradually from those below 45 to between 46 and 55 and above 56. As an example, farmers who indicated that they often used travel and tell were progressively distributed as 11% (Below 45 years), 24% (46-55) and 65% (above 56 years). This could be explained by the fact that as the farmers grow older they value the importance of face to face interaction when sharing important messages.



**Figure 4.1:** Methods used to share own created intervention strategies by emerging cattle farmers in Limpopo province.

**Table 4.3:** Observed p-values for chi-square tests between farmers' characteristics and mode of communication used

	<i>Pearson chi-square value (p)</i>			
	<i>District</i>	<i>Gender</i>	<i>Education</i>	<i>Age</i>
<b>Method of communication used</b>	0.001***	0.001***	0.001***	0.001***
<b>Cramer's V</b>	0.126	0.316	0.121	0.115

Figure 4.1 shows the key communication channels that were cited by respondents in sharing own created intervention strategies and various cattle management skills. Travel and tell/face-to-face interactions (56%) and the use of mobile phones (41%) were the commonly used channels of communication. Farmers who shared

information by using the travel and tell approach were largely from the districts of Capricorn (45%) and Waterberg (36%) with 94% of them being males.

A considerable proportion (45%) of the respondents disclosed that they often shared intervention strategies using mobile phones. Slightly above half (55%) of those respondents were from Waterberg district and 14% of them were females. The farmers use mobile phones to connect with cattle buyers, other farmers and the extension personnel. Preference of the respondents to use mobile phones can be attributed to the widening mobile phone infrastructure and increased number of services offered by mobile phone companies in South Africa. Goldstuck (2012) found that 8 million South Africans were accessing internet through their mobile phones and further predicted that by 2014, the number will increase to 10 million people. These mobile devices include hand held devices such as tablet computers and smart phones which can run customised software (Simpson and Calitz, 2014). In a study by Mtega (2013) in Tanzania, the majority of farmers indicated that they used face to face (64%) and mobile phones (66%) for communicating agricultural information. Mobile phones are found to become popular method for communicating agricultural information. However, some of the farmers admitted using multiple communication channels depending on who they were communicating with. Very few respondents indicated that they share their extension messages during group meetings (2%) and by means of postal services (1%). Study results indicating that none of the farmers reported to have used radios or television as channels of communication contradicts findings by many researchers such as Mtega and Msungu (2013). Such inconsistency could be attributed to the fact that farmers in the study areas were asked to identify channels they used to share the intervention strategies implemented not the general communication modes they used on their day to day management of their farming systems.

## **4.5 Conclusion**

Current findings indicate that the majority of farmers sought for management advice when confronted with challenges and constraints. The two major sources of advice

used by the farmers were government extension officers and other farmers. The farmers' ability to seek advice after faced with a challenge was associated with characteristics such as location and education. Also, choice of a particular source of information was associated with farmers' gender. Respondents were involved in the creation of intervention strategies and messages and the majority indicated that they shared these with other farmers. They indicated that they preferred using farm to farm visits or face to face interactions and mobile phones when sharing the own created intervention messages. It could be important to further support access of cattle management knowledge in the smallholder sector. Given the challenges facing the government, farmers should not continue to largely rely on it alone but also other sources of information. Therefore, it is important to device tools and policies that motivate the creation and sharing of extension messages at farmer level for sustainable growth.

## References

- Adetayo, A.J. & Eunice, B. (2013). Privatization of agricultural extension services in Nigeria: A fallacy? *Asian J. Agric. Ext, Econ. & Soc.* 2(1), 14-22
- Ahmad, S., Jamal, M., Ikramullah, A. & Himayathullah. (2007). Role of extension service on the farm productivity of district Swat (A case study of two villages). *Sarhad J. Agric.* 23(4), 1265-1271.
- Aliber, M. & Hall, R. (2012). Support for smallholder farmers in South Africa: Challenges of scale and strategy. *Development Southern Africa*, 29(4):548-562.
- Baloyi, J. K. (2010). An analysis of constraints facing smallholder farmers in the Agribusiness value chain: A case study of farmers in the Limpopo Province, Department of Agricultural Economics Extension and Rural Development, Faculty of Natural and Agricultural Sciences, University of Pretoria.
- Chikazunga, D. & Paradza, G. (2012). Can smallholder farmers find a home in South Africa's food-system? Lessons from Limpopo Province. The Institute for Poverty, Land and Agriculture Studies, (PLAAS) Blog. <http://www.plaas.org.za/blog/can-smallholder-farmers-find-home-south-africa%E2%80%99s-food-system-lessons-limpopo-province>. Accessed 10 June 2016.
- CTA. (2012). Agricultural Extension: A time for change. Linking knowledge to policy and action for food and livelihoods. Technical Centre for Agricultural and Rural Cooperation ACP-EU (CTA) Wageningen, Netherlands.
- Cole, S. A. & Fernando, A. N. (2012). The Value of Advice: Evidence from Mobile Phone-Based Agricultural Extension Harvard Business School Working Paper 13-047.
- Frequin, S., Anseeuw, W., & D'haese, M. (2012). Demystifying contract farming: evidence from rural South Africa. Department of Agricultural Economics. Ghent University. Belgium.
- DAFF. (2010). Integrated Growth and Development Plan 2011-2031. Available online.

- DAFF. (2010). The Strategic Plan for South African Agriculture. Department of Agriculture, Directorate of Agricultural Information Services, Pretoria.
- DAFF. (2012). Strategic Plan for the 2012/13-2016/17. Department of Agriculture Fisheries and Forestry, South Africa.  
<http://www.nda.agric.za/doaDev/topMenu/StratPlan201213-201617.pdf>:  
Accessed on the 2nd of April 2016
- Goldstuck, A. (2012). Internet Access in South Africa 2012. World Wide Worx.
- MacLeod, N. D., McDonald, C.K. & van Oudtshoorn, F.P. (2010). Challenges for emerging livestock farmers in Limpopo province, South Africa, *African Journal of Range & Forage Science*, 25:2, 71-77
- Mittal, S. & Mehar. M. (2013). Agricultural information networks, information needs and risk management strategies: a survey of farmers in Indo-Gangetic plains of India. Socioeconomics Working Paper 10. Mexico, D.F.: CIMMYT.
- Motiang, D. A & Webb, E.C. (2015). Sources of information for small-holder cattle farmers in Dr Ruth Segomotsi Mompati District Municipality in the North West Province, South Africa. *Applied Animal Husbandry & Rural Development*, Volume 8, 26-33: [www.sasas.co.za/aahrd/](http://www.sasas.co.za/aahrd/)
- Mtega, W. P., Ngoepe, N. & Dube, L. (2016). Factors influencing access to agricultural knowledge: The case of smallholder rice farmers in the Kilombero district of Tanzania, *Journal of South African Information management*.
- Mtega, W. P. & Msungu A. C. (2013). Using information and Communication Technologies for enhancing the accessibility of agricultural information for improved agricultural production in Tanzania. *The Electronic Journal of Information Systems in Developing Countries*, [www.ejisdc.org](http://www.ejisdc.org)
- Okonya, J. S. & Kroschel J. (2014). Gender differences in access and use of selected productive resources among sweet potato farmers in Uganda. *Agriculture & Food Security* **3**:1

- Rees, D., Momanyi, M., Wekundah, J., Ndungu, F., Odondi, J., Oyure, A. O., Andima, D., Kamau, M., Ndubi, J., Musembi, F., Mwaura L., & Joldersma, R. (2000). Agricultural Knowledge And Information Systems In Kenya – Implications For Technology Dissemination And Development. The Agricultural Research and Extension Network, DFID
- Sarvanan, R. (2011). A Report on Tribal Farmers Personal and Socio-Economic Information, Communication Pattern and Information Needs Assessment.
- Simpson, A. P, and Calitz, A. P. (2014). The use of Mobile Technologies amongst South African commercial farmers. South Africa Journal of agricultural extension, Vol 42
- Sokoya, A, A., Adefunke, O, A. & Fagbola, B, O. (2014). Farmers Information Literacy and Awareness towards Agricultural Produce and Food Security: FADAMA III programs in Osun state Nigeria, IFLA. <http://library.ifla.org/1001/1/140-sokoya-en.pdf>
- Stone, W. A. & Terblanche, S. E. (2012). The Evaluation of the Subtropical Crops Extension and Advisory Service (SUBTROP) as Perceived by Farmer Members in the Subtropical Regions, South Africa. S. Afr J. of Agric. Ext., 40(1), 58-67.
- United Nations Population Division (UNPD). (2008). The 2006 revision and world urbanization prospects: the 2005 Revision. Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, World Population Prospects

## **Chapter 5: General Discussions, Conclusions and Recommendations**

### **5.1 Introduction**

Cattle production remains one of South Africa's most important farming practices, holding a fundamental position in terms of livelihoods creation and food security among the rural poor. Within the rural areas of Limpopo Province, smallholder cattle farming which is composed of subsistence and subsistence-cum-commercial (emerging) farmers dominates agricultural activities (DAFF, 2012). Emerging cattle farmers are an important component of the cattle farming industry in the province and to date they have received support from the government and other developmental institutions to assist them migrate to commercial level (National Treasury, 2010). However, the sustainability of the emerging cattle farming sector in South Africa has not been documented and its contribution to food security is still low (IDC, 2016). Therefore, the broad objective of the current study was to assess the need of a farmer knowledge management and sharing tool (Management database) that would improve emerging cattle farmers' contribution to sustainability and food security. This was achieved through an understanding of ecological and socio-economic challenges and constraints affecting the emerging cattle farmers and evaluating current strategies employed in creating and sharing solutions and interventions for the challenges and constraints faced.

### **5.2 General discussion of results**

Chapter 3 tested the hypothesis that emerging beef cattle farmers in Limpopo Province were not significantly confronted with ecological and socio-economic management challenges and constraints. Findings demonstrated that farmers within the study areas were faced with a myriad of management challenges and constraints. These challenges and constraints were broadly categorised into environmental/ecological and biophysical, and production, institutional and infrastructural and marketing. The majority of the farmers reported that they were confronted with many ecological challenges such as droughts, heat waves, rangeland

degradation and biodiversity loss while very few farmers reported incidences of flooding, frosts and land pollution. Ecological protection or stewardship is invariably one of the pillars of sustainability that farmers of this era should compulsorily and responsibly accommodate in their farming systems (Donnelly *et al.*, 2014). Overall, capacity of the farmers to apply mitigation and adaptation strategies in their cattle farming systems can be improved positively if they are allowed and capacitated to share intervention strategies they create among themselves. Therefore, a management database system will help address some of the ecological challenges faced as it allows knowledgeable and experienced farmers to share their ideas with other farmers.

Production challenges and constraints reported by the farmers include poor grazing conditions, feed shortages, and unavailability of water, parasites attack, diseases prevalence, stock theft and predation. In the face of feed shortage challenge, some of the farmers adopted the use of cheaper feed supplements such as crop residues brought from own or neighbours cropping farms and grass hay cut from road edges in the early post-rainy season. Other farmers relied on government drought cattle feed rations and bought-in commercial feed supplements. Water is one of the most limiting resources in Limpopo province (LDA, 2012). It was reported as a major constraint in the current study. Some farmers were using expensive and unsustainable strategies such as the use of trucks to fetch water from distant sources. Others drilled boreholes and built storage dams. Farmers from the study areas had knowledge gaps in terms of their respective interventions to solve the constraints faced. Consequently, this justifies the need to strengthen and coordinate the exchange of extension messages among farmers, and between farmers and government extension officers to address these ecological challenges and constraints. This may positively impact on the overall cattle productivity hence improved their contribution towards food security and livelihoods of emerging farmers.

Farmers reported to be faced with other challenges including lack of fencing infrastructure to facilitate controlled breeding and grazing management, high transaction costs, market unreliability, and poor access to markets and marketing



information. Markets are an important means through which the farmers can be integrated effectively into the mainstream of cattle marketing industry (Obi *et al.*, 2011). Despite the Nguni being a potential beef brand for the future (Marandure, 2015), it is fundamental for farmers to start realize the importance of collective selling in terms of market control. A management database system has the potential to link farmers from different and distant farming communities by allowing them to share and explore collective marketing opportunities. It can improve accessibility to market information and hence access to markets by the emerging farmers.

Farmers in the current study indicated that they also faced institutional and infrastructural constraints such as poor access to extension services, lack of financial support, and lack of community production and marketing infrastructure. These challenges are further influenced by farmers' demographic attributes such as age, education, gender of household head, and household size (Moloi, 2008). Poor access to extension has been widely reported in recent studies by (Akpalu, 2013; Gwala, 2013; Khaphayi and Celliers, 2016). The South African extension model is deemed weak and under resourced (MacLeod *et al.*, 2010). Also, it tends to be bureaucratic and inefficient, instead of consulting farmers about their needs, it generally decides what is best for them (CTA, 2012). Knowledge exchange strategies such as the use of management database system can help address such limitations and weakness of the extension system and hence solve the challenges reported by the farmers. The database will influence farmers to identify, share and prioritise their problems and needs. More importantly, the data base may assist farmers to seek ways of solving their problems within their community rather than only waiting for the government's extension service. Improved access to appropriate, timely cattle management knowledge and skills by farmers will promote adoption and practicing of sustainable farming practices by farmers which might increases economic profitability, environmental stewardess, welfare improving and hence positive contribution toward national food security. However, the management database may not directly and effectively influence improved access to infrastructure and financial support but farmers can use the platform to share ideas on how best they can get support from the government and other developmental institutions.

The challenges and constraints identified and characterised in the current study may assist in the development of appropriate policies, strategies and tools that can improve emerging farmers' cattle productivity and contribution to food security in South Africa. Nevertheless, with the right advice, continuing technical support, and the pursuit of sound management practices, by many of these emerging farmers might help in reducing issues that constraint farmer productivity.

Chapter 4 explored the information sources and extension sharing strategies used by emerging cattle farmers in Limpopo. The tested hypothesis was that emerging beef cattle farmers do not have common sources of information and systems of sharing own created extension messages. The first part of the chapter was designed to identify if farmers seek advice after being confronted with management challenges and constraints and the sources of information they consulted. Findings showed that a highly significant proportion of these farmers sought advice when confronted with management challenges and constraints. Based on chi-square test, perceptions of seeking advice when faced with a management challenge or constraint was found to be significantly associated with location and education. This was because the majority of farmers who exhibited such a perception were from only two districts and they were more educated. The government extension services followed by other farmers were the most commonly used and significant sources of advice. Choice of these sources of information was found to be significantly associated with gender of the farmers as more males reported to have used certain sources than females. Survey results showed that farmers mostly relied on government extension officers when seeking advice on production, marketing, and institutional and infrastructural management issues while other farmers were frequently consulted on animal protection issues. A study by Stone and Terblanché (2012) found that 75% of the farmers in the subtropical regions of South Africa reported to use extension services as main sources of information. Farmers in the current study areas indicated that they were not able to meet and interact with extension officers at their farms. They mostly communicate with them by use of mobile phones or after visiting the extension offices. It is uncertain whether the extension support will be extended to

the farms hence emerging farmers should explore the use of management database as a complementary effort for access to appropriate knowledge for their challenges.

The majority of farmers from the study areas indicated that they have either created new interventions or made use of the existing measures to address the challenges faced (Appendix 2). The ability by farmers to come up with innovative strategies is a fundamental attribute necessary for the implementation of management database system. Given that most farmers reported that their interventions were slightly effective to effective in solving challenges faced, it is therefore important for them to share on a large platform with other farmers. The extension support team should be allowed to critique some of the intervention strategies created before adoption by other farmers.

Systems of communication used when sharing intervention messages created by the farmers were also identified. A large proportion of the farmers reported that they were using farm to farm visits or face-to-face interactions when sharing the intervention messages. In addition, a significant proportion indicated that they used mobile phones as the mode of communication when sharing the intervention strategies. However, none of the farmers reported to have used radio, television or print media. The introduction of a management database can improve exchange of messages by farmers who are distant apart, reduce travelling costs and time and other resources spent travelling. However, this system should work concurrently with face-to-face and farm visits for practical demonstrations of some of the activities to be effected.

### **5.3 Conclusions**

It is clearly evident that livestock particularly cattle is well expected to remain a strategic asset for the development of the subsistence and emerging farming communities in South Africa. To improve on such capacity requires a profound understanding of the issues affecting growth of the sector, and the current strategies by farmers to address fight these issues. Results from the current study shows that emerging beef cattle farmers in Limpopo Province are confronted by ecological,

production, institutional, infrastructural and marketing challenges and constraints. These include poor grazing conditions, feed shortages, water scarcity, drought, pest and disease, lack of breeding camps, inadequate production and market infrastructures, inadequate market access and access to marketing information, unreliable markets, high transaction costs, poor access to extension, lack of financial support as well as stock theft, predation and straying of animals, in that order. Current findings indicate that the majority of emerging farmers do seek for management advice when confronted with challenges and constraints. The two major sources of advice they used were government extension officers and other farmers. The farmers' ability to seek advice after faced with a challenge was associated with characteristics such as location and education. Also, choice of particular sources of information was associated with farmers' gender. Most of the farmers were involved in the creation of extension messages which they share with other farmers and the extension agents. Emerging cattle farmers used farm to farm visits and mobile phones when sharing extension messages they created. Given the prevalence and continual effects from the identified challenges and constraints, strategies and tools that promote sharing of extension messages by farmers to improve productivity, environmental protection, welfare development and hence food security contribution are encouraged.

#### **5.4 Recommendations**

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

i. Encourage knowledge creation and sharing among farmers

Current experiences of sharing agricultural information reported in this study need to be harnessed through improved networking and partnerships. Decentralized information management and sharing of appropriate knowledge using new technologies such web-based applications like management database systems is encouraged. Such systems encourage farmers to identify, share and prioritise their problems and needs but most importantly, to seek ways of solving their problems

within their community rather than waiting for the government's extension service. The database will also, not only serve as an information sharing platform but for record keeping as it is capable of producing documented decisions based on accessible and reproducible knowledge. For sustainability of the system, farmers should be asked to pay an annual fee for the maintenance and upgrading of the systems.

#### ii. Public and private sector support for infrastructural development

It is important for the government to strengthen public-private partnership in financing the establishment of production and marketing infrastructure in the emerging farming communities. Multi-stakeholder cattle farming development forums targeting emerging and communal farmers at local and district municipalities as well as provincial level could be a good way to foster these linkages or partnerships. Such forums should then be used in identifying the appropriate infrastructure and proposed locations for the benefit of the aforementioned farmers. Investment in production infrastructure will improve productivity and cushion some of the challenges reported in this study. These include theft, predation, straying, uncontrolled breeding and poor grazing management associated with lack of fencing as well as parasites and diseases associated with poor access to dipping facilities. On the other hand, availability of marketing infrastructure will significantly improve the ability of farmers to reduce transaction costs, improve market access and access to market information.

#### iii. Access to finance

Emerging farmers should be assisted with access to financial resources. Access to finance will help in solving some of the challenges faced such as poor fencing structures, shortage of feeds and water. Access to financial services is important for emerging farmers, enabling them to better manage risk and take advantage of opportunities. Access to financial services reduces vulnerability and helps poor

people increase their income, so families are able to improve their well-being, including access to better nutrition, health care, and education. In this regard, government and development agencies are recommended to develop savings-led community-based financial organizations (CBFOs) that could cost-effectively provide financial services to emerging farmers. Savings-led CBFOs initiate their financial intermediation activities with emerging farmers' savings without or with access external funds from bank-linked or donor-funded revolving loan funds only after members have gained experience managing the lending of their own savings. Apart from access to finance, these farmers should be supported in understanding how agricultural finance works through the use of strategic planning skills, business plans and proposals for accessing the right type of finance at the right time.

## **5.5 Areas for further research**

The current study provided justification for the establishment and implementation of a management database by emerging cattle farmers in Limpopo Province. Further research should consider the following questions:

- a. What are the potential effects of knowledge management and sharing on sustainability of smallholder livestock farming and its contribution to household food security?
- b. Given the lack of capital among the emerging cattle farmers to what extent can efforts to develop them be directed towards the exploitation of niche markets, for example organic beef and grass-fed beef markets.
- c. How applicable can the proposed database be to farmers producing cattle under communal circumstances?
- d. Can such a database be generalized to other production systems and therefore be commercialized?

## References

- Akpula, D. A. (2013). Agriculture extension service delivery in a semi-arid rural area in South Africa: The case study of Thorndale in The Limpopo Province. *African Journal of Food, Agriculture, Nutrition and development*, 13(4): 8034-8057.
- CTA. (2012). *Agricultural Extension: A time for change. Linking knowledge to policy and action for food and livelihoods*. Technical Centre for Agricultural and Rural Cooperation ACP-EU (CTA) Wageningen, Netherlands.
- DAFF. (2012). *Strategic Plan for the 2012/13-2016/17*. Department of Agriculture Fisheries and Forestry, South Africa.  
<http://www.nda.agric.za/doaDev/topMenu/StratPlan201213-201617.pdf>:  
Accessed on the 2nd of April 2016
- Donnelly, K. A. M., Olsen, P., Vidarsson, J. R. & Ziegler, F. (2014). Supply chain expectations for tool to calculate sustainability of white fish products at a batch level. *Nofima*.
- Gwala, L. (2013). *Effect of Agricultural Extension Services on Beneficiaries of the Nguni Cattle Project: The case of Ncera and Kwezana villages, Eastern Cape Province, Dessertetaion, MSc Agricultural Extension, Department of Agricultural economics, University of Fort Hare*
- Industrial Development Corporation (IDC). (2016). *A study on the potential product development for the commercialization and value add to beef products. APCF Terms of reference*. [http://www.idc.co.za/images/2016/Rural-cattle\\_Terms-of-reference.pdf](http://www.idc.co.za/images/2016/Rural-cattle_Terms-of-reference.pdf)
- Khapayi, M. & Celliers P. R. (2016). Issues and constraints for emerging farmers in the Eastern Cape Province, South Africa. *African Journal of Agricultural Research*, 10(41):3860-3869.

- Limpopo Department of Agriculture. (2012). Livestock research and innovation strategy: Terms of reference. Limpopo Provincial Department of Agriculture: Polokwane.
- MacLeod, N. D., McDonald, C.K. & van Oudtshoorn, F.P. (2010). Challenges for emerging livestock farmers in Limpopo province, South Africa, *African Journal of Range & Forage Science*, 25:2, 71-77
- Marandure, T. (2015). Sustainability of smallholder cattle production and its vertical integration into the formal beef market value chain in South Africa, MSc Sustainable Agriculture, Stellenbosch University, South Africa.
- Moloi, M. J. (2008). A Comparison of Socio-economic Characteristics that Determine the Farm Income of Emerging Livestock and Horticultural Farmers in South Africa. MSc Thesis, Unpublished. Department of Agricultural Economics University of Limpopo.
- National Treasury (South Africa) and Gordhan, P. (2010). Budget speech, 2010. National Treasury.  
<http://www.poa.gov.za/news/Documents/NPC%20National%20Development%20Plan%20Vision%202030%20lo-res.pdf>.
- Obi, A., van Schalkwyk, H., D. & Tilbur, A. (2011). Market access, poverty alleviation and socio-economic sustainability in South Africa. In H. D. van Schalkwyk, J. A. Groenewald, G. C. G. Fraser, A. Obi and A. van Tilburg (Eds.), *Unlocking markets to smallholders: Lessons from South Africa* (pp. 13-33). Wageningen: Wageningen Academic Publishers.
- Stone, W. A. & Terblanche', S. E. (2012). The Evaluation of the Subtropical Crops Extension and Advisory Service (SUBTROP) as Perceived by Farmer Members in the Subtropical Regions, South Africa. *South African Journal of Agricultural extension*, 40 (1), 58-67.



## Appendix 1

### A SURVEY QUESTIONNAIRE

**NOTE:** Any information you provide will be strictly confidential and will not be used for any purpose outside this research. Information provided in this survey will not be attributed directly to you and will be used only for descriptive and analytical purposes in a form that will not reveal your identity or the identity of your organization.

Consent given? ☐ YES ☐ NO

[If the answer to this question is “No”, end the interview now]

Name of Farmer:	Municipality Name:
Farmer's Tel No:	Name of farm:
Enumerator Name:	Date of interview:

### SECTION A: HOUSEHOLD DEMOGRAPHIC INFORMATION

1.0 What is the size of your household? Adults: F.....M..... Children: F.....M.....

2.0 Household head gender ☐ Male ☐ Female

3.0 Marital Status ☐ Single ☐ Married ☐ Divorced ☐ Widowed

4.0 Age of the farmer ☐ <35 ☐ 36-45 ☐ 46-55 ☐ 56-65 ☐ >65

5.0 What is your highest level of education? .....

6.0 What are your sources of income? (Tick first column as appropriate and rank levels of source of income in the second column – 1 for highest income)

Source	Rank
Crops	
Livestock	
Salary/wages	
Other (specify)	

7.0 What is the total size of your farm..... (Ha)?

7.1 Of the total land, how much is allocated for grazing.... (Ha), arable..... (Ha) and conservation purposes..... (Ha)?

7.2 Land ownership ☐ Private/Own ☐ Communal ☐ Leased ☐ Tribal ☐ Other.....

### SECTION B: ECOLOGICAL CHALLENGES AND CONSTRAINTS

#### FEEDING, WATER AND ENVIRONMENTAL MANAGEMENT

#### Grazing and environmental management

8.0 If you have grazing land, how do you describe its condition (natural pasture condition)?

☐ Very poor ☐ Poor ☐ Fair ☐ Good ☐ Excellent

8.1 If poor, what do you think are the main reasons for the current state? (Rank with 1 being more important) ☐ Poor grazing management ☐ Poor soil conditions ☐ Poor rainfall ☐ Bush encroachment ☐ overgrazing ☐ Overstocking ☐ Other.....

8.2 Did you at some point seek advice on how to improve the condition of your grazing land?

☐ Yes ☐ No.

8.3 If yes, whom did you often consult? ☐ Other farmers ☐ Government extension agent ☐ Private extension agent ☐ Relative/friend ☐ Print media ☐ Internet ☐ Other.....

**8.4 Have you ever come up with your own intervention(s) on how to improve the condition of your grazing lands?** ☐ Yes, in many cases ☐ Yes, but in few cases ☐ Not at all.

**8.5 If yes, what was your main intervention?** .....

**8.6 Did you communicate the intervention to anyone?** ☐ Yes ☐ No

**8.7 If yes, whom did you share the intervention with?** ☐ The government extension officer  
☐ Other farmers ☐ Media personnel ☐ Private extension officer ☐ Other.....

**8.8 Comment on how efficient the intervention(s) was in improving natural pasture condition?**  
☐ Very effective ☐ Effective ☐ Slightly effective ☐ No effect

**8.9 What mode of communication did you use when sharing the management ideas on improving grazing lands? (If more than one rank with 1 being more used)** ☐ Internet (email) ☐ Cell phone/telephone ☐ Postal mail ☐ Travel and tell ☐ Other.....

**9.0 Do you face environmental management challenges at your farm?** ☐ Yes ☐ No

**9.1 If yes, which of the following environmental management challenges do you face at your farm?**

Challenge	Tick	Indicate the extent of the challenge
Drought		<input type="checkbox"/> Very high <input type="checkbox"/> High <input type="checkbox"/> Moderately high <input type="checkbox"/> Neutral
Floods		<input type="checkbox"/> Very high <input type="checkbox"/> High <input type="checkbox"/> Moderately high <input type="checkbox"/> Neutral
Heat waves		<input type="checkbox"/> Very high <input type="checkbox"/> High <input type="checkbox"/> Moderately high <input type="checkbox"/> Neutral
Cold spells and frosts		<input type="checkbox"/> Very high <input type="checkbox"/> High <input type="checkbox"/> Moderately high <input type="checkbox"/> Neutral
Windstorms		<input type="checkbox"/> Very high <input type="checkbox"/> High <input type="checkbox"/> Moderately high <input type="checkbox"/> Neutral
Soil erosion		<input type="checkbox"/> Very high <input type="checkbox"/> High <input type="checkbox"/> Moderately high <input type="checkbox"/> Neutral
Plant biodiversity loss/erosion		<input type="checkbox"/> Very high <input type="checkbox"/> High <input type="checkbox"/> Moderately high <input type="checkbox"/> Neutral
Land pollution		<input type="checkbox"/> Very high <input type="checkbox"/> High <input type="checkbox"/> Moderately high <input type="checkbox"/> Neutral
Air pollution		<input type="checkbox"/> Very high <input type="checkbox"/> High <input type="checkbox"/> Moderately high <input type="checkbox"/> Neutral

**9.2 Did you at some point seek advice on how to reduce environmental management challenges at your farm?** ☐ Yes ☐ No.

**9.3 If yes, whom did you often consult?** ☐ Other farmers ☐ Government extension agent  
☐ Environmental management agent ☐ Relative/friend ☐ Print media ☐ Internet ☐ Other.....

**9.4 Have you ever come up with your own intervention(s) to reduce environmental challenges?**  
☐ Yes, in many cases ☐ Yes, but in few cases ☐ Not at all.

**195 If yes, what was your main intervention?** .....

**9.6 Did you communicate the intervention to anyone?** ☐ Yes ☐ No

**9.7 If yes, whom did you share the intervention with?** ☐ The government extension officer  
☐ Other farmers ☐ Media personnel ☐ Private extension officer ☐ Other.....

**9.8 Comment on how efficient the intervention(s) was in improving natural pasture condition?**  
☐ Very effective ☐ Effective ☐ Slightly effective ☐ No effect

**9.9 What mode of communication did you use when sharing the management ideas on improving pasture conditions? (If more than one rank with 1 being more used)** ☐ Internet (email) ☐ Cell phone/telephone ☐ Postal mail ☐ Travel and tell ☐ Other.....

### Cattle feeding management

**10.0 Do you experience challenges of cattle feed shortage?** ☐Yes ☐No

**10.1 If yes, what are the major causes of feed shortage at your farm?** *(If more than one rank with 1 being more important)* ☐Poor veld condition ☐Lack of capital to purchase supplements

☐Drought ☐Poor management of the available feeds ☐Shortage of grazing land

**10.2 What is the extent of feed shortage challenge at your farm?** ☐Very high ☐High ☐Slightly high ☐Neutral

**10.3 Have you at some point consulted for ideas on how to reduce the feed shortage challenge?**

☐Yes ☐No.

**10.4 If yes, whom did you often consult?** ☐Other farmers ☐Government extension agent

☐Private extension agent ☐Print media ☐Cattle feed manufacturers ☐Community leaders

☐Other.....

**10.5 Have you ever come up with your own intervention(s) to improve feed availability at your farm?** ☐Yes in many cases ☐Yes, but in few cases ☐Not at all.

**10.6 If yes, what was your main intervention?** .....

.....

**10.7 Did you communicate the intervention to anyone?** ☐Yes ☐No

**10.8 If yes, with whom did you share the intervention with?** ☐Other farmers ☐Government extension agent

☐Private extension agent ☐Print media ☐Cattle feed manufacturers

☐Other.....

**10.9 Comment on how efficient your strategy was in solving the challenge of feed shortage?**

☐Very effective ☐Effective ☐Slightly effective ☐No effect

**10.10 What mode of communication did you use when sharing the management ideas on feed shortages?** *(If more than one rank with 1 being more used)* ☐Internet ☐Cell phone/telephone

☐Postal mail ☐Travel and tell ☐Other.....

### Water management

**11.0 Is availability of water for your cattle a challenge at your farm?** ☐Yes ☐No

**11.1 If yes, what is the extent of this challenge at your farm?** ☐Very high ☐High ☐Slightly high ☐Neutral

**11.2 Have you at some point asked for ideas to improve availability of water at your farm?** ☐Yes ☐No.

**11.3 If yes, whom did you often consult?** ☐Other farmers ☐Government extension agent ☐

Private extension agent ☐Print media ☐Radio/TV ☐Own records ☐Other.....

**11.4 Have you at some come up with your own ideas to improve water availability at your farm?**

☐Yes in many cases ☐Yes, but in few cases ☐Not at all.

**11.5 What was your main idea?** .....

.....

**11.6 Did you communicate the intervention to anyone?** ☐Yes ☐No

**11.7 If yes, whom did you communicate with?** ☐The government extension officer ☐Other farmers

☐Media personnel ☐Private extension officer ☐Other.....

**11.8 Comment on how efficient the intervention was in solving water availability problem?**

☐Very effective ☐Effective ☐Slightly effective ☐No effect

**11.9 What mode of communication did you use when sharing the management ideas on improving water availability?** *(If more than one rank with 1 being more used)* ☐Internet ☐Cell

phone/telephone ☐Postal mail ☐Travel and tell ☐Other.....

## Technical knowledge in cattle feed, water and environmental management

12.0 Please indicate your level of skills (experience and/or training) in the following feed and water management skills? (Tick appropriate level)

	Very low	Low	Slightly lower	Neutral	Slightly higher	High	Very high
Rangeland management							
Fodder production							
Feed conservation							
Feed formulation							
Feed budgeting							
Water harvesting and conservation							
Soil conservation							
Climate change mitigation and adaptation							
Biodiversity							
Land and air pollution							

12.1 Do you recommend sharing of feed, water and environmental management ideas with other farmers in the project? ☐ Recommend ☐ Do not recommend ☐ No comment

12.2 How would you like to share feed and water management ideas/skills? (Please rank with 1 being most suggested) **NOTE:** The enumerator should briefly explain these communication modes before the farmer attempts to answer! ☐ Farmer group meetings ☐ Field days/demonstrations ☐ Print media (Posters and pamphlets) ☐ Farm-farmer visits ☐ other.....

## BREEDING MANAGEMENT

### Cattle breeding management

13.0 Are you faced with cattle breeding management challenges? ☐ Yes ☐ No

13.1 If yes, what are the challenges.....

13.2 Who do you often consult when faced with cattle breeding challenges? ☐ Private veterinary officer ☐ Government veterinary officer ☐ Other farmers ☐ Friends/relatives ☐ Other.....

13.3 Have you ever come up with your own intervention(s) to improve the existing cattle breeding system at your farm? ☐ Yes in many cases ☐ Yes, but in few cases ☐ Not at all.

13.4 What was your main intervention? .....

13.5 Did you communicate the intervention to anyone? ☐ Yes ☐ No

13.6 If yes, whom did you share the intervention with? ☐ The government extension officer ☐ Other farmers ☐ Media personnel ☐ Private veterinary officer ☐ Cattle breeding companies ☐ Other.....

13.7 Comment on how efficient the intervention(s) was in improving cattle breeding?

☐ Very effective ☐ Effective ☐ Neutral ☐ Slightly effective ☐ No effect

13.8 What mode of communication did you use when sharing the management ideas on improving cattle breeding? (If more than one rank with 1 being more used) ☐ Internet (email)

☐ Cell phone/telephone ☐ Postal mail ☐ Travel and tell ☐ Other.....

### Farmer's cattle breeding management skills

14.0 Please indicate your level of skills (experience and/or training) in the following cattle breeding management skills? (Tick appropriate level)

	Very low	Low	Slightly lower	Neutral	Slightly higher	High	Very high
Selection & culling of breeding animals							
Heat detection							
Artificial insemination							
Crossbreeding							

**14.1 Do you recommend sharing of cattle breeding management ideas with other farmers in the project?** ☐ Recommend ☐ Do not recommend ☐ No comment

**14.2 How would you like to share cattle breeding ideas/skills?** (Please rank with 1 being most suggested) *NOTE: The enumerator should briefly explain these communication modes before the farmer attempts to answer!*

☐ Farmer group meetings ☐ Field days/demonstrations ☐ Print media (Posters and pamphlets)  
☐ Farm-farmer visits Other.....

---

## CATTLE HEALTH MANAGEMENT AND PROTECTION

---

### Diseases

**15.0 Have you encountered cases of cattle getting sick or dying from diseases?** ☐ Yes ☐ No

**15.1 If yes, what is the extent of these challenges at your farm?** ☐ Very high ☐ High

☐ Moderately high ☐ Neutral

**15.2 When faced with the disease challenge, who do you often consult for help?**

☐ Veterinary drug suppliers ☐ Other farmers ☐ Private veterinary officer ☐ Government veterinary officer ☐ Government extension officer ☐ Print Media ☐ Internet ☐ Other.....

**15.3 Have you at some point come up with an intervention to prevent, control or treat cattle diseases at your farm?** ☐ Yes in many cases ☐ Yes, but in few cases ☐ Not at all.

**15.4 If yes, how did you intervene?** .....

**15.5 Did you communicate the intervention to anyone?** ☐ Yes ☐ No

**15.6 If yes, whom did you share the idea with?** ☐ The government extension officer ☐ Other farmers ☐ Veterinary extension officer ☐ Media personnel ☐ Friend/relative ☐ Other.....

**15.7 Please comment on how efficient the intervention/strategy was in solving the cattle disease problem(s)?** ☐ Very effective ☐ Effective ☐ Slightly effective ☐ No effect

**15.8 What mode of communication did you use when sharing the management ideas on reducing cattle disease challenge?** (If more than one rank with 1 being more used) ☐ Internet (email) ☐ Cell phone/telephone ☐ Postal mail ☐ Travel and tell ☐ Other.....

### Parasites

**16.0 Are parasites (internal and external) a challenge to the management of your cattle?**

☐ Yes ☐ No

**16.1 If yes, what is the extent of this challenge at your farm?** ☐ Very high ☐ High ☐ Moderately high ☐ Neutral

**16.2 When faced with this challenge, who do you often consult for help?**

☐ Veterinary drug suppliers ☐ Private veterinary officer ☐ Government veterinary officer ☐ Government Extension officer ☐ Other farmers ☐ Print Media ☐ Internet ☐ Other.....

**16.3 Have you at some point come up with an intervention to control parasites?** ☐ Yes, in many cases ☐ Yes, but in few cases ☐ Not at all.

**16.4 What was your intervention?** .....

**16.5 Did you communicate the invention to anyone?** ☐Yes ☐No

**16.6 If yes, whom did you share with?** ☐The government extension officer ☐Other farmers

☐Veterinary extension officer ☐Media personnel ☐Other.....

**16.7 How efficient was the intervention?** ☐Very effective ☐Effective ☐Slightly effective

☐No effect

**16.8 What mode of communication did you use when sharing the management ideas on challenge of parasites?** *(If more than one rank with 1 being more used)* ☐Internet (email) ☐Cell

phone/telephone ☐Postal mail ☐Travel and tell ☐Other.....

### Predation of animals

**17.0 Is predation of animals a challenge at your farm?** ☐Yes ☐No.

**17.1 If yes, describe the level of the challenge?** ☐Extremely high ☐Very high ☐High

☐Moderately high

**17.2 Have you at some point ask for ideas to reduce the challenge of cattle predation?** ☐ Yes

☐No.

**17.3 If yes, whom did you often consult?** ☐Other farmers ☐Government extension agent

☐Private extension agent ☐Print media ☐Other.....

**17.4 Have you at some point come up with your own intervention to reduce predation of animals?**

☐Yes in many cases ☐Yes, but in few cases ☐Not at all.

**17.5 What was your idea?** .....

**17.6 Did you communicate the intervention to anyone?** ☐Yes ☐No

**17.7 If yes, whom did you communicate with?** ☐The government extension officer ☐Other

farmers ☐Media personnel ☐Private extension officer ☐Other.....

**17.8 How efficient was the intervention in solving the challenge?** ☐Very effective ☐Effective

☐Slightly effective ☐No effect

**17.9 What mode of communication did you use when sharing the management ideas on reducing/avoiding predation cattle?** *(If more than one rank with 1 being more used)* ☐Internet (email)

☐Cell phone/telephone ☐Postal mail ☐Travel and tell ☐Other.....

### Stock theft

**18.0 Is stock theft a challenge at your farm?** ☐Yes ☐No.

**18.1 If yes, describe the level of the challenge?** ☐Extremely high ☐Very high ☐High

☐Moderately high **18.2 Did you manage to recover the lost cattle?** ☐ Yes ☐No

**18.3 If yes, who assisted you to recover them?** ☐Other farmers ☐Government extension agent

☐Police ☐Relative/friend ☐Self ☐Other.....

**18.4 Have you at some point came up with your own intervention to reduce stock theft?** ☐Yes in many cases ☐Yes, but in few cases ☐Not at all.

**18.5 What was (is) your main idea?** .....

**18.6 Did you communicate the intervention to anyone?** ☐Yes ☐No

**18.7 If yes, whom did you communicate with?** ☐The government extension officer ☐Other

farmers ☐Media personnel ☐Police ☐Private extension officer ☐Other.....

**18.8 How efficient was the intervention in solving stock theft problem?** ☐Very effective

☐Effective ☐Slightly effective ☐No effect

**18.9 What mode of communication did you use when sharing the management ideas on reducing/avoiding cattle theft?** *(If more than one rank with 1 being more used)* ☐Internet (email)

☐Cell phone/telephone ☐Postal mail ☐Travel and tell ☐Other.....

### Straying of animals

19.0 Is straying of animals a challenge at your farm? ☐ Yes ☐ No.

19.1 If yes, describe the level of the challenge? ☐ Extremely high ☐ Very high ☐ High  
☐ Moderately high

19.2 Did you manage to recover the lost cattle? ☐ Yes ☐ No

19.3 If yes, who assisted you to recover them? ☐ Other farmers ☐ Government extension agent  
☐ Police ☐ Relative/friend ☐ Self ☐ Other.....

19.4 Have you at some point come up with your own intervention to reduce straying of animals?  
☐ Yes in many cases ☐ Yes, but in few cases ☐ Not at all.

19.5 What was your main intervention? .....

19.6 Did you communicate the intervention to anyone? ☐ Yes ☐ No

19.7 If yes, whom did you communicate with? ☐ The government extension officer ☐ Other farmers  
☐ Media personnel ☐ Private extension officer ☐ Police ☐ Other.....

19.8 How efficient was the intervention in solving the challenge? ☐ Very effective ☐ Effective  
☐ Slightly effective ☐ No effect

19.9 What mode of communication did you use when sharing the management ideas on reducing/avoiding straying of cattle challenge? (If more than one rank with 1 being more used)  
☐ Internet (email) ☐ Cell phone/telephone ☐ Postal mail ☐ Travel and tell ☐ Other.....

### Technical skills in animal health and protection management

20.0 Please indicate your level of skills (experience and/or training) in the following cattle health management skills? (Tick appropriate level)

	Very low	Low	Slightly lower	Neutral	Slightly higher	High	Very high
Disease management & control							
Parasites control							
Parasitic disease control & management							
Animal hygiene management							
Animal identification							
Fencing and herding management							

20.1 Do you recommend sharing of ideas on animal health and protection management with other farmers in the project? ☐ Recommend ☐ Do not recommend ☐ No comment

20.2 How would you like to share disease and parasite management skills with other farmers? (Please rank with 1 being most suggested) **NOTE: The enumerator should briefly explain these communication modes before the farmer attempts to answer!** ☐ Farmer group meetings ☐ Field days/demonstrations ☐ Print media (Posters and pamphlets) ☐ Farm-farmer visits  
☐ Other.....

## SECTION C: SOCIO-ECONOMIC CHALLENGES & CONSTRAINTS

### MARKETING MANAGEMENT CHALLENGES AND CONSTRAINTS

#### Access to marketing information

21.0 Is lack of access to marketing information a challenge to your cattle farming business?  
☐ Yes ☐ No

21.1 If yes, describe the extent of this challenge? ☐ Very high ☐ High ☐ Slightly high

21.2 Whom do you often consult when you face this challenge? ☐ The government extension officer ☐ Other farmers ☐ Buyers ☐ Media personnel ☐ Friend/relative ☐ None  
☐ Other.....



**21.3 Have you ever designed your own intervention for this challenge?** ☐ Yes ☐ No

**21.4 If yes, what was your main intervention?**.....

**21.5 Did you communicate the intervention to anyone?** ☐ Yes ☐ No

**21.6 If yes, whom did you communicate with?** ☐ The government extension officer ☐ Other farmers ☐ Media personnel ☐ Buyer ☐ Other.....

**21.7 How effective was the intervention?** ☐ Very effective ☐ Effective ☐ Slightly effective ☐ Did not work

**21.8 What mode of communication did you use when sharing the management ideas on improving marketing access? (If more than one rank with 1 being more used)** ☐ Internet (email) ☐ Cell phone/telephone ☐ Postal mail ☐ Travel and tell ☐ Other.....

### Transactional costs

**22.0 Are you confronted with transactional costs challenges when marketing your cattle?**

☐ Yes ☐ No

**22.1 If yes, to what extent is this challenge affecting the marketing of your cattle?** ☐ Very high ☐ High ☐ Slightly high ☐ Neutral

**22.2 Have you at some point asked for advice on how to reduce transactional costs when marketing your cattle?** ☐ Yes ☐ No

**22.3 From whom did you often get the advice?** ☐ The government extension officer ☐ Other farmers ☐ Buyers ☐ Media personnel ☐ Friend/relative ☐ Other.....

**22.4 Have you ever designed your own strategy to reduce these marketing transactional costs?** ☐ Yes ☐ No

**22.5 If yes, what was your strategy?**.....

**22.6 Did you communicate the intervention to anyone?** ☐ Yes ☐ No

**22.7 If yes, whom did you communicate with?** ☐ The government extension officer ☐ Other farmers ☐ Media personnel ☐ Buyer ☐ Other.....

**22.8 How effective was the intervention?** ☐ Very effective ☐ Effective ☐ Slightly effective ☐ Did not work

**22.9 What mode of communication did you use when sharing the management ideas on reducing marketing transactional costs? (If more than one rank with 1 being more used)** ☐ Internet (email) ☐ Cell phone/telephone ☐ Postal mail ☐ Travel and tell ☐ Other.....

### Market Reliability

**23.0 Are you faced with unreliable markets challenges?** ☐ Yes ☐ No

**23.1 Describe the extent of this challenge?** ☐ Highly unreliable ☐ Moderately unreliable ☐ Unreliable ☐ Same

**23.2 If unreliable, have you at some point consulted for advice regarding the challenge?** ☐ Yes ☐ No

**23.3 From whom did you often get the advice?** ☐ The government extension officer ☐ Other farmers ☐ Buyers ☐ Media personnel ☐ Friend/relative ☐ Other.....

**23.4 Have you ever come up with an intervention to reduce the challenge?** ☐ Yes ☐ No

**23.5 If yes, what was your intervention?**.....

**23.6 Did you share your innovation to anyone?** ☐ Yes ☐ No

**23.7 If yes, whom did you communicate with?** ☐ The government extension officer ☐ Other farmers ☐ Media personnel ☐ Buyers ☐ Other.....

**23.8 How effective was the intervention?** ☐ Very effective ☐ Effective ☐ Slightly effective ☐ Did not work



**23.9 What mode of communication did you use when sharing the management ideas on improving marketing reliability?** (If more than 1 rank with one being more used) ☐ Internet (email) ☐ Cell phone/telephone ☐ Postal mail ☐ Travel and tell ☐ Other.....

### Cattle marketing management skills

**24.0 Please indicate your level of skills (experience and/or training) in the following cattle marketing management skills?** (Tick appropriate level)

	Very low	Low	Slightly lower	Neutral	Slightly higher	High	Very high
Pricing and costing							
Sales promotion & advertising							
Product development & differentiation							
Record keeping							
Customer relations							

**24.1 Do you recommend sharing marketing management ideas/skills with other farmers in your project?** ☐ Recommend ☐ Do not recommend ☐ No comment

**24.2 How would you like to share cattle marketing management ideas/skills?** (Please rank with 1 being most suggested) *NOTE: The enumerator should briefly explain these communication modes before the farmer attempts to answer!* ☐ Farmer group meetings ☐ Field days/demonstrations ☐ Print media (Posters and pamphlets) ☐ Farm-farmer visits ☐ Other.....

## SECTION D: INSTITUTIONAL AND INFRASTRUCTURAL CHALLENGES AND CONSTRAINTS

### Access to government extension and veterinary services

**25.0 Is accessibility to government extension support services a challenge?** ☐ Yes ☐ No

**25.1 What is the extent of this challenge to you?**  
☐ Very high ☐ High ☐ Slightly high ☐ Neutral

**25.2 Is accessibility to government veterinary services a challenge?** ☐ Yes ☐ No

**25.3 What is the extent of this challenge to you?**  
☐ Very high ☐ High ☐ Slightly high ☐ Neutral

**25.4 Have you at some point asked for advice on how to improve access to government extension and veterinary services?** ☐ Yes ☐ No

**25.6 If, yes whom did you often consult for advice?** ☐ The government extension officer ☐ Other farmers ☐ Media personnel ☐ Veterinary officer ☐ Other.....

**25.7 Have you at some point come up with your own intervention to improve access to government extension and veterinary services?** ☐ Yes in many cases ☐ Yes, but in few cases ☐ Not at all

**25.8 What was your main idea?** .....  
 .....

**25.9 Did you communicate the intervention to anyone?** ☐ Yes ☐ No

**25.10 If yes, whom did you communicate with?** ☐ The government extension officer ☐ Other farmers ☐ Media personnel ☐ Veterinary officer ☐ Friends/relative ☐ Other.....

**25.11 How efficient was the intervention in solving these challenges?** ☐ Very effective ☐ Effective ☐ Slightly effective ☐ No effect

**25.11 What mode of communication did you use when sharing the ideas on improving access to government extension and veterinary services? (If more than one rank with 1 being more used)**

☐ Internet (email) ☐ Cell phone/telephone ☐ Postal mail ☐ Travel and tell ☐ Other.....

### **Access to financial support**

**26.0 Is access to financial support from financial institutions a challenge?** ☐ Yes ☐ No

**26.1 If yes, describe the extent of this challenge?** ☐ Very high ☐ High ☐ Slightly high

☐ Average

**26.2 Have you at some point asked for advice on how to access financial support?** ☐ Yes ☐ No

**26.3 If yes, whom did you often consult to improve access to finance from financial institutions?**

☐ The government extension officer ☐ Other farmers ☐ Banks ☐ Media personnel ☐ NGOs

☐ None ☐ Other.....

**26.4 Have you ever come up with your own ideas to improve access to financial support by financial institutions?** ☐ Yes ☐ No

**26.5 If yes, what was your main intervention?**.....

.....

**26.6 Did you communicate the ideas to anyone?** ☐ Yes ☐ No

**26.7 If yes, whom did you communicate with?** ☐ The government extension officer ☐ Other farmers ☐ Media personnel ☐ agricultural training institutions ☐ Other.....

**26.8 How effective was the intervention?** ☐ Very effective ☐ Effective ☐ Slightly effective

☐ Did not work

**26.9 What mode of communication did you use when sharing the management ideas on improving access to financial support? (If more than one rank with 1 being more used)** ☐ Internet (email) ☐ Cell phone/telephone ☐ Postal mail ☐ Travel and tell ☐ Other.....

### **Access to cattle management training**

**27.0 Is access to cattle management training from agricultural training institutions a challenge?**

☐ Yes ☐ No

**27.1 If yes, describe the extent of this challenge?** ☐ Very high ☐ High ☐ Slightly high

☐ Average

**27.2 Have you at some point seek advice on how to improve access to cattle management training?** ☐ Yes ☐ No

**27.3 If yes, whom did you often consult on ideas to improve access to cattle management training from agricultural institutions?** ☐ The government extension officer ☐ Other farmers

☐ agricultural training institutions ☐ Media personnel ☐ NGOs ☐ Other.....

**27.4 Have you ever come up with your own ideas to improve access to training in cattle management?** ☐ Yes ☐ No

**27.5 If yes, what was your main intervention?**.....

.....

**27.6 Did you communicate the ideas to anyone?** ☐ Yes ☐ No

**27.7 If yes, whom did you communicate with?** ☐ The government extension officer ☐ Other farmers ☐ Media personnel ☐ Agricultural training institutions ☐ Other.....

**27.8 How effective was the intervention?** ☐ Very effective ☐ Effective ☐ Slightly effective

☐ Did not work

**27.9 What mode of communication did you use when sharing the management ideas on improving access to agricultural training? (If more than one rank with 1 being more used)**

☐ Internet (email) ☐ Cell phone/telephone ☐ Postal mail ☐ Travel and tell ☐ Other.....

## COMMUNITY INFRASTRUCTURAL SUPPORT FOR CATTLE FARMERS

**Production infrastructure- fences, dip tanks/spray race, crush pen, holding pen, water trough, feeding trough, dip tank, borehole/dams etc.**

**28.0 Is lack of production infrastructure a challenge in your farming community?** ☐ Yes  
☐ No

**28.1 If yes, comment on the level of this challenge in your farming community?**

☐ Very high ☐ High ☐ Slightly high ☐ Neutral

**28.2 Have you at some point asked for advice on how you can better access community cattle production infrastructure?** ☐ Yes ☐ No

**28.3 If yes, whom did you often consult?** ☐ The government extension officer ☐ Other farmers  
☐ Media personnel ☐ Community leaders ☐ Other.....

**28.4 Have you at some point came up with your own intervention to improve access to production infrastructure?** ☐ Yes in many cases ☐ Yes, but in few cases ☐ Not at all.

**28.5 What was your main idea?** .....  
.....

**28.6 Did you communicate the intervention to anyone?** ☐ Yes ☐ No

**28.7 If yes, whom did you communicate with?** ☐ The government extension officer ☐ Other farmers  
☐ Media personnel ☐ Community leaders ☐ Other.....

**28.8 How efficient was the intervention in improving access to production infrastructure?**

☐ Very effective ☐ Effective ☐ Slightly effective ☐ No effect

**28.9 What mode of communication did you use when sharing the management ideas on improving access to production infrastructure? (If more than one rank with 1 being more used)**

☐ Internet (email) ☐ Cell phone/telephone ☐ Postal mail ☐ Travel and tell ☐ Other.....

**Marketing infrastructure -roads, electricity, auctions, abattoirs, telecommunication, loading and offloading rumps etc**

**29.0 Is lack of marketing infrastructure a challenge in your farming community?** ☐ Yes ☐ No

**29.1 If yes, comment on the level of this challenge in your farming community?**

☐ Very high ☐ High ☐ Slightly high ☐ Neutral

**29.2 Have you at some point asked for advice on how you can better access community marketing infrastructure?** ☐ Yes ☐ No

**29.3 If yes, whom did you often consult?** ☐ The government extension officer ☐ Other farmers  
☐ Media personnel ☐ Community leaders ☐ Other.....

**29.4 Have you at some come up with your own intervention to improve access to marketing infrastructure?** ☐ Yes in many cases ☐ Yes, but in few cases ☐ Not at all.

**29.5 What was your main idea?** .....  
.....

**29.6 Did you communicate the intervention to anyone?** ☐ Yes ☐ No

**29.7 If yes, whom did you communicate with?** ☐ The government extension officer ☐ Other farmers  
☐ Media personnel ☐ Buyers ☐ Other.....

**29.8 How efficient was the intervention in improving access to infrastructure?** ☐ Very effective

☐ Effective ☐ Slightly effective ☐ No effect

**29.9 What mode of communication did you use when sharing the management ideas on improving access to marketing infrastructure? (If more than one rank with 1 being more used)**

☐ Internet (email) ☐ Cell phone/telephone ☐ Postal mail ☐ Travel and tell ☐ Other.....

**Overall management skills**

**300 How do you rate yourself in terms of the following overall management skills?** (*Tick where appropriate*)

<b>Management skill</b>	<b>1=Poor</b>	<b>2=Fair</b>	<b>3=Good</b>	<b>4=Do not know</b>
Farm business management				
Record keeping				
Risk management				
Marketing management				
Labour and conflict management				
Animal security management				
Environmental management				

**30.1 Do you recommend sharing overall management ideas/skills with other farmers in your project?** ☐ Recommend ☐ Do not recommend ☐ No comment

**30.2 How would you like to share cattle marketing management ideas/skills?** (Please rank with 1 being most suggested) **NOTE:** *The enumerator should briefly explain these communication modes before the farmer attempts to answer!* ☐ Farmer group meetings ☐ Field days/demonstrations ☐ Print media (Posters and pamphlets) ☐ Farm-farmer visits ☐ Other.....

## Appendix 2

Intervention category	The farmer own created Intervention
<b>Strategies that conserve and/ or improve availability of cattle feeds</b>	<ul style="list-style-type: none"> <li>➤ Shorten the grazing interval in summer and lengthen in winter</li> <li>➤ Using crop remains from the farm or negotiate to access from other farms as supplementary feeds</li> <li>➤ Cutting down natural grass along the fences and roads just after summer and bale it for use in winter</li> <li>➤ Opening up of new camps to allow other camps to rest ( effective management of grazing lands)</li> <li>➤ Spreading of cattle manure in the natural pasture fields to improve growth during rainy season</li> </ul>
<b>Strategies that protect the environmental and other physical resources on the farm</b>	<ul style="list-style-type: none"> <li>➤ Routine picking of plastics and other polluting substances for disposal</li> <li>➤ Cutting down of invasive species and old trees (Sicklebos)</li> <li>➤ Constructed water drainage facilities to control flooding and ensure good drainage</li> <li>➤ Erosion control using locally available material- Constructing gabions with stones and wood</li> </ul>
<b>Interventions to improve water supply and accessibility to animals</b>	<ul style="list-style-type: none"> <li>➤ The of generators or solar as an alternative source of power</li> <li>➤ Use of rubber snakes to scare away baboons which were destroying PVC water pipes</li> <li>➤ Collecting water from nearby sources with tanks</li> <li>➤ Harvesting water from house roofs for use in winter.</li> </ul>
<b>The use of conventional and/ or traditional methods to control parasites, diseases and animal</b>	<ul style="list-style-type: none"> <li>➤ Using traditional herbs and other locally available substances to cure animals (Traditional knowledge)</li> <li>➤ Assisting cows with complications during calving</li> </ul>

<b>conditions.</b>	<ul style="list-style-type: none"> <li>➤ Using used-oil from car and tractor engines to control ticks.</li> </ul>
<b>Own intervention strategies implemented to increase animal security.</b>	<ul style="list-style-type: none"> <li>➤ Hunting and killing of predators, destroying areas they live and making noise to scare them away</li> <li>➤ Hire more cattle herders to reduce stock theft challenge/Increase security</li> <li>➤ Tracking and recording cattle with DNA Technology</li> <li>➤ Bring cattle to graze in closer and secure paddocks as well as keeping them in kraals during the night.</li> <li>➤ Erecting fence around poisonous plants infested areas to prevent animals from grazing</li> <li>➤ Destroying the snares or traps around the farms</li> <li>➤ Using used oil, petrol, diesel and other substances to scare away snakes in the paddocks</li> <li>➤ Counting of cattle on weekly basis to quickly identify any loss from predation, stray or theft</li> <li>➤ Farmer organized groups to improve security (night patrols)</li> </ul>
<b>Financing of farm projects and investment using own sources</b>	<ul style="list-style-type: none"> <li>➤ The farmer uses savings or personal sources to finance the project.</li> <li>➤ Hired movable infrastructure to facilitate production or marketing of animals</li> <li>➤</li> </ul>
<b>Working collectively with already existing and other farmers in the project</b>	<ul style="list-style-type: none"> <li>➤ Farmers organized themselves into group to improve access to training</li> <li>➤ Marketing animals through already established farmers (commercial farmers) which have better access to markets</li> <li>➤ Farmer initiated group marketing of cattle and sharing of transport costs</li> <li>➤ Consulting other farmers for knowledge and assistance in management and infrastructure support-especially from the already established</li> <li>➤ Negotiate for grazing space from other farmers</li> <li>➤ Exchanging breeding bulls with other farmers or buying a new replacement.</li> </ul>

<b>Communication (visiting, calling or writing) to responsible authorities for advice and improved service delivery</b>	<ul style="list-style-type: none"> <li>➤ Farmers contacting clients or the department of agriculture as a group in order to get help</li> <li>➤ Negotiate with buyers to come to their communities as well as to offer better payment plans for transport</li> <li>➤ Visiting the government offices to speak to the superiors in person as a way of showing the extent of the challenge</li> </ul>
<b>Routine maintenance, construction or upgrading of farm equipment and infrastructure (production and marketing)</b>	<ul style="list-style-type: none"> <li>➤ Using of locally available material to construct production and marketing infrastructures as well as using suitable locations to facilitate loading and offloading of animals</li> <li>➤ Constructed all required production and marketing infrastructure by himself</li> </ul>