Analysis of extension services on capacity building of smallholder livestock farmers at Midvaal Local Municipality, Gauteng province

B. Manyakanyaka

orcid.org/0000-0002-6554-4880

Dissertation accepted in fulfilment of the requirements for the degree Master of Science in Agricultural Extension at the North West University

Supervisor: Dr Sinah Modirwa

Co-supervisor: Dr Christopher Tshwene

Graduation ceremony: October 2022

Student number: 36327913

DECLARATION

I, Bulelani Manyakanyaka, hereby declare that the work contained in this research report is my own work, it is submitted for the degree of Master of Science in Agricultural Extension at the Department of Agricultural Economics and Extension, North-West University, Mafikeng Campus. I have never submitted it to any other university either in whole or partial.

…… 22/09/2022 ……

B. Manyakanyaka DATE

ACKNOWLEDGEMENT

Firstly, I will like to thank the Lord for everything, because through Him everything is possible. Thank You Almighty for doing everything for me up until this day, because He is my Shepherd, Provider and He gives me strength to overcome every obstacle. This work is possible through His Mercy.

Secondly, I would like to pass vote of thanks to my supervisors Dr S. Modirwa and Dr C. Tshwene in the Department of Agricultural Economics and Extension, North-West University for being patient and guiding me in my work. Your assistance is certainly valued.

I also want to thank NWU for granting me an opportunity to embark on this journey. A special thanks to the farmers who sacrificed their time and work to answer my questions. Without the contribution of farmers in Midvaal Local Municipality, this study would not have been successful. Your participation is appreciated and noted.

Lastly, I would like to take this opportunity to thank my family, especially my wife and my brothers Dr S. Maoba and Mr T.W Shasha who were always supportive in my work. Your assistance is highly appreciated and valued.

Regards

Bulelani Manyakanyaka

ABSTRACT

The purpose of this study was to analyse access and effectiveness of extension and advisory services in capacity building of smallholder livestock farmers in Midvaal Local Municipality, Gauteng Province, South Africa. Survey design and quantitative research methods were used for sample purposes and a structured questionnaire was used to collect data from the target participants of 148 livestock farmers. The data gathered from participants was coded and captured in Microsoft Excel (Ms Excel). Descriptive statistics such as frequency counts, mean, percentages, standard deviation, rank order and inferential statistics such as binary logistic regression were used to analyse the data, via SPSS. The results showed that technical farm visits (M = 3.3, SD=± 1.36) and informal training (M = 3.2, SD=± 1.31) are professed to be effective at the study area. The study further showed that extension services have less impact on enabling farmers to penetrate formal market (M = 2,0 SD=± 1.06) and access to finance (M = 1.9, SD=± 1.01). Binary logistic regression results showed that the gender and employment status were the main variables that significantly influenced livestock farmers' access to extension services. In conclusion, it was noted that extension and advisory services have a positive impact, meaning that they are effective at the study area. The study recommended that Extension Recovery Plan (ERP) pillars must be fully implemented at the study area for the effectiveness of extension services. Furthermore, choosing the right approach or approaches is necessary. Participatory approach should always be encouraged among extension services, farmers, researchers, and other relevant stakeholders. All the parties involved in the development of the farming community must collaborate and work collectively as a unit for the development of the farming community.

Keywords: Extension Services, Capacity Building, Smallholder Livestock Farmers, Midvaal Local Municipality

TABLE OF CONTENTS

Contents

DECLARATION i

ACKNOWLEDGEMENT ii

ABSTRACT iii

LIST OF TABLES vi

LIST OF FIGURES vii

LIST OF ABBREVIATIONS viii

CHAPTER ONE 1

INTRODUCTION 1

1.1 Background of the Study 1

1.2 Problem Statement 2

1.3 Significance of the Study 3

1.4 Aim of the Study 3

1.5 Research questions 3

1.6 Specific objectives 4

1.7 Hypothesis 4

1.8 The outline of the dissertation 4

CHAPTER TWO 5

LITERATURE REVIEW 5

2.1 Introduction 5

2.2 Livestock production in South Africa 5

2.2.1 Livestock farming in the commercial sector 5

2.2.2 Livestock farming in the smallholder sector 7

2.4 Smallholder farmers in South Africa 8

2.5 Agricultural extension and advisory services 10

2.6 Extension Approaches used in Gauteng province towards capacity building of farmers. 11

2.7 Needs-based development 12

2.8 Framework for designing and analysing agricultural advisory services 13

2.9 Conclusion 15

CHAPTER THREE 16

RESEARCH METHODOLOGY 16

3.1. Introduction 16

3.2 The Study Area 16

3.3 Research design 17

3.4 The population of the study 17
3.5 Sampling procedure and sample size 18
3.6 Data Collection 18
3.7 Data capturing and analysis 19
3.8 Ethics consideration 21
3.9 Validity and Reliability 21
3.10 Conclusion 21
CHAPTER FOUR 22
RESULTS AND DISCUSSION 22
4.1 Introduction 22
4.2 Demographic characteristics of the respondents 22
4.3 Access and effectiveness of extension services on capacity building of livestock farmers 28
4.3.1 Mean number of smallholder livestock owned by respondents in a period of two years 29
4.3.2 Farming systems of smallholder livestock farmers 30
4.3.3 Access to extension services by smallholder livestock farmers 31
4.4 Perception of smallholder livestock farmers towards extension services 35
4.5 Constraints facing smallholder livestock farmers on capacity building 37
4.6 Regression analysis 39
4.7 Conclusion 40
CHAPTER FIVE 41
5.1 Introduction 41
5.2 Conclusion 41
5.3 Recommendations 41
References 42
Appendices 53

LIST OF TABLES

Tables	Title	Page
Table 1:	Summary of sampling procedure	18
Table 2:	The independent variables used in the binary logistic regression	20
Table 3:	Age of smallholder livestock farmers	23
Table 4:	Level of education of smallholder livestock farmers	24
Table 5:	Home language of smallholder livestock farmers	25
Table 6:	Household size of smallholder livestock farmers	26
Table 7:	Livestock types owned by smallholder livestock farmers	29
Table 8:	Mean number of smallholder livestock owned by respondents in a period of two years in the study area	30
Table 9:	Access and effectiveness of extension services in capacity building of livestock farmers...	34
Table 10:	Perception of smallholder livestock farmers towards extension services	36
Table 11:	Constraints facing smallholder livestock farmers on capacity building	38
Table 12:	Binary logistic regression analysis on access of livestock farmers to agricultural extension services	40

LIST OF FIGURES

Figures	Title	Page
Figure 1:	Framework for designing and analysing agricultural advisory services	14
Figure 2:	The map of Midvaal Local Municipality	17
Figure 3:	Gender of smallholder livestock farmers	22
Figure 4:	Marital status of smallholder livestock farmers	24
Figure 5:	Employment status of smallholder livestock farmers	26
Figure 6:	Source of income of smallholder livestock farmers	27
Figure 7:	Farm/plot size (ha) of smallholder livestock farmers	28
Figure 8:	Farming systems of smallholder livestock farmers	31
Figure 9:	Access to extension services by smallholder livestock farmers	32

LIST OF ABBREVIATIONS

NWU	North West University
GDARD	Gauteng Department of Agriculture and Rural Development
DAFF	Department of Agriculture, Forestry and Fisheries
INGENAES	Integrating Gender and Nutrition within Agricultural Extension Services
SADC	Southern African Development Community
ABSA	Amalgamated Banks of South Africa
T&V	Training and Visit
SPSS	Statistical Package for Social Sciences
DoA	Department of Agriculture
SA	South Africa
AIS	Agricultural Innovation Systems
GDP	Gross Domestic Product
IFAD	International Fund for Agricultural Development
BFAP	Bureau for Food and Agricultural Policy
IDC	Industrial Development Corporation
FSD	Farmer Support and Development
FAO	Food and Agriculture Organisation
NAMC	National Agricultural Marketing Council
EAS	Extension and Advisory Services
CGIAR	Consortium of International Agricultural Research Centres
LRAD	Land Redistribution for Agricultural Development
CBO's	Community Based Organisations
ERP	Extension Recovery Plan

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Agricultural extension can be defined in many ways, but it should be noted that it is one of the tools used to encourage agricultural development, through scientific research, knowledge and technologies in order to improve agricultural practices through farmer education, which will result on growth of the beneficiaries (Integrating Gender and Nutrition within Agricultural Extension Services, 2015; Mbembela, Emmanuel & Atanasi, 2018). This will in return make farmers become better managers, improve their decision making, contribute to agricultural developments and achieve higher income (Norton & Alwang, 2019). This can be done through agricultural advisory services involving subject matter specialists, private organisations, government entities, as well as through proper consultations and frequent advises from extension officers or agricultural advisors (Nkosi, 2017). Marketing also forms part of the development of farmers (including exports), non-market units, sustainable agriculture, adapting to climate change and considering health challenges that affect rural individuals (INGENAES, 2015).

Smallholder farmers are classified as farmers who have limited resources in terms of land. In addition, they are characterised with labour intensive operations, use traditional production methods and often lack recognized capacity and support (Pienaar and Traub, 2015). In South Africa, most smallholder farmers are classified as farmers residing in communal lands. These farmers are often governed by traditional authorities, underprivileged, less educated and have underdeveloped infrastructure (Thamaga-Chitja & Morojele, 2014). Even though they are living under such conditions, they must meet food security, where everyone will have access to adequate, safe, and healthy food at all times for a healthy living (May, 2017). The Southern African Region has a serious challenge when it comes to food and nutrition uncertainty. It is, therefore, not surprising that South Africa forms part of the countries anticipated to have large volume of food insecure people (13.7million), representing about 24% of the country's population (Southern African Development Community [SADC], 2019).

In South Africa, livestock farming contributes an estimate of 25% -30% of the overall agricultural production per year (Maltou & Bahta, 2019). Beef, mutton, and goat markets are some of the key contributing factors to S.A livestock value chain following broiler sector. Gauteng province accounted for 16% of beef slaughtering per province during 2016/7 financial year following Mpumalanga and Free State province (Department of Agriculture Forestry and Fisheries [DAFF], 2018). There are about 8 000 commercial and 5 800 communal sheep farmers in S.A contributing to an employment of about 35 000 workers at a commercial level (DAFF, 2017).

Goat production in South Africa currently accounts for approximately 3% of the total African goat population (DAFF, 2018), even though Agriculture trends have shown a negative price decrease on livestock products due to current state of the economy (Amalgamated Banks of South Africa [ABSA], 2020).

The estimated number of 240 000 emerging farmers in South Africa are rearing livestock, which plays a major role in income generation, food provision and poverty alleviation (Habiyaremye, Maziya, Chaminuka & Mdlulwa, 2017). As a result, capacity building is key in the development of the farming community, as it assists in the operations of an entity through improvement of management skills (Lammert, Johnson & Fiore, 2015). Therefore, for that to be possible, it is crucial for public extension agents to undergo capacity development in training for them to respond effectively to the farming community (Maka, Ighodaro & Ngcobo-Ngotho, 2019).

1.2 Problem Statement

Capacity building is a process of building and equipping individuals, organizations, and communities through involvement of relevant stakeholders to achieve set goals and promoting sustainable agriculture that will improve the livelihoods (Issa, 2013). Poor access of extension services can hinder the growth of smallholder livestock farmers from graduating from emerging to commercial level (Oduniyi, Rubhara & Antwi, 2020). Smallholder livestock farmers are facing challenges of poor livestock management, poor adoption of modern technologies. These result in high mortality, low calving rate and not being market orientated (Tselaesele, Bagwasi, Lepetu, Bahta and Oladele, 2018). As a result, some smallholder livestock farmers keep their livestock for selling during Easter and festive seasons, religious purposes and during the times of need for money (DAFF, 2017). According to Zantsi & Bester (2019), agricultural extension services in South Africa have not yet achieved its mandate of transferring

skills and technology, knowledge and solving problems of smallholder farmers in order to develop them. This might be due to limited resources which affects the extension services from capacitating the smallholder livestock farmers. Training of extension personals and improvement of communication systems in extension systems are key in the development of the agricultural sector, as they will in return improve access level to information, skills, resources and production (Raidimi & Kabiti, 2019).

1.3 Significance of the Study

This study analysed the extension and advisory services on capacity building of smallholder livestock farmers at Midvaal Local Municipality in Gauteng Province. Giving extension services an opportunity to be measured on accessibility and effectiveness towards capacitating smallholder livestock farmers. The study further outlined the challenges that are faced by smallholder livestock farmers and reflected on the benefits of capacity building and the importance of collaboration amongst relevant stakeholders, such as researchers, extension services and farmers, in trying to improve the livelihoods of the smallholder livestock farmers and the service standards.

1.4 Aim of the Study

The aim of the study was to evaluate the access and effectiveness of extension services in the capacity building of smallholder livestock farmers in Midvaal local Municipality.

1.5 Research questions

i. What are the socio-economic characteristics of smallholder livestock farmers in Midvaal Local Municipality?
ii. How accessible and effective is extension services in capacity building of smallholder livestock farmers in Midvaal Local Municipality?
iii. What is the perception of smallholder livestock farmers towards extension and advisory services on capacity building in Midvaal Local Municipality?
iv. What are the challenges faced by smallholder livestock farmers at Midvaal Local Municipality in accessing extension and advisory services on capacity building?

1.6 Specific objectives

i. To ascertain the socio-economic characteristics of smallholder livestock farmers in Midvaal Local Municipality.

ii. To determine the accessibility and effectiveness of extension services in capacity building of smallholder livestock farmers in Midvaal Local Municipality

iii. To determine the perception of smallholder livestock farmers towards extension and advisory services on capacity building in Midvaal Local Municipality.

iv. Identify constraints faced by smallholder livestock farmers at Midvaal Local Municipality in accessing extension and advisory services on capacity building.

1.7 Hypothesis

The following null hypotheses was made:

$H_{1:}$ There is no significant relationship between socio-economic characteristics of smallholder livestock farmers and their access to extension and advisory services on capacity building of smallholder livestock farmers in Midvaal Local Municipality.

1.8 The outline of the dissertation

This dissertation contains five chapters:

- Chapter 1: This chapter provides the background of the study, problem statement, research aim and objectives
- Chapter 2: This chapter presents the literature review related to the study.
- Chapter 3: This chapter outlines research methodology
- Chapter 4: This chapter presents the summary of the results of the study and discussions.
- Chapter 5: This chapter presents the conclusions and recommendations derived from the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature based on the objectives of the study. It covers livestock production in South Africa, contribution of livestock to rural livelihoods, smallholder farmer in South Africa, challenges faced by livestock smallholder farmers, agricultural extension and advisory services, and extension approaches used in Gauteng towards capacity building of smallholder farmers. Lastly, the chapter presents a discussion of needs-based development.

2.2 Livestock production in South Africa

Livestock keeping in developing countries plays a vital role in agricultural Gross Domestic Product (GDP), as it contributes around 30% (International Fund for Agricultural Development [IFAD], 2016). Livestock production in South Africa is divided into two categories, namely, commercial sector and emerging sector (smallholder and subsistence) (The Agriculture Sector Education and Training Authority [AgriSETA], 2018). Commercial sector in S.A is classified as a matured and well-developed sector as compared to emerging sector (DAFF, 2017).

2.2.1 Livestock farming in the commercial sector

Livestock at a commercial level is contributing to the economy of the country enormously. It should be noted that to perform better in the Southern region, it is imperative to comprehend the value chain.

Poultry

Broiler industry in South Africa is one of the leading enterprises when compared to other livestock products. As a result, broiler accounts for 33% of all animal products in South Africa in Rands. It accounted for R38.6 billion in gross value in the financial year of 2015/16 (DAFF, 2017). Broiler industry serves as an economical source of protein followed by beef, creating an employment rate of about 65 206 jobs inclusive (broiler, hatchery, rearing, processing, distribution, and crop fields produced for poultry feeds) in 2016 (DAFF, 2017). Even though poultry is leading in the value chain of S.A, when compared to other countries like USA, Brazil, Argentina and

Ukraine, production cost of rearing a bird is high due to feeds (Bureau for Food and Agricultural Policy [BFAP], 2018).

Beef

Beef industry is well structured in South Africa with around 60% of the 13.84 million cattle farmers falling under commercial sector (Industrial Development Corporation [IDC], 2018). This means that if the remaining 40% emerging farmers have a chance of contributing to the beef value chain, they should treat their farming enterprises as a business (IFAD, 2016). According to (DAFF, 2018), the gross value of cattle and calves slaughtered from 2007/08 to 2016/17 increased from R12 billion to R33 billion and created job opportunities for the locals. It has been documented that 2 125 000 people are depended on livestock industry (DAFF, 2017). Even though S.A beef industry is doing well, it should be noted that there are other exporters and imports which pose threat to S.A beef industry. Countries like Australia, Pakistan, India, and Brazil are major exporters of beef and imports of chicken products (IDC, 2018).

Sheep

Sheep farming in S.A plays an important part into the economy of the country through mutton and wool industry. On mutton market value chain, it was noticed that from the 2006/07 financial year till the 2014/15 financial year, there was an increase in the gross value chain of mutton of about R41.6 billion in that 10-year period (DAFF, 2017). In 2015/16 there was a small decrease in numbers due to theft and predators (DAFF, 2017). The wool industry in S.A plays an important role at a commercial and emerging sector, with 90% of the wool produced being exported, putting S.A on the third largest exporters of wool in 2017 (BFAP, 2018). In 2007 to 2017 S.A exports on wool increased with more than 12% with the involvement of Eastern Cape smallholder farmers (BFAP, 2018).

Goats

Goat farming in S.A plays a vital role in the economy of the country through meat, mohair, and milk, with the Eastern Cape contributing approximately 38% in S.A (DAFF, 2018). Goats are kept in all the nine provinces of S.A and there is growth in the gross value of chevon, ranging from 2007/08 to 2016/17. The trends showed that the gross value of chevon increased by 215% during 2016/17 compared to 2007/08

(DAFF, 2018). Mohair production in 2016 contributed approximately 53% to global production (Musango, Duminy & Batinge, 2017). The production of mohair in 2015 amounted to 2500 tons when compared to the 2006 production which was 3700 tons, meaning there was a decline in mohair production (DAFF, 2016).

2.2.2 Livestock farming in the smallholder sector

Livestock plays a vital role to rural livelihoods as it has been identified as one of the food security sources in the food chain in different parts of the world (Hegde, 2019). In developing countries around 1 billion people make ways of living through livestock farming (IFAD, 2016). Livestock is utilised for animal traction and also serves as a way of sustaining livelihoods through cattle sale and social sales (Okello, Muhanguzi, MacLeod, Welburn, Waiswa & Shaw, 2015). Livestock is also considered to be a dietary source as it contributes around 36% of populations' needs and 49% of agricultural output (Cheteni & Mokhele, 2019).

Small scale livestock farmers play a vital role on food production and human health. Landscape management and market must form part in the development of livestock farmers for them to sustain and be able to grow (Food Agricultural Organization [FAO], 2019). Tricarico, Kebreab & Wattiaux (2020) noted that livestock also serves as a source of milk in emerging sector. This contributes to dietary needs, like meeting the needs for high-quality protein, calcium, magnesium, selenium, riboflavin, vitamin B12, and pantothenic acid (vitamin B5) in at-risk populations, particularly children, pregnant women, and the elderly.

According to Mmbengwa, Nyhodo, Myeki, Ngethu & Van Schalkwyk (2015), livestock keeping in communal areas also creates jobs for the communities, especially in the Eastern Cape and the Northern Cape. In a mixed set up livestock farming also assists in fertilising the crops and improving soil fertility. Therefore, through proper management of livestock it can improve the livelihoods of the people (FAO, 2018). It is, therefore, advisable for relevant stakeholders to assist livestock farmers as it contributes to agricultural production and rural development initiatives (Sanyang, Jobe & Drammeh, 2017).

Among livestock, goats have been identified to be good sources of milk and meat in low-income countries as a result, keeping them plays a vital role in food security chain, even though government entities have a tendency of neglecting small stock (goat)

farmers (Miller & Lu, 2019). Even DAFF (2016) noted the healthy benefits (richness in various nutrients) of goat milk consumption. Besides, it can be processed to different products like cheese, butter, and other dairy products. This means that goat farming improves the livelihoods of the communities as it supplies them with meat, milk, hides, skins, and manure (Nwachukwu & Berekwu, 2020). In addition, the rearing and keeping of goats is inexpensive, as indigenous goats have adaptive characteristics on harsh conditions (Monau, Raphaka, Zvinorova-Chimboza & Gondwe, 2020).

2.4 Smallholder farmers in South Africa

Smallholder farmers in South Africa are usually associated with limited resource and non-commercial and subsistence agriculture. They are usually found in former homeland areas (DAFF, 2018). They are faced with many constraints of poor infrastructure, inadequate information and being in remote areas which sometimes affect accessibility (Sinyolo and Mudhara, 2018). The above statement was also noted by National Agricultural Marketing Council [NAMC] (2016) that smallholder farmers are finding it hard to access and penetrate lucrative market due to the above mentioned challenges.

Diseases have been noted to be one of the challenging factors on livestock farming due to lack of knowledge on vaccines by smallholder livestock farmers. This influences productivity (Maziya, Chiumbu & Gumede, 2019). As a result, it has been noted that in the commercial sector mortality is approximately 3% as compared to communal farmers whose mortality is above 17%. This indicates that communal farmers are losing their stock at a higher rate (Mmbengwa et al., 2015).

In other parts of the country where low rainfall prevails most of the time, smallholder farmers do not generate enough revenue. Instead, they lose because of water shortage and drought constraints (Mpandeli, Nesamvuni & Maponya, 2015). Government has come up with initiatives to assist smallholder farmers like, land reform programme, revitalization of irrigation schemes and other farmer support systems. These initiatives have not yet yielded good results due to lack of managerial skills and experience by farmers (Mujuru & Obi, 2020). This means that the improvement of the selection criteria for support systems to farmers are needed to avoid wasteful expenditure.

Smallholder farmers are faced with many challenges as government institutes have a tendency of giving more attention to commercial farmers and less focus on subsistence and smallholder farmers (Von Loeper, Musango, Brent & Drimie, 2016). Khapayi & Celliers (2016) also noted that South African agricultural economy does not cater enough for emerging farmers. As a result, they cannot benefit from the opportunity presented to them. These results on smallholder farmers having challenges of access to capital, markets, relevant and effective information which could enable them to grow in their businesses (Mutero, Munapo & Seaketso, 2016). This leaves the vulnerable unable to sustain themselves from agricultural earnings because they cannot access financial tools which could assist them to thrive (Abbas, Mirza & Afzal, 2017). Von Loeper et al., (2016) noted that extension personnel in some parts of the country only visit smallholder farmers once a year and the changing of staff at a provincial government makes it difficult to implement extension services successfully.

Poor access of extension services and poor livestock management practices hinder the growth of smallholder farmers from graduating from emerging to commercial level (Oduniyi, Rubhara & Antwi, 2020). At the same time, it should be noted that increasing livestock numbers without proper management can have a negative impact on the environment (Enahoro, Mason-D'Croz, Mul, Rich, Robinson, Thornton & Staal, 2019). In some developing countries land ownership is a challenging factor to smallholder farmers as they do not have access and rights to land ownership (Shabangu, 2016).

Climate change is also one of the key factors that have a negative impact on food security. It has resulted in an increase in average temperatures, change in amount of rainfall and increased severity of drought (Vignola, Harvey, Bautista-Solis, Avelino, Rapidel, Donatti & Martinez, 2015; Masipa, 2017). Adaptability of smallholder farmers to climate change is still one of the challenges facing them due to their low income, education level, limited land area, poor access to technical assistance, markets, and credits (Vignola, et al., 2015).

Poor linkage between extension services, researchers and other agricultural innovation system (AIS) create another gap on the adoption of modern technologies by clients even though there are programmes in place which are made to promote agricultural development (Modirwa, 2014). As a result, communal farmers are faced with many challenges of reproduction, quality, off-take and stock management (FAO, 2019).

Poor choice of extension approach in an organization can lead to extension services not being effective as expected to be. Therefore, it is vital to evaluate the approach to be used, and this must be in line with the skills of extension personnel and needs of the beneficiaries (Mahlangu, Masemola, Matsaunyane, Letsaolo & Luvhengo, 2020). Internal challenges within organisations like restriction of travelling kilometres affect extension service in a negative way. This results in late delivery of services and not being able to reach majority of farmers (Maziya et al., 2019).

2.5 Agricultural extension and advisory services

Agricultural extension and advisory services (EAS) are one of the fundamental services designed to capacitate and support rural communities and other relevant stakeholders (Mbo'o-Tchouawou & Colverson, 2014). This means that these key valuable extension services must increase agricultural productivity and achieve sustainable development (Maoba, 2016). As Norton & Alwang (2019) also noted, one of the primary roles of extension services is to improve farmers' decision making and improve skills development. This will lead to growth, development of agricultural sector and have a significant role on food security, economic and social development (Ugochukwu and Chinyelu, 2020). As it was also noted in the Norms and Standards under specific functions, provision and facilitation of advice on skills development in agriculture is one of the functions that is needed in order to achieve the objectives (Department of Agriculture [DOA], 2005).

Collaboration of stakeholders in planning and working hand in hand can improve the service standards, which will have an impact on the livelihoods of the farmers through technical site visits (Maoba, 2016). Because of climate change, extension agents need to find a way to respond effectively to the farming community. This can be achieved by capacitating extension agents on collaboration with other institutes who have a know-how on climate smart agriculture (CSA), strengthening communication, networking, facilitation and partner engagements (Maka, Ighodaro & Ngotho, 2019).

Capacity building is a process of building and equipping individuals, organizations, and communities through involvement of relevant stakeholders to achieve set goals and promoting sustainable agriculture that will improve the livelihoods (Issa, 2013). There are methods used to capacitate clients such as information sharing, training and visit (T&V), monitoring and evaluation and networking (Kumari & Khanduri, 2019). This means that considering the levels of capacity building is crucial at individual level,

organization level and societal level, as they all play a significant role in the development of farmers (Kumari & Khanduri, 2019). Therefore, extension services need to collaborate with other stakeholders because of the complexity of the farming system in place in order to increase capacity building (Chikaire, Ani, Atoma & Tijjani, 2015). This calls for extension services to understand the needs of smallholder farmers in order to respond effectively on time and with valuable information (Ugochukwu, Ogundeji & van der Westhuizen, 2020).

In Gauteng province, it has been noted that extension services, namely technical farm visits, formal training, informal training, access to proper farm infrastructure, access to formal market, access to production inputs, access to finance, access to workshops and demonstrations have some successful stories. However, they have not reached their mandate due to certain challenges associated with the approach in use (Mahlangu et al., 2020). In the process of improving the extension services, it should be noted that smallholder farmers undervalue collaboration among themselves sometimes (NAMC, 2017). This means that proper planning, willingness and involvement of relevant stakeholders can improve agricultural extension and advisory services.

Training of extension personnel and improvement of communication systems in extension systems are key in the development of the agricultural sector, as they will in return improve access level to information, skills, resources and production (Raidimi & Kabiti, 2019). It was noticed that extension services are not effective and that insufficient funding for research might be playing a role on that (Zwane & Montmasson-Clair, 2016).

2.6 Extension Approaches used in Gauteng province towards capacity building of farmers.

The farming community is faced with different challenges. As a result, it is noted that there is no extension method that is right for all the challenges under the norms and standards for extension and advisory services (Department of Agriculture, 2005; (Bureau for Food and Agricultural Policy [BFAP], 2018). There are many approaches used in the field of agriculture in order to develop farmers and improve adoption to modern technologies, any approach used is based on the available recourses and needs assessment (Kaur & Kaur, 2018). These approaches may include: general agricultural extension approach, commodity specialized approach, training and visit approach, agricultural extension participatory approach, project approach, farming systems development approach, cost

sharing approach and educational institution approach. All the mentioned approaches have a common objective of capacity building of farmers in order for them to increase farm production (Ashraf, Sharjee, Babar, Junaid, Iqba, Rasheed & Fatima, 2018).

In Gauteng province commodity specialized approach has been adopted under farmer support and development (FSD) in trying to respond to the needs of the farmers. This approach allows extension, research, market and other agricultural innovations systems to come together, even though public interest may not be a priority (FAO, 1997; Mapiye, Makombe, Molotsi, Dzama & Mapiye (2021). Through this approach and support programmes, extension services have improved in terms of capacity building of farmers, even though there is still more to be done in terms of farmers getting assistance on access to finance and formal markets (Chepape & Maoba, 2020). Therefore, targeted approaches are required in order to have an effective response to production and market challenges faced by smallholder farmers (Ugochukwu, Ogundeji & van der Westhuizen, 2020).

Market linkage and certification of smallholder farmers by governing bodies can put them in a better position of supplying lucrative markets, thus generating income (Kelly & Metelerkamp, 2015). DAFF developed a Zero Hunger Strategy where one of the objectives is the establishment of effective support systems for the development of the farmers through effective collaboration among relevant stakeholders (Masipa, 2017). This means that extension services should earmark farmers disadvantaged in terms of access to credit, capital and education, in order to improve adoption of traditional and new sustainable agricultural practices (SAPs) for the benefit of the farming community (Myeni, Moeletsi, Thavhana, Randela & Mokoena, 2019). Lastly, it should be noted that there is no approach or method that is suitable for all the situations and all purposes (Davis & Terblanché, 2016). As a result, the approach in use in GDARD is not fully implemented due to limited resources.

2.7 Needs-based development

DoA, (2005) noted that "Projects and/or programmes will be based on needs identification, assessment and prioritisation in collaboration with farmers/communities or their representatives". Advisably, needs assessment must be done within extension in order to improve service standards, delivery and considering the use of available resources in an effectively way (Dill, Miller, McCoy & Rhodes, 2017). Asset-based

community development (ABCD) approach is one of the approaches that can be used in order to allow community members to participate effectively in order to have a sense of ownership in their development (Nel, 2018).

2.8 Framework for designing and analysing agricultural advisory services

The framework for designing and analysing agricultural advisory services in figure 1 can be used to examine the capacity and management of agricultural advisory services, and will thus help on policy development, decision making, implementation and investments towards agricultural advisory services (Birner, Davis, Pender, Nkonya, Anandajayasekeran, Ekboir, Mbabu, Spielman, Horna & Benin, 2006). The formation of monitoring and evaluation systems and making the findings of different research projects be similar in order to have a better understanding of the roles and operations of advisory services (Birner et al., 2006).

This framework analyses and assesses the performance of advisory services provided to farmers based on their needs and opportunities (P), looking into advisory methods (A) used in place. This study is concerned about the level of access of extension and advisory services which will have impact (I) on yield productivity, income, employment status and farm household (H).

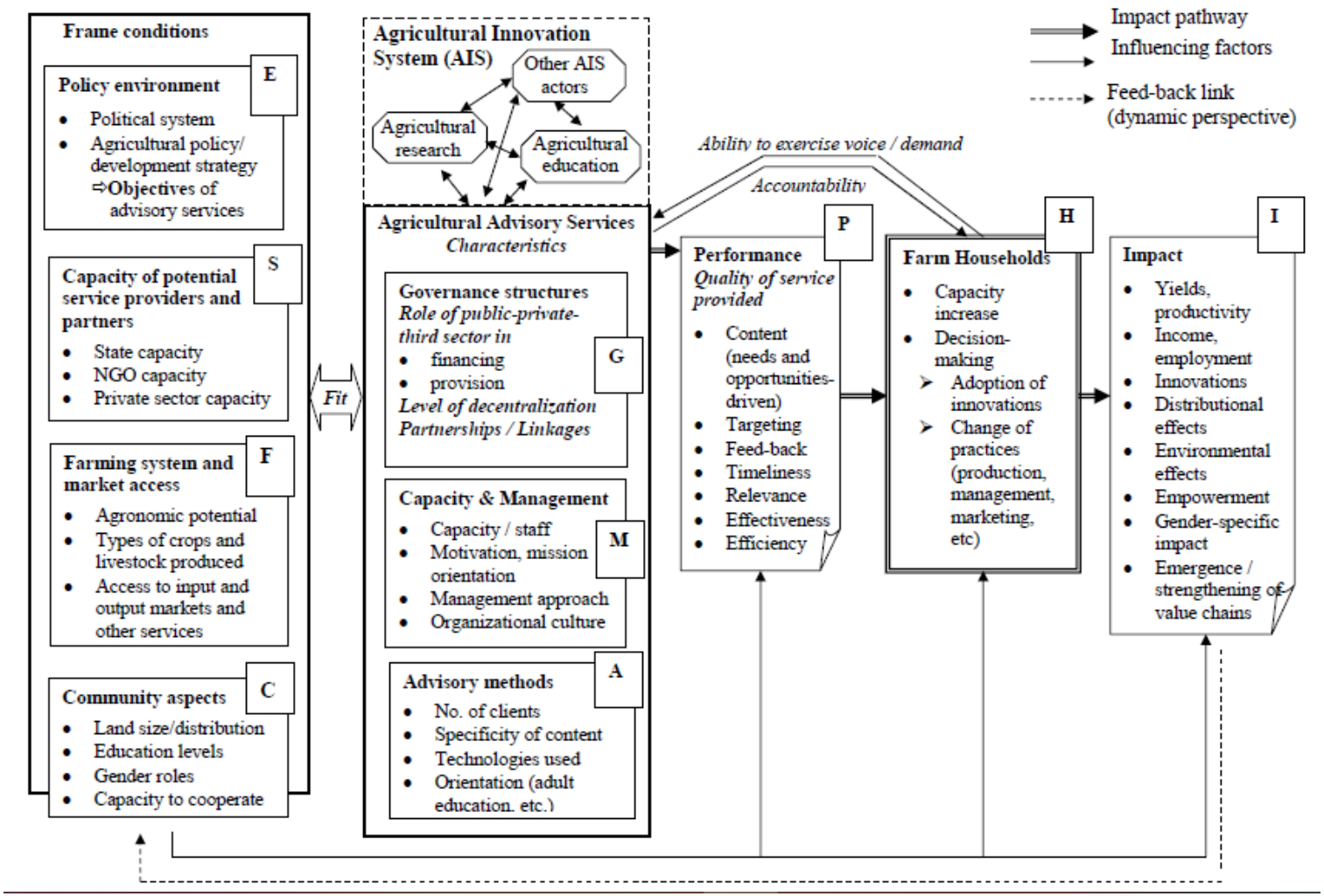

Figure 1: Framework for designing and analysing agricultural advisory services (Birner et al. (2006).

2.9 Conclusion

This chapter covered livestock production in South Africa, contribution of livestock to rural livelihoods, smallholder farmer in South Africa, challenges faced by livestock smallholder farmers, agricultural extension and advisory services, extension approaches used in Gauteng towards capacity building of smallholder farmers and lastly needs-based development. By doing so, this chapter highlighted the importance of collaboration amongst extension services and other relevant stakeholders for the development of the farming communities.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

This chapter describes the procedures which were undertaken during this study (methodology applied during data collection in the study.) It presents a description of the study area, research design, population of the study, sample size and sampling procedure.

3.2 The Study Area

The study was conducted at Midvaal Local Municipality (26.5837° S, 28.0654° E) in Gauteng Province. This Municipality is situated within Sedibeng District Municipality, Southern region of Gauteng Province in South Africa. Geographically the municipality is located halfway between South of Johannesburg, East Rand, Vaal, and Vereeniging areas. The land surface area of the Municipality is 1 722km² and has 29 854 households with a population density of 111 612. The main Towns and Settlements are Meyerton, Daleside, Randvaal, Henley-on-Klip, Walkerville and De Deur.

The reasons for choosing this Municipality for study purposes were: i. The area is predominately rural and extensive farming practices constitute about 50 % of the total land use. ii. There is a need to assess and document opportunities and challenges faced by the livestock farming community in the study area.

Figure 2: Map of Midvaal Local Municipality: Source: Midvaal maps

3.3 Research design

The study used a survey design and quantitative research methods to achieve the stated objectives. Quantitative research method is concerned with numbers and figures in the collection and analysis of data. Furthermore, statistical data gathered in quantitative research can be used as a tool for saving time and resources (Eyisi, 2016). Another advantage of using this method is that the findings can be generalised to represent the whole population or sub population which can be randomly selected.

Survey design was used to gather information from the respondents through administering of questionnaires. This is because survey design aims at describing, recoding, and interpreting the results without influencing the variables (Baha, 2016).

3.4 The population of the study

Makapela (2015) described population as a group of individuals whom the researcher will be focused on and the results obtained will represent the overall view of the population. The population of this study was smallholder livestock farmers' in Midvaal Local Municipality. To minimise sample error, a database of 238 smallholder farmers in Midvaal Local Municipality was obtained from the Gauteng Department of Agriculture and Rural Development (GDARD) to represent a population unit of the study.

3.5 Sampling procedure and sample size

Simple random sample technique was used to select the participants. This was done so that individual farmers in the study population can have an equal chance of being selected in the study. A simple random sampling is defined as one of the sampling methods in which every unit in the population has a chance of being included in the sample (Mohsin, 2016). This sampling method reduces chances of systemic error, minimizes sampling biases, and gives a better representable sample (Mohsin, 2016). Raosoft sample calculator was used to determine the sample size of the study. In using the Raosft sample calculator, the following were considered: level of confidence, margin of error, population size and response of distribution. A confidence level of 95% was sought, with a 5% margin of error, 238 population size and 50% response of distribution. The sample size consisted of 148 smallholder livestock farmers selected from the study population. Table 1 provides a summary detail of the number of smallholder farmers sampled from the study area.

Table 1: Summary of sampling procedure

Name of Municipality	**Total number of smallholder farmers**	**Number of farmers that were interviewed**	**Municipality code**
Midvaal Local Municipality	238	148	
Total	**238**	**148**	Municipal code: GT422

3.6 Data Collection

A structured questionnaire was used to collect data from the targeted participants. The questionnaire was administered face to face by the researcher to the targeted participants. The questionnaire was first pre-tested. The questionnaires contained closed-ended questions. The questionnaire was divided in to four sections. The first section of the questionnaire was the demographic characteristics of the respondent such as age, gender, household size, level of education and others.

The second section was on the analyses of extension and advisory services on capacity building of smallholder livestock farmers in Midvaal Local Municipality, such as training, visitations, support (infrastructure and production inputs) and others.

The third section was on the perception of smallholder livestock farmers towards extension and advisory service on capacity building in Midvaal Local Municipality. It included participants' perception towards the services rendered, kind of support, channel used and others.

The last section was on constraints faced by smallholder livestock farmers at Midvaal Local Municipality in accessing extension and advisory services on capacity building. These constraints include access to relevant information, markets, livestock management and others.

3.7 Data capturing and analysis

The data gathered from participants was coded and captured in Microsoft Excel (Ms Excel), SPSS statistical software was used to analyse data from the participants (Rahman, 2017). Descriptive statistics such as frequency counts, mean, percentages, standard deviation, rank order and inferential statistics such as binary logistic regression was used to analyse the data. All data collected was summarised and presented in tables and graphs. The mean number of livestock owned by smallholder livestock farmers in a two-year period (2019 – 2021) was analysed using a T-Test. The analyses of extension and advisory services, namely technical farm visits, formal training, informal training, access to proper farm infrastructure, access to formal market, access to production inputs, access to finance, access to workshops and demonstrations on capacity building of smallholder livestock were measured using a 5-point Likert scale (1) Strongly disagree, (2) Disagree, (3) Neither agree nor disagree; (4) Agree, (5) Strongly agree. Perception of smallholder livestock farmers towards extension and advisory services on capacity building was measured with a 4-point Likert scale (1) Strongly agree, (2) Agree, (3) Disagree (4) Strongly disagree. Constraint index (CI) was used to establish the order of the challenges faced by smallholder livestock farmers in accessing extension and advisory services on capacity building at the study area, using the following formula:

Constraint Index (CI) = PLHC x 4 + PLMC x 3 + PLLC x 2 + PLNC x 1

Where, PLHC – denotes percentage of livestock farmers who had high constraints

PLMC – denotes percentage of livestock farmers who had medium constraints

PLLC – denotes percentage of livestock farmers who had constraints

PLNC – denotes percentage of livestock farmers who had no constraints

The binary logistic regression model was adopted in this study because the dependent variable had binary outcomes and it permits determination of the likelihood of a certain

event occurring. The dependent variable was an agricultural extension service measured on a dichotomous scale, namely, received or not received extension services and denoted as 1 or 0, respectively. The predictions were based on gender, age, marital status, level of education, household size, employment status, and farm size of the livestock farmers in the study area (Table 2). The independent variables had both categorical and continuous variables. The association between the dependent and independent variables was not linear, thus logistic regression model was used, which was the logit transformation of y. The model was computed as follows:

$$\text{Logit (p)} = \text{In}\left(\frac{P}{1-P}\right) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + U_i$$

$\frac{P}{1-P}$ is the odds ratio

P = The probability that livestock farmer is receiving extension services

1-P = probability that livestock farmer is not receiving extension services

α = the constant of the equation

β = the coefficient of the independent variables

X = the independent variables

U_i = the disturbance term

Table 2: The independent variables used in the binary logistic regression

Variables	**Description of variables**	**Units**
X_1 = Gender	Male = 1, Female = 0	Dummy
X_2 = Age	Age in years	Number
X_3 = Marital status	Married = 0, Not married = 1	Dummy
X_4 = level of education	Non-post matric = 0, Post metric =1	Dummy
X_5 = Household size	Number of household members	Number
X_6 = Employment status	Full time = 0, Part time =1	Dummy
X_7 = Farm size	Size of the farms in hectares	Number

3.8 Ethics consideration

Given that the study required human participants, ethical consideration was addressed through voluntary participation, and the respondents' right to privacy was respected by obtaining direct consent from them. Anonymity was guaranteed to make respondents to be free and allow them to give as much information as needed to support the research. Informed consent was explained clearly to the respondents to enable them to decide whether they would participate in the study or not. Their willingness to participate in the research was formally obtained through verbal consent. Ethical clearance was obtained from the ethics committee of the North-West University Mafikeng campus

3.9 Validity and Reliability

Thatcher (2010) stated that validity regulates whether the tool measures what it was intended to measure. According to Creswell (2014), reliability is when an investigator uses certain processes to check for the precision of the research findings. A board of experts in Agricultural Extension and Agricultural Research carried out the face validity of the questionnaire. The panel comprised senior researchers and lecturers in the Department of Agricultural Economics and Extension of the North-West University as well as other researchers, community and senior management officers in the Rural Environment and Agricultural Development.

3.10 Conclusion

This chapter highlighted an overview on how the study was conducted, through the assistance of the participants in trying to analyse extension and advisory services on capacity building. A questionnaire was used as a tool to gather data and all the collected data was coded in Microsoft Excel and at a later stage it was transferred to SPSS.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the findings of the research study. It presents a description and analysis of all information collected from the participants. This was done by looking into their demographic information, analyses of extension services on capacity building, perception of participants towards extension services on capacity building and constraints facing the participants.

4.2 Demographic characteristics of the respondents

Gender of the respondents is shown in Figure 3, which indicates that most respondents at 58% were males and at 42% are females. This means that males are dominant in livestock farming at the study area. This could be caused by the traditional events and beliefs associated with livestock keeping as they are facilitated by men in most cases. As women are not allowed to enter the kraals and take part in discussions related to kraal activities in other culture. This might be the cause of low participation of women in agricultural activities (Mbo'o-Tchouawou & Colverson 2014). Chepape & Maoba (2020) also noted that South African government has not yet reached its mandate on women empowerment in all economic activities, as male counterparts are still dominant in other industries.

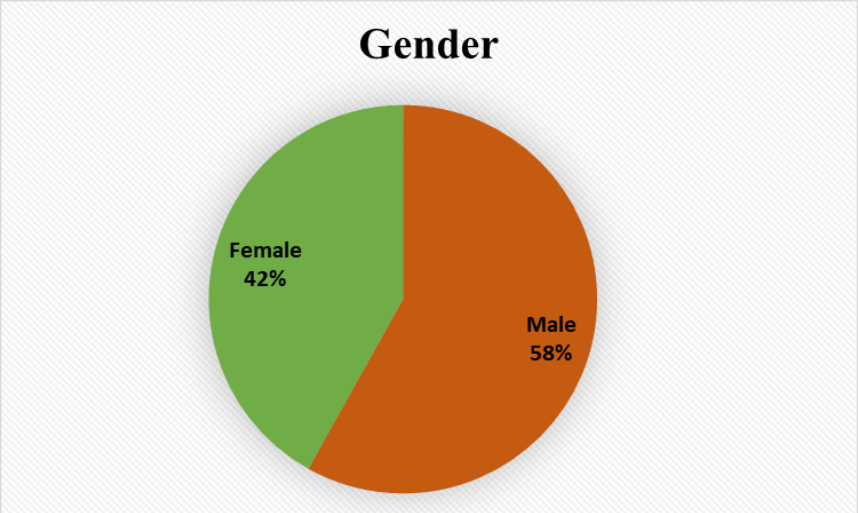

Figure 3: Gender of smallholder livestock farmers (n=148)

Source: Field survey 2021

The age of the respondents is shown in Table 3. It showed that the farmers were ranging from age 20-30 give 14%, ranging from 30-40 gives 23%, those ranging from 40-50 gives 24%, those ranging from 50-60 and 60 -70 gives both 18% and those who are ranging from 80-90 gives 3%. The age distribution clearly shows that livestock farming is commonly practiced at the study area and many age groups are partnering in livestock farming, even though youth involvement is still low. Therefore, youth need to be encouraged and supported to participate more in farming through governmental support initiatives. Maka, Ighodaro & Ngcobo-Ngotho (2019) noted that elderly people at some point will no longer be able to perform their agricultural activities effectively even though their experience can be shared with youth. By doing so this will have a positive effect on food value chain and in the continuation of food supply.

Table 3: Age of smallholder livestock farmers (n=148)

Age	Frequency	Percent (%)
20-30	20	14
30-40	34	23
40-50	36	24
50-60	27	18
60-70	27	18
80-90	4	3
Total	**148**	**100.0**

Source: Field survey 2021

Marital status of the respondents is shown in Figure 4. The figure displays that most of the livestock farmers at the study area were single (45%), married (43%), widowed (7%) and divorced (5%). Marital status was considered in this study because it is important in time devoted to household activities and agricultural activities. As women play multiple roles in households and agricultural activities, it is crucial for extension services to assist women farmers in order to improve their standard of living (Mbo'o-Tchouawou & Colverson, 2014). Modirwa (2014) also indicated that married farmers tend to yield positive results in farming as they tend to fend for their households.

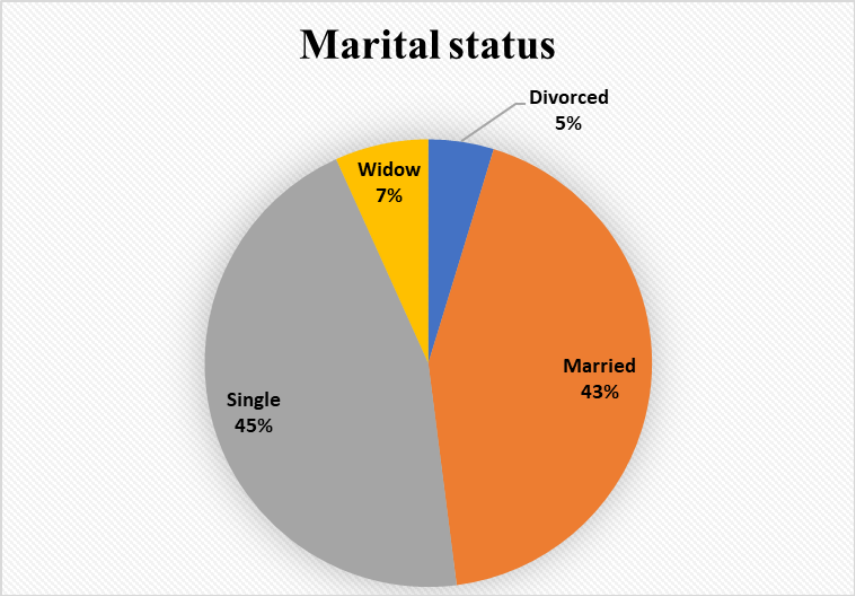

Figure 4: Marital status of smallholder livestock farmers (n=148)

Source: Field survey 2021

Levels of education of the respondents are shown in Table 4. It is shown that most of the respondents attended secondary school (40%), followed by primary level (18%), tertiary (16%), no formal education (14%) and lastly college (12%). Understanding the level of education of the participants is key as it assists on the delivery channel of information for better results. As Ugochukwu, Abiodun & van der Westhuizen (2020) noted, education yields positive results and improves the responsiveness of farmers.

Table 4: Level of education of smallholder livestock farmers (n=148)

Level of education	Frequency	Percent (%)
College	18	12
Primary	27	18
Secondary	59	40
Tertiary	23	16
No formal education	21	14
Total	**148**	**100.0**

Source: Field survey 2021

Home languages of the respondents are presented in Table 5. It shows the diversity of the farming community in the study area, as SeSotho language (41%) is dominant, followed by IsiZulu (38%), Sepedi (9%), English, IisXhosa and SeTswana (3%) and XiTsonga, Venda and Ndebele (1%). This diversity can be caused by the fact that most

people migrate from rural areas to the cities in order to better their livelihoods. Therefore, home language of the respondents should be observed as language is one of the most vital tools used to communicate information. Lonyangapuo (2015) noted that language is fundamental in building the agricultural sector depending on the use of language, which will have an effect on the results. This means that an official responsible for the study area must be able to talk both or one of these languages (Sesotho and IsiZulu) for effective results, as they are dominant in the study area.

Table 5: Home language of smallholder livestock farmers (n=148)

Home language	Frequency	Percent %
English	5	3
IsiXhosa	4	3
IsiZulu	56	38
Ndebele	1	1
Sepedi	13	9
SeSotho	61	41
SeTswana	5	3
Venda	1	1
XiTsonga	2	1
Total	**148**	**100.0**

Source: Field survey 2021

Household size of the respondents is presented in Table 6. This shows that most of the households range from 1-5 members with (90%), followed by household size of 6-10 (9%) and lastly by household size that range from 11-15 (1%). Therefore, this shows that most households consist of household member that range between 1-5 members. This range could be caused by the cost of living, which results in less numbers of family members (Modirwa, 2014). Knowing the household size will assist in knowing why job creation is low or high, since other family members tend to work within their family projects. As a result, in such instances this can lead to low numbers on job creation, in an event where all family members are actively involved in a project without employing anyone from outside.

Table 6: Household size of smallholder livestock farmers (n=148)

Household size	Frequency	Percent %
1-5	134	90
6-10	13	9
11-15	1	1
Total	**148**	**100.0**

Source: Field survey 2021

Employment status of the respondents is presented in Figure 5, where it is shown that self-employment is high (55%), followed by employed (16%) and unemployed (28%). Even though there is a high rate of self-employment, government institutions have an important role to play in supporting livestock farmers as participants indicted that they make a living through their agricultural and non-agricultural activities. Therefore, proper support to livestock farmers can improve their production, which will in return promote growth and create jobs for the community. As Maoba (2016) also noted, assisting farmers with proper farm infrastructure and advisory services is the way forward in growing agriculture.

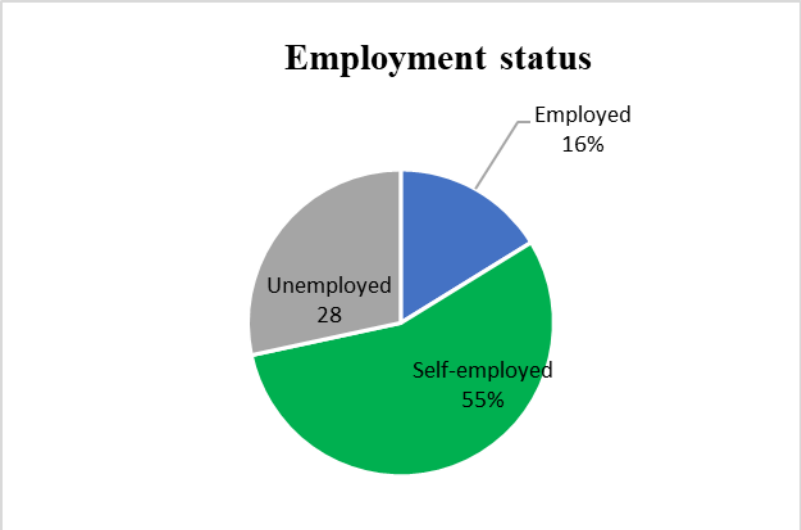

Figure 5: Employment status of smallholder livestock farmers (n=148)

Source: Field survey 2021

Source of income of the participants is presented in Figure 6 where it is shown that most of the income is sourced from salary (69%), which consist of self-employed and employed. This is followed by remittances (18%), retirement pension (7%) and social grant (6%). This means that promoting and supporting agriculture is the way to go, as

other elderly participants regard agriculture as the main source of income even though they are also receiving social grants. Dembele, Bett, Kariuki & Le Bars (2018) noted that most of smallholder farmers engage in multiple income generating commodities in trying to improve their standard of living. This implies that knowing the sources of income, will assist in determining if agricultural activities are having any impact or not in the livelihoods of the respondents in the study area.

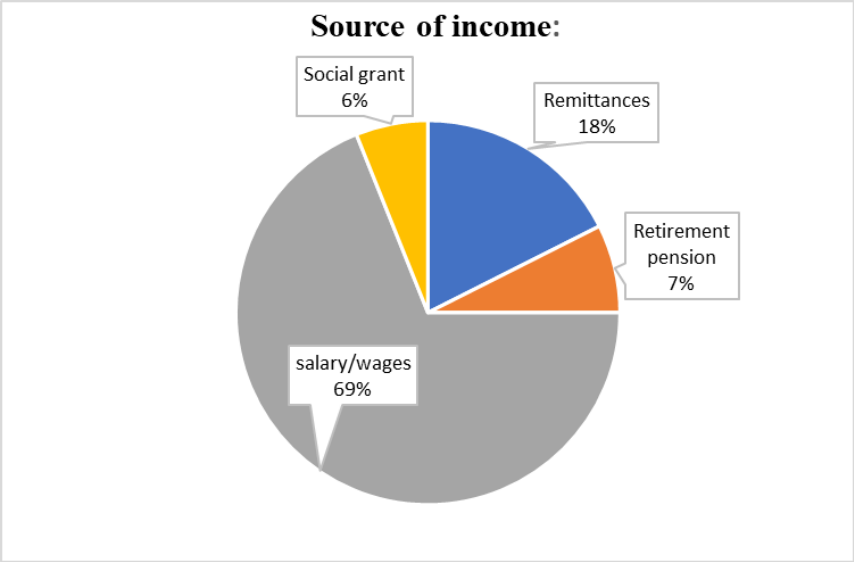

Figure 6: Source of income of smallholder livestock farmers (n=148)

Source: Field survey 2021

Farm/plot sizes of the respondents are presented in Figure 7, which shows the amount of land the farmers are operating within, with the highest percent of 79% of livestock farmers owning land that is ranging from 1-10 hectare (ha), followed by 3% ranging from 21-120 ha, 11-20 ha and 300-528 ha and lastly by 12% of communal land (farmers who do not own land). Understanding the size of operation is key in agriculture as it will form part in planning and decision making regarding the best suitable enterprise to be practiced for better results. These results clearly show that all spheres of government (National, Provincial and Local Municipality) must collaborate and see how best they can assist the farming community with land, because even the participants owning land also utilise the communal land for their livestock. As Abdu-Raheem (2014) noted, poor linkage among governmental spheres and poor management within extension services is one of the critical issues. This means that addressing this issue can have a positive impact in the farming community and the economy of the country.

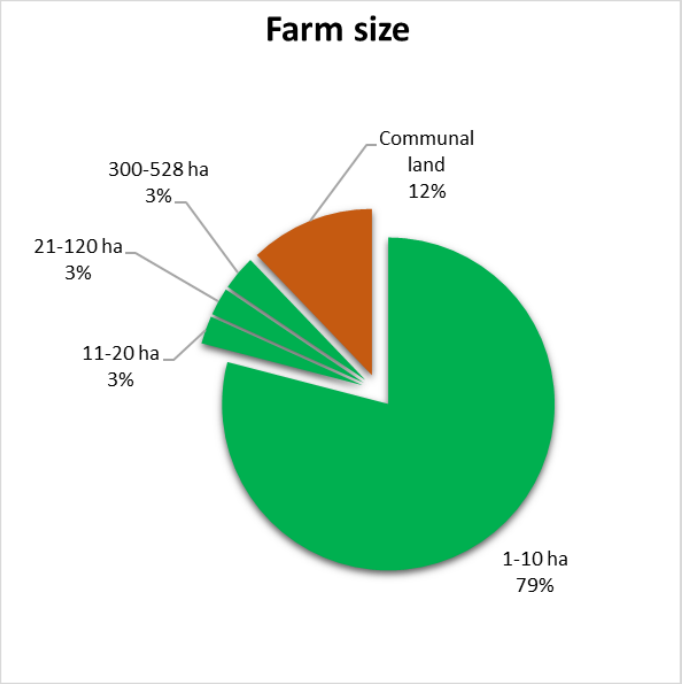

Figure 7: Farm/plot size (ha) of smallholder livestock farmers (n=148)

Source: Field survey 2021

4.3 Access and effectiveness of extension services on capacity building of livestock farmers

Livestock types owned by the respondents are presented in Table 7, which shows the distribution of livestock owned by the respondents. The results shows that most of the respondents do mixed farming within their space of operation. This could be due to farmers wanting continuous financial flow within their businesses since there are dry seasons in all commodities at some point. As Dembele, Bett, Kariuki & Le Bars (2018) noted, most of smallholder farmers engage in multiple income generating commodities in trying to improve their standard of living. Poultry farming, particularly broiler farming, seems to be one of the commodities that is being practised mainly. This might be due to the short life cycle, management, cost implications on the rearing space, returns and the marketing part poultry farming. The reasons for low numbers in other livestock could be contributed by the issue of land as 97% of the respondents does not have enough land for grazing and lack of support from the relevant stakeholders.

Table 7: Livestock types owned by smallholder livestock farmers (n=148)

	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Broiler	48	500.00	8000.00	2062.5000	210.04527	1455.23633
Layer	23	60.00	5000.00	2350.4348	360.38817	1728.36096
Sheep	58	1.00	102.00	24.3448	2.24707	17.11320
Goats	48	3.00	65.00	21.1667	1.93130	13.38041
Cattle	72	3.00	300.00	38.7222	5.14132	43.62556
Bulls	62	1.00	25.00	3.1452	.44995	3.54293
Calves	62	1.00	150.00	12.8548	2.57113	20.24509
Piggery	31	3.00	110.00	20.4839	4.95352	27.58003
Valid N (listwise)	23					

Source: Field survey 2021

4.3.1 Mean number of smallholder livestock owned by respondents in a period of two years

The results of the mean number of livestock owned by smallholder livestock farmers in a two-year period (2019 – 2021) are presented in Table 8. The results show that the number of broiler chickens increased by 22% during the study period however, the increase was not statistically significant. Also, the numerical increase observed was as a result of additional three farmers in 2021 who were not keeping broilers in the year 2019. In other remaining livestock commodities, the number decreased even though there was an increase numerically during the study period. The following numbers of decreases were observed per commodity: Layer - 2%; Sheep - 8%: Goats - 9%: Cattle - 11%: Bulls - 25%: Calves - 32%: Pigs - 5%: however, all these decreases are not statistically significant.

These results show that there is no significant growth in the study area, which might be caused by lack of resources, type of support from the extension services and relevant stakeholders within the municipality. As Masangano, Kambewa, Bosscher & Fatch (2017) noted, sometimes extension services do not respond to the needs and interests of the farmers, which might be the results of top-down approach. Maltou & Bahta (2019) also suggested that collaboration of relevant government institutes and improvement on turnaround time in relevant support can improve the current state. This means that

extension services and relevant stakeholders need to collaborate and come up with viable, practical, and sustainable programmes that will be led by the needs and interests of the intended target groups.

Table 8: Mean number of smallholder livestock owned by respondents in a period of two years in the study area (n=148)

Types of livestock	2019		2021			
	N	Mean	N	Mean	T-Test	Significant (2-tailed)
Broiler	45	1609	48	2063	1.482	0.142
Layer	17	2400	23	2350	-0.081	0.936
Sheep	51	26	58	24	-0.432	0.666
Goats	47	23	48	21	-0.692	0.491
Cattle	66	44	72	39	-0.479	0.632
Bulls	60	4	62	3	-1.167	0.246
Calves	52	19	62	13	-1.157	0.250
Pigs	27	21	31	20	-0.084	0.934

Source: Field survey 2021: N – number of livestock farmers

4.3.2 Farming systems of smallholder livestock farmers

The farming systems of the respondents are shown in Figure 8, which indicates that 62% of the respondents are doing mixed farming and others are doing one commodity only in terms of livestock: 21% is broiler, 8% is layer, 1% is goat, 1% sheep and 7% pigs. These results can be driven by the issue of farm sizes of the respondents, as it was identified that 79% of the respondents' own plots that range from 1-10 ha, which favours intensive farming. Therefore, intensive farming could be the way forward for the livestock farmers, especially poultry and piggery farming through proper consultations and observation of Municipal bylaws. This means that support of proper farm infrastructure is crucial as most poultry and piggery farmers are converting their existing structures for production. Maoba (2016) also encountered similar findings.

On the issue of other livestock commodities, it can be crucial that the National, Provincial and Local governments collaborate and come up with strategies to assist farmers with enough grazing land, without distracting the Municipal plans and existing businesses within the Municipality. Land Reform and Rural Development (2001) under land redistribution for agricultural development indicated that people should be assisted with land for agricultural purposes. The findings in this study show that there are still some challenges of land for agricultural activities.

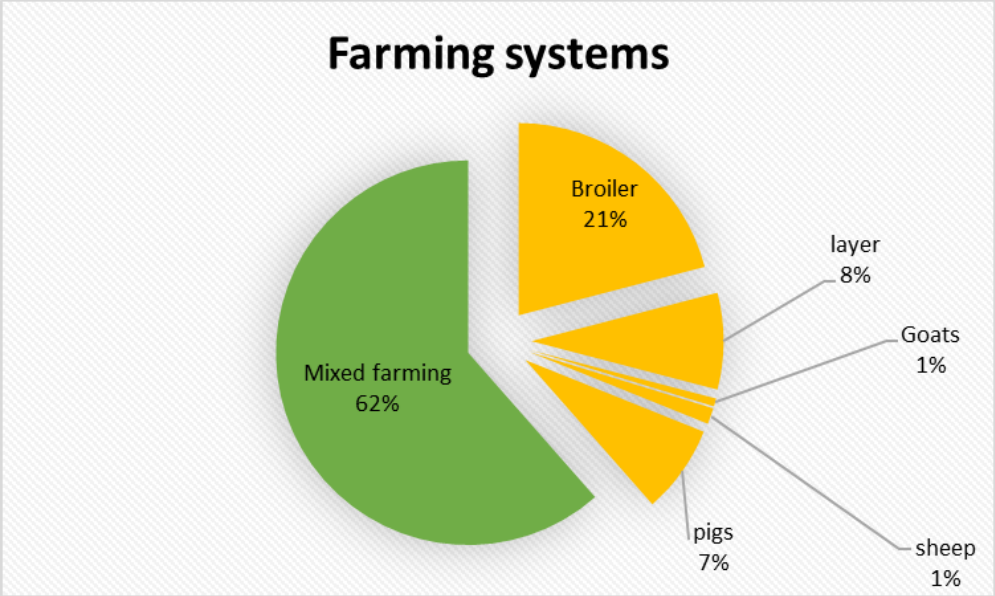

Figure 8: Farming systems of smallholder livestock farmers (n=148)

Source: Field survey 2021

4.3.3 Access to extension services by smallholder livestock farmers

Access to extension services is presented in Figure 9 where it is indicated that 24% of the respondents do not have access to extension services and 76% of respondents reported that they have access to extension services. These results show that there is still room for improvement in extension services. It should be noted that extension services require other relevant stakeholders for them to be fully effective (Zwane & Davis, 2017). This means that research, extension services, farmers and community-based organisations (CBO's) must collaborate and consult with relevant stakeholders for the effectiveness of extension services. As 24% of farmers indicated that they are not receiving extension services, this might be caused by the lack of communication, visibility, and accountability of extension personnel amongst the farming community (Hlatshwayo & Worth, 2019).

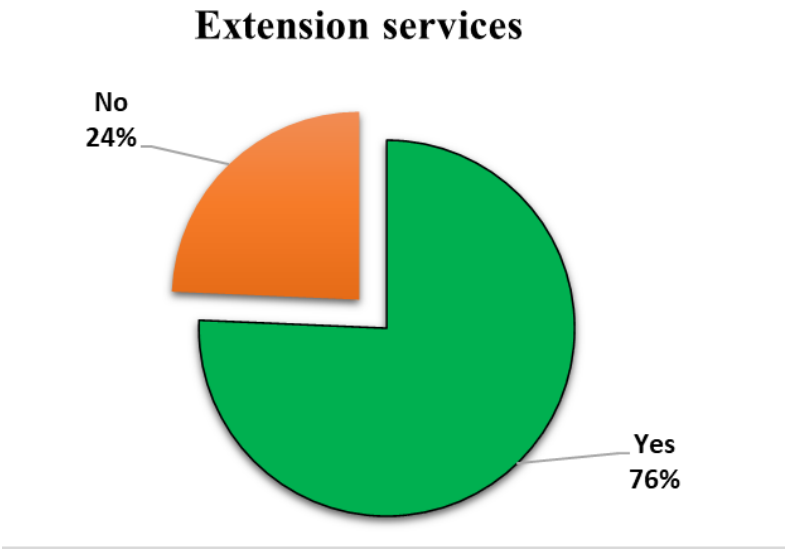

Figure 9: Access to extension services by smallholder livestock farmers (n=148)

Source: Field survey

The findings on the effectiveness of extension services on capacity building of livestock farmers was carried out using a Likert scale method are shown in Table 9. It should be noted that any deliverable with a mean (M) less than 3 is regarded as not effective and the ones above 3 are regarded as effective. The results show the following according to their means: the participants agree that the technical farm visits (M = 3.3, SD=± 1.36), informal training (M = 3.2, SD=± 1.31) and access to production inputs (M = 3.0, SD=± 1.37) are services that are accessible and are having a positive impact towards their farming enterprises. Lastly, the results show that following services are not easily obtained from the extension services in the study area. This results in a negative impact on livestock farmers on their daily operations: access to demonstrations (M = 2.6, SD=± 1.26), access to workshops (M = 2.6, SD=± 1.21), formal training (M = 2.5, SD=± 1.21), access to proper farm infrastructure (M = 2.2, SD=± 1.22), access to formal market (M = 2,0 SD=± 1.06) and access to finance (M = 1.9, SD=± 1.01).

This might be caused by the issue of cost containment measures together with the weak linkage between relevant stakeholders in the study area. It should be noted that the commodity approach in use requires other services to be in place for the effectiveness of extension services, for example, prioritizing specialized training for extension personnel is vital (Ashraf, Hassan & Ashraf, 2019). This should happen so that the technical part can improve, inclusive of all the other core services that the participants are struggling to

attain from the extension services, such as proper farm infrastructure support, access to finance and formal market. This suggests that when selecting an approach, it is vital to consider the available resources within the unit. This can be achieved by consulting with relevant stakeholders and coming up with a viable approach or approaches that will respond to the needs of the participants (Mahlangu et al., 2020).

Table 9: Access and effectiveness of extension services in capacity building of livestock farmers (N = 148)

	Accessibility		Effectiveness of extension services							
Extension services	**Yes**	**No**	**(1) Strongly disagree**	**(2) Disagree**	**(3) Neither agree nor disagree**	**(4) Agree**	**(5) Strongly agree**	**Mean**	**SD**	**Ranking**
Technical farm visits	110 (74)	38 (26)	26 (18)	11 (7)	29 (20)	51 (34)	31 (21)	3.3	1.36	1st
Formal training	44 (30)	104 (70)	36 (24)	49 (33)	30 (20)	23 (16)	10 (7)	2.5	1.21	5th
Informal training	91 (61)	57 (39)	23 (16)	24 (16)	30 (20)	48 (32)	23 (16)	3.2	1.31	2nd
Access to proper farm infrastructure	37 (25)	111 (75)	54 (36)	46 (31)	21 (14)	19 (13)	8 (5)	2.2	1.22	6th
Access to formal market	32 (22)	116 (78)	60 (41)	43 (29)	30 (20)	12 (8)	3 (2)	2.0	1.06	7th
Access to production inputs	83 (56)	65 (44)	26 (18)	32 (22)	25 (17)	40 (27)	25 (17)	3.0	1.37	3rd
Access to finance	27 (18)	121 (82)	59 (40)	55 (37)	20 (14)	11 (7)	3 (2)	1.9	1.01	8th
Access to workshops	57 (39)	91 (61)	30 (20)	44 (30)	30 (20)	36 (24)	8 (5)	2.6	1.21	4th
Demonstrations	60 (41)	88 (59)	34 (23)	46 (31)	25 (17)	32 (22)	11 (7)	2.6	1.26	4th

Source: Field survey 2021

4.4 Perception of smallholder livestock farmers towards extension services

The perception of smallholder farmers towards extension services is presented in Table 10, using a Likert scale method. It should be noted that any deliverable with a mean (M) less than 2.5 is regarded as having a positive effect, whereas the ones above 2.5 are regarded as having a negative effect. The commodity approach in use is having a positive impact on the operations of the respondents, with a mean (M) value of (M=2.1, DS=± 0.90), followed by technical farm visit (M=2.2, DS=± 0.97), linkage with relevant stakeholders (M=2.4, DS=± 1.03) and informal training (M=2.4, DS=± 0.96). All the above-mentioned deliverables, the respondents agree that they are yielding positive results on their operations. This suggests that all the above deliverables should be encouraged and improved, especially the technical part as the commodity approach requires specialization.

The results also indicated that following deliverables still yield negative results on the respondents' operations: formal training (M=2.6, DS=± 0.89) and CASP (M=2.6, DS=± 0.95). These results can be caused by the issues of budgetary constraints, cost containment and bylaws, especially in the study area. Therefore, these two variables should be examined as they are vital in the development of extension services, the farming community and the municipality. In closing, the approach in use is not fully implemented due to the availability of resources within the unit, even though the farming community is responding well to the services rendered.

Table 10: Perception of smallholder livestock farmers towards extension services (n=148)

	Positive	Negative	(1) Strongly agree	(2) Agree	(3) Disagree	(4) Strongly disagree	Mean	Std. Deviation	Ranking
Technical farm visit	105 (71)	43 (29)	37 (25)	69 (47)	21 (14)	21 (14)	2.2	.96691	2nd
CASP	61 (41)	87 (59)	23 (16)	41 (47)	59 (40)	25 (17)	2.6	.94770	4th
Formal training	50 (34)	98 (66)	18 (12)	47 (32)	60 (41)	23 (16)	2.6	.89471	4th
Informal training	80 (54)	68 (46)	32 (22)	49 (33)	48 (32)	19 (13)	2.4	.96291	3rd
Commodity approach in use	97 (66)	51 (34)	40 (27)	63 (43)	33 (22)	12 (8)	2.1	.89991	1st
Linkage with relevant stakeholders	70 (47)	78 (53)	34 (23)	47 (32)	41 (28)	26 (18)	2.4	1.02844	3rd

Source: Field survey 2021

4.5 Constraints facing smallholder livestock farmers on capacity building

The findings on the constraints faced by the participants at the study area are shown in Table 11. It should be noted that constraints with a mean (M) value of less than 2.5 are minor constraints, whereas those above the mean value are major constraints. The results show that high costs of feed and medication with the mean value of (M=3.6, SD=±0.64) and access to formal market (M=3.5, SD=±0.69) are regarded as being the highest constraints faced by the participants. These are followed by access to funding (M=3.4, SD=±0.77), access to enough land (M=3.1, SD=±1.14), access to modern technology (M=2.8, SD=±0.96), access to relevant stakeholders (M=2.7, SD=±1.06), disease control (M=2.6, SD=±1.11), financial management skills (M=2.5, SD=±1.01), poor record keeping (M=2.5, SD=±1.05) and livestock management skills (M=2.5, SD=±1.03) which are regarded as medium constraints facing the respondents.

The results further indicate that accessing informal market (M=2.4, SD=±0.95) and access to agricultural practitioners and advice (M=2.0, SD=±1.15) are low constraints, which might be as a result of the visibility of extension personnel and their dedication to their field. These results show that extension services and relevant stakeholders have a huge role to play as Maoba (2016) noted that high costs of feeds on poultry farming are one of the highest constraints faced by poultry farmers in the farming industry. Even up to date the challenge is still existing and is one of the highest constraints facing the livestock farmers at the study area. This means that the issues of infrastructural support, production inputs, formal market, record keeping, and financial management skills need a serious attention for the benefits of the farming community. Supporting smallholder livestock with enough grazing land with all the above mentioned can improve the agricultural potential of the study area.

Table 11: Constraints facing smallholder livestock farmers on capacity building (n=148)

Challenges	(1) no constraints	(2) low constraints	(3) Medium constraints	(4) high constraints	Min	Max	Mean	SD	Ranking
Access to agricultural practitioner and advice	77 (52)	25 (17)	22 (15)	24 (16)	1.00	4.00	2.0	1.15	10th
Livestock management skills	29 (20)	47 (32)	41 (28)	31 (21)	1.00	4.00	2.5	1.03	8th
Access to formal market	1 (1)	14 (9)	47 (32)	86 (58)	1.00	4.00	3.5	0.69	2nd
Access to informal market	29 (20)	51 (34)	48 (32)	20 (14)	1.00	4.00	2.4	0.95	9th
Access to modern technology	14 (9)	41 (28)	49 (33)	44 (30)	1.00	4.00	2.8	0.96	5th
Access to relevant stakeholders	21 (14)	48 (32)	33 (22)	46 (31)	1.00	4.00	2.7	1.06	6th
Access to funding	3 (2)	16 (11)	45 (30)	84 (57)	1.00	4.00	3.4	0.77	3rd
Poor record keeping	33 (22)	44 (30)	41 (28)	30 (20)	1.00	4.00	2.5	1.05	8th
Financial management skills	28 (19)	43 (29)	49 (33)	28 (19)	1.00	4.00	2.5	1.01	8th
Disease control	30 (20)	45 (30)	31 (21)	42 (28)	1.00	4.00	2.6	1.11	7th
High costs of feed and medication	2 (1)	7 (5)	34 (23)	105 (71)	1.00	4.00	3.6	0.64	1st
Access to enough land	25 (17)	11 (7)	30 (20)	82 (55)	1.00	4.00	3.1	1.14	4th

Source: Field survey 2021, Min - Minimum; Max-Maximum; SD-Standard Deviation

4.6 Regression analysis

The results of the binary logistic regression model are presented in Table 12. The model was deployed to establish variables which may have an influence on livestock farmers' access to agricultural extension services in the study area. The variables tested were gender, age, marital status, level of education, household size, employment status (farming full time or part time) and farm size. The results revealed that the gender and employment status were main variables that significantly ($P<0.05$) influenced livestock farmers' access to extension services. The negative coefficients observed for gender (-1.204) suggested that the male livestock farmers are less likely to receive extension services compared to the female livestock farmers. The odds ratio observed for gender indicated that men were 0.3 times less likely to access extension services than women. The discovered gender differences indicate a positive stride towards women's empowerment in the livestock sector in the study area. However, measures should be taken to ensure that male counterparts are not neglected and end up abandoning farming because that would put pressure on existing social challenges like food security, poverty alleviation, and job creation, among others. Also, the negative coefficient recorded for employment status (-1.195) insinuated that livestock farmers farming part time are less likely to receive extension services. The odds ratio noted for employment status suggested that livestock farmers farming part time were 0.3 times or 30% less likely to receive extension services in comparison to those farming full-time. The finding may be attributed to easy accessibility and availability of farmers farming full time compared to those farming part time. However, other variables such as age, level of education, household size and farm size had positive coefficients, but were not predictors ($P>0.05$) for livestock farmers to access extension services. The goodness-of-fit test was used to evaluate how well the model fit the data and the chi-square analysis was significant ($P<0.05$), which indicated that the model did fit the data well.

Table 12: Binary logistic regression analysis on access of livestock farmers to agricultural extension services

Variables	β (Coefficient)	SE	Wald Statistics	df	P-value	e^{β} (odds ratio)
Gender (1)	-1.204	0.456	6.975	1	0.008	0.300
Age	0.021	0.018	1.338	1	0.247	1.021
Marital status (1)	0.048	0.478	0.010	1	0.919	1.050
Level of education (1)	0.536	0.515	1.084	1	0.298	1.709
Household size	0.153	0.150	1.049	1	0.306	1.166
Employment status (1)	-1.195	0.512	5.446	1	0.020	0.303
Farm size	0.053	0.055	0.928	1	0.335	1.054
Constant	0.268	1.231	0.048	1	0.827	1.308

Model tests		χ^2	Df	P-value
Chi-square ($\chi 2$)		20.532	7	0.005
-2 Log likelihood	141.379			
Cox & Snell R^2	0.130			
Nagelkerke R^2	0.195			

SE - Standard error, df - Degree of freedom

4.7 Conclusion

The results revealed that the gender and employment status were main variables that significantly influence livestock farmers' access to extension services in the study area. This chapter presented the results in terms of the demographic characteristics, analyses of extension services on capacity building, perception of participants towards extension services on capacity building and constraints facing the participants. The following chapter looks into conclusion and recommendations.

CHAPTER FIVE
CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the conclusion based on the findings of the study. Furthermore, the chapter provides possible recommendations for the development of extension services, farming community, relevant stakeholders and the municipality.

5.2 Conclusion

The study has shown that extension services in the study area were playing a major role in the capacity building of smallholder livestock farmers. The most effective extension services were farm visits for the provision of technical advice, informal training, and production inputs. The accessibility to extension services was significantly influenced by gender and farming status, that is, whether they were farming full time or part time. Male and part-time livestock farmers were 30% less likely to receive extension services. The major constraints faced by the farmers in question need to be addressed to maximize their potential to maintain sustainability and develop smallholder livestock farmers. In conclusion based on the results, extension services on capacity building of smallholder livestock farmers at the study area, are accessible and effective, even though there is still more room for improvement.

5.3 Recommendations

Based on the results, it is recommended that all the less accessible extension services must be improved for extension to be more effective in capacity building. The development of a comprehensive development plan is needed to enhance the provision of formal trainings, farm infrastructure, access to formal markets and access to finance. All the major challenges faced by smallholder livestock farmers must be addressed urgently to maintain their sustainability and growth. All the support from extension services should respond to the needs of the farming community within a reasonable time frame.

References

Abbas, R., Mirza, F.I. and Afzal, A., 2017. Farm management capacities contribute to sustainability of rural livelihoods amongst small farmers in district Layyah, Punjab, Pakistan. *Journal of Rural Development and Agriculture*, 2(1), pp. 11-25.

Abdu-Raheem, K.A., 2014. Modelling effective and simultaneous promotion of food security and biodiversity conservation through agricultural extension activities. *S.Afr. Tydskr. Landbouvoorl./S. Afr. J. Agric. Ext.,* 42(2), pp. 51 - 61.

Amalgamated Banks of South Africa [ABSA], 2020. Agri-Trends: Livestock and hide trends. http://agrink.co.za/downloads/ABSA%20Agri%20Trends%20Livestock%20and%20_ibre.pdf [Accessed 10/06/2020].

Ashraf, E., Sharjeel, H.K., Babar, R., Junaid, M., Iqbal, Q., Rasheed, R. and Fatima, N., 2018. Perceptions of extension field staff regarding technology transfer through different extension approaches. *Sarhad Journal of Agriculture*, 34(2), pp. 291-300.

Ashraf, S., Hassan, Z.Y. and Ashraf, I., 2019. Dynamics of agricultural extension services in Pakistan: A history of national performance. *The J. Anim. Plant Sci.,* 29(6), pp. 1-11.

Baha, H., 2016. An introduction of descriptive analysis, its advantages and disadvantages. https://www.academia.edu/25307454/Title_An_Introduction_on_Descriptive_Analysis_Its_advantages_and_disadvantages [Accessed 10/09/2020].

Birner, R., Davis, K., Pender, J., Nkonya, E., Anandajayasekeran, P., Ekboir, J., Mbabu, A., Spielman, D., Horna, D. and Benin, S., 2006. From best practise to best fit: A framework for analysing pluralistic Agricultural Advisory Services Worldwide.

Bureau for Food and Agricultural Policy, 2018. BFAP BASELINE|Agricultural outlook 2018 -2027. http://www.bfap.co.za/wp-content/uploads/2018/08/BFAPBaseline-2018.pdf [Accessed 25/10/2020].

Chepape, R.M. and Maoba, S., 2020. Impact of agricultural developmental programmes on smallholder farmers of Bronkhorstspruit region in Tshwane metropolitan municipality, Gauteng Province. South African Journal of Agricultural Extension, 48 (1): pp. 31-41.

Cheteni, P. and Mokhele, X., 2019. Small-scale livestock farmers' Participation in markets: Evidence from the Land Reform beneficiaries in the central Karoo, Western Cape, South Africa. *S. Afr. J. Agric. Ext.,* 47(1), pp. 118 - 136.

Chikaire, J.U., Ani, A.O., Atoma, C.N. and Tijjani, A.R., 2015. Capacity Building: Key to Agricultural Extension Survival. *Sch. J. Agric. Vet Sci.*, 2(1), pp. 3-21.

Creswell, J.W., 2014. Reasearch design: qualitative, quantitative, and mixed methods approaches (4th ed.). USA: Sage Publications.

Davis, K.E. and Terblanché, S.E., 2016. Challenges facing the agricultural extension landscape in South Africa, Quo Vadis?. *S. Afr. J. Agric. Ext.*, 44(2), pp. 231 -247.

Dembele, B., Bett, H.K., Kariuki, I.M. and Le Bars, M., 2018. Understanding the multiple sources drivers of agricultural income amongst smallholder farmers in Southern Mali. *Review of Agricultural and Applied Economics,* 2(1), pp. 32-40.

Department of Agriculture, 2005. Norms and Standards for extension and advisory services in agriculture.https://www.nda.agric.za/doaDev/sideMenu/NationalExtensionSupport/docs/NORMS_AND_STANDARD_BOOKLET.pdf [Accessed 20/10/2020].

Department of Agriculture Forestry and Fisheries, 2017. A profile of the South African mutton market value chain. http://www.nda.agric.za/doaDev/sideMenu/Marketing/Annual%20Publications/Commodity%20Profiles/Mutton%20Market%20Value%20Chain%20Profile%202017.pdf [Accessed 10/06/2020].

Department of Agriculture Forestry and Fisheries, 2018. A profile of the South African beef market value chain. https://www.nda.agric.za/doaDev/sideMenu/Marketing/Annual%20Publications/Commodity%20Profiles/Beef%20Market%20Value%20Vhain%20Profile%202018.pdf [Accessed 12/06/2020].

Department of Agriculture, Forestry and Fisheries, 2016. A profile of goat milk. https://www.nda.agric.za/doaDev/sideMenu/AgroProcessingSupport/docs/Goat%20Milk%20document%20final.pdf [Accessed 25/10/2020].

Department of Agriculture, Forestry and Fisheries, 2017. A profile of the South African broiler market value chain. https://www.nda.agric.za/doaDev/sideMenu/Marketing/Annual%20Publications/Commodity%20Profiles/Broiler%20Market%20Value%20Chain%20Profile%202017.pdf [Accessed 22/10/2020].

Department of Agriculture, Forestry and Fisheries, 2016. A profile of the South African mohair market value chain. https://www.nda.agric.za/doaDev/sideMenu/Marketing/Annual%20Publications/Commodity%20Profiles/field%20crops/Mohair%20Market%20Value%20Chain%20Profile%202016.pdf [Accessed 25/10/2020].

Department of Agriculture, Forestry and Fisheries, 2018. A profile of the South African goat market value chain. http://www.nda.agric.za/doaDev/sideMenu/Marketing/Annual%20Publications/Commodity%20Profiles/Goat%20Market%20Value%20Chain%20Profile%202018.pdf [Accessed 05/05/2020].

Dill, S. P., Miller, J.O., McCoy, T. and Rhodes, J.L., 2017. Maryland eastern shore agricultural needs assessment. https://www.nacaa.com/journal/index.php?jid=728 [Accessed 27/10/2020].

Enahoro, D., Mason-D'Croz, D., Mul, M., Rich, K.M., Robinson, T.P., Thornton, P. and Staal, S.S., (2019). Supporting sustainable expansion of livestock production in South Asia and Sub-Saharan Africa: Scenario analysis of investment options. *Global Food Security*, 20(1), p. 114–121.

Eyisi, D., 2016. The usefulness of qualitative and quantitative approaches and methods in researching problem-solving ability in science education curriculum. *Journal of Education and Practice*, 7(15), pp. 91-100.

Food and Agriculture Organization, 1997. Improving agricultural extension. https://www.oerafrica.org/FTPFolder/Website%20Materials/Agriculture/haramaya/Perspective_Agricultural_Extension/Attachment/Improving%20AgEx.-FAO.pdf [Accessed 26/10/2020].

Food and Agricultural Organization, 2018. Shaping the future of livestock. http://www.fao.org/3/i8384en/i8384en.pdf [Accessed 23/10/2020].

Food and Agriculture Organization, 2019. Developing sustainable value chains for small-scale livestock producers. http://www.fao.org/3/ca5717en/ca5717en.pdf [Accessed 21/10/2020].

Habiyaremye, A., Maziya, M., Chaminuka, P. and Mdlulwa, Z., 2017. Smallholder livestock farmers' knowledge, attitudes, practices and perceptions towards vaccinations: The case of five provinces in South Africa. https://idl-bnc-idrc.dspacedirect.org/bitstream/handle/10625/57343/IDL-57343.pdf?sequence=2&isAllowed=y [Accessed 06/10/2020].

Hegde, N.G., 2019. Livestock Development for Sustainable Livelihood of Small Farmers. *Asian Journal of Research in Animal and Veterinary*, 3(2), pp. 1-17.

Hlatshwayo, P.P.K. and Worth, S.H., 2019. Agricultural extension: criteria to determine its visibility and accountability in resource poor communities. *S. Afr. J. Agric. Ext.*, 47(2), pp. 13-20.

Industrial Development Corporation, 2018. A study on the potential product development for the commercialization and value add to beef products.https://www.idc.co.za/wp-content/uploads/2018/11/Beef-Study-Final-Report.pdf [Accessed 25/10/2020].

Integrating Gender and Nutrition within Agricultural Extension, 2015. Extension and advisory services - Terminology and glossary. https://agrilinks.org/sites/default/files/resource/files/INGENAES%20Extension%20Glossary.pdf [Accessed 06/05/2020].

International fund for Agricultural Development, 2016. How to do livestock value chain analysis and project development. https://www.ifad.org/documents/38714170/40262483/Livestock+value+chain+analysis+and+project+development.pdf [Accessed 23/10/2020].

Issa, F.O., 2013. Building the capacity of agricultural extension personnel for effective implementation of agricultural transformation agenda in Nigeria. *Journal of Agricultural Extension*, 17(1), pp. 78-88.

Kaur, K. and Kaur, P., 2018. Agricultural extension approaches to enhance the knowledge of farmers. *Int.J.Curr.Microbiol.App.Sci*, 7(2), pp. 2367-2376.

Kelly, C. and Metelerkamp, L., 2015. Smallholder farmers and organic agriculture in South Africa.https://www.researchgate.net/profile/Luke_Metelerkamp/publication/325994518_SMALLHOLDER_FARMERS_AND_ORGANIC_AGRICULTURE_IN_SOUTH_AFRICA/links/5b322e534585150d23d542eb/SMALLHOLDER-FARMERS-AND-ORGANIC-AGRICULTURE-IN-SOUTH-AFRICA.pdf [Accessed 21/10/2020].

Khapayi, M. and Celliers, P. R., 2016. Factors limiting and preventing emerging farmers to progress to commercial agricultural farming in the King William's Town area of the Eastern Cape Province, South Africa. *S.Afr. Tydskr. Landbouvoorl./S. Afr. J. Agric. Ext.,* 44(1), p. 25 – 41.

Kumari, S. and Khanduri, V., 2019. Capacity development for farmers and their service providers.https://www.researchgate.net/profile/Sudha_Kumari2/publication/332671004_CAPACITY_DEVELOPMENT_FOR_FARMERS_AND_THEIR_SERVICE_PROVIDERS/links/5cc2c73992851c8d22051ff3/CAPACITY-DEVELOPMENT-FOR-FARMERS-AND-THEIR-SERVICE-PROVIDERS.pdf?origin=publication_detail [Accessed 22/10/2020].

Lammert, J.D., Johnson, L. and Fiore, T.A., 2015. Conceptualizing capacity building. https://www2.ed.gov/about/offices/list/osers/osep/rda/cipp2-conceptualizing-capacity-building-2-10-15.pdf [Accessed 21/10/2020].

Land Reformed and Rural Development, 2001. Land Redistribution for Agricultural Development: A Sub-Programme of the Land Redistribution Programme. https://www.gov.za/sites/default/files/gcis_document/201409/land-redistribution-agricultural-development.pdf [Accessed 15/03/2021].

Lonyangapuo, K.M., 2015. Language and the Development of Agriculture in Kenya. *Research on Humanities and Social Sciences,* 5(2), pp. 1-9.

Mahlangu, S.A., Masemola, M., Matsaunyane, L.B.T., Letsaolo, S. and Luvhengo, U., 2020. Reviewing the current state of extension in Gauteng Province: Case of food security sub-directorates. *Journal of Critical Reviews,* 7(13), pp. 241-244.

Maka, L., Ighodaro, I.D. and Ngcobo-Ngotho, G.P.T., 2019. Capacity development for scaling up climate-smart agriculture (csa) innovations: agricultural extension's role in mitigating climate change effects in Gqumashe community, Eastern Cape, South Africa. *S. Afr. J. Agric. Ext.,* 47(1), pp. 45 - 53.

Makapela, M., 2015. Effectiveness of agricultural extension organisation in rural areas: The case of Amathole District Municipality (Eastern Cape). http://uir.unisa.ac.za/bitstream/handle/10500/20225/dissertation_makapela_m.pdf?sequence=1&isAllowed=y [Accessed 10/09/2020].

Maltou, R. and Bahta, Y.T., 2019. Factors influencing the resilience of smallholder livestock farmers to agricultural drought in South Africa: Implication for adaptive capabilities. *Jamba Journal of Disaster Risk Studies,* 11(1), pp. 1-7.

Maoba, S., 2016. Farmers' perception of agricultural extension service delivery in Germiston Region, Gauteng Province. South African Journal of Agricultural Extension, 44 (2): pp. 167-173.

Maoba, S., 2016. Production performance and profitability analysis of small scale layer projects supported through CASP in Germiston region, Gauteng Province. South African Journal of Agricultural Extension, 44(1), p. 42 – 49.

Mapiye, O., Makombe, G., Molotsi, A., Dzama, K. and Mapiye, C., 2021. Towards a revolutionized agricultural extension system for the sustainability of smallholder livestock production in developing countries: The potential role of ICTs. *Sustainability 2021,* 13(5868), pp. 1-18.

Masangano, C.M., Kambewa, D., Bosscher, N. and Fatch, P., 2017. Malawi's experiences with the implementation of pluralistic, demand-driven and decentralised agricultural extension policy. *Journal of Agricultural Extension and Rural Development,* 9(9), pp. 185-195.

Masipa, T.S., 2017. The impact of climate change on food security in South Africa: Current realities and challenges ahead. *Jàmbá - Journal of Disaster Risk Studies,* 9(1), pp. 1-7.

May, J., 2017. Food security and nutrition: Impure, complex?. https://foodsecurity.ac.za/wp-content/uploads/2018/04/Final_WP2_Food-security-and-nutrition-Impure-complex-and-wicked_5-Oct-2017.pdf [Accessed 10/06/2020].

Maziya, M., Chiumbu, S. and Gumede, N.A., 2019. Smallholder farmers'knowledge of and attitudes to livestock vaccinations: Challenges and policy implications in South Africa. https://www.researchgate.net/profile/Mbongeni_Maziya2/publication/335160735_Smallholder_farmers%27_knowledge_of_and_attitudes_to_livestock_vaccinations_Challenges_and_policy_implications_in_South_Africa/links/5e5f942ea6fdccbeba189576/Smallholder-farmers-k [Accessed 22/10/2020].

Mbembela, M.N., Emmanuel, M.E. and Atanasi, M., 2018. Role of extension services on livestock investment decisions by smallholder farmers in Mbulu and Bariadi Districts, Tanzania. *Indian Res. J. Ext. Edu.*, 18(3), pp. 57-70.

Mbo'o-Tchouawou, M. and Colverson, K., 2014. Increasing access to agricultural extension and advisory services: How effective are new approaches in reaching women farmers in rural areas?.https://cgspace.cgiar.org/bitstream/handle/10568/35495/PR_extension%20services.pdf?sequence=5 [Accessed 26/10/2020].

Midvaal data AfriGIS, 2020. Midvaal. https://www.google.com/maps/place/Midvaal/@-26.6292203,27.8577738,10z/data=!3m1!4b1!4m5!3m4!1s0x1e94ef924fdaf323:0x81fd176ce545b4e8!8m2!3d-26.5836999!4d28.0654445 [Accessed 05/05/2020].

Midvaal Local Municipality, 2020. Midvaal about us. http://www.midvaal.gov.za/index.php/about-2#about-us [Accessed 05/05/2020].

Miller, B.A. and Lu, C.D., 2019. Current status of global dairy goat production: an overview. *Asian-Australas J Anim Sci*, 32(8), pp. 1219-1232.

Mmbengwa, V., Nyhodo, B., Myeki, L., Ngethu, X. and Van Schalkwyk, H., 2015. Communal livestock farming in South Africa: Does this farming system create jobs for poverty stricken rural areas?. 159(10), pp. 176-192.

Modirwa, S., 2014. Analysis of stakeholders' collaboration in agricultural innovation systems in the North-West Province, South Africa. https://dspace.nwu.ac.za/bitstream/handle/10394/17983/Modirwa_MS.pdf?sequence=1 [Accessed 12/06/2020].

Mohsin, A., 2016. A manual for selecting sampling techniques in research. https://mpra.ub.uni-muenchen.de/70218/1/ [Accessed 10/09/2020].

Monau, P., Raphaka, K., Zvinorova-Chimboza, P. and Gondwe, T., 2020. Sustainable utilization of indigenous goats in Southern Africa. 12(20), pp. 1-9.

Mpandeli, S., Nesamvuni, E. and Maponya, P., 2015. Adapting to the impacts of drought by smallholder farmers in Sekhukhune District in Limpopo Province, South Africa. *Journal of Agricultural Science,* 7(2), pp. 1-10.

Mujuru, N.M. and Obi, A., 2020. Effects of cultivated area on smallholder farm profits and food security in rural communities of the Eastern Cape Province of South Africa. 12(3272), pp. 1-17.

Musango, J.K., Duminy, L. and Batinge, B., 2017. Understanding sustainability of mohair value chain *in South Africa.* https://www.sustainabilityinstitute.net/wp-content/uploads/2020/01/2017_Phase_I_Mohair_Value_Chain_Project_Final_Report.pdf [Accessed 25/10/2020].

Mutero, J., Munapo, E. and Seaketso, P., 2016. Operational challenges faced by smallholder farmers: a case of Ethekwini Metropolitan in South Africa". *Environmental Economics,* 7(2), pp. 40-52.

Myeni, L., Moeletsi, M., Thavhana, M., Randela, M. and Mokoena, L., 2019. Barriers affecting sustainable agricultural productivity of smallholder farmers in the Eastern Free State of South Africa. 11(3003), pp. 1-18.

National Agricultural Marketing Council, 2016. Measuring and tracking smallholder market access in South Africa. https://www.namc.co.za/wp-content/uploads/2018/10/Measuring-and-tracking-smallholder-market-access-in-South-Africa-WP-2016-03.pdf[Accessed 21/10/2020].

National Agricultural Marketing Council, 2017. Factors influencing communal livestock farmers participation into the National Red Meat Development Programme(NRMDP) in South Africa: the case of the Eastern Cape Provinc*e.* https://www.google.co.za/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwirnoOPps_sAhUsVRUIHdZhCfs4FBAWMAZ6BAgHEAI&url=https%3A%2F%2Fageconsearch.tind.io%2Frecord%2F263686%2Ffiles%2FWP_2017-02_NRMDP.pdf&usg=AOvVaw0vq6mdhy1wtMQjBvHLE9b9 [Accessed 25/10/2020].

Nel, H., 2018. A Comparison between the Asset-oriented and Needs-based community development approaches in terms of systems changes. 30(1), pp. 33-52.

Nkosi, N.Z., 2017. Level of access to agricultural extension and advisory services by emerging livestock farmers in Uthungulu District Municipality, Kwa Zulu Natal Province. http://uir.unisa.ac.za/bitstream/handle/10500/22946/disseration_nkosi_nz.pdf?sequence=1&isAllowed=y [Accessed 11/06/2020].

Norton, G.W. and Alwang, J., 2019. Change in agricultural extension and implications for farmer adoption of new practices. *Applied Economic Perspectives and Policy,* 42(1), pp. 8-20.

Nwachukwu, C.U. and Berekwu, N., 2020. Production and management of goat rearing in rural areas of Ezinihitte Mbaise, Imo State, Nigeria. *Journal of Tropical Agriculture, Food, Environment and Extension,* 19(3), pp. 25 - 31.

Oduniyi, O.S., Rubhara, T.T. and Antwi, M.A., 2020. Sustainability of livestock farming in South Africa. Outlook on production constraints, climate-related events, and upshot on adaptive capacity. *Sustainability,* 12(2582), pp. 1-16.

Okello, W.O., Muhanguzi, D., MacLeod, E.T., Welburn, S.C., Waiswa, C. and Shaw, A.P., 2015. Contribution of draft cattle to rural livelihoods in a district of Southeastern Uganda endemic for bovine parasitic diseases: an economic evaluation. 8(571), pp. 3-9.

Pienaar, L. and Traub, L.N., 2015. Understanding the smallholder farmer in South Africa: Towards a sustainable livelihoods classification. https://ageconsearch.umn.edu/bitstream/212633/2/Pienaar-Understanding%20the%20smallholder%20farmer%20in%20South%20Africa-1233.pdf. [Accessed 06/05/2020].

Rahman, Md.S., 2017. The advantages and disadvantages of using qualitative and Quantitative Approaches and methods in language “testing and assessment” research: A literature review. *Journal of Education and Learning,* 6(1), pp. 102-112.

Raidimi, E.N. and Kabiti, H.M., 2019. A review of the role of agricultural extension and training in achieving sustainable food security: A case Of South Africa. *S. Afr. J. Agric. Ext.,* 47 (3), pp. 120 - 130.

Sanyang, S.E., Jobe, L. and Drammeh, M., 2017. Commercialization of livestock through value chain approach by smallholder farmers in the Gambia. *World Journal of Agricultural Sciences,* 13(4), pp. 172-178.

Shabangu, P., 2016. Challenges faced by small scale farmers in Swaziland: A case of Hhohho region.https://scholar.ufs.ac.za/bitstream/handle/11660/9849/ShabanguP.pdf?sequence=1&isAllowed=y [Accessed 20/10/2020].

Sinyolo, S. and Mudhara, M., 2018. Farmer groups and inorganic fertiliser use among smallholders in rural South Africa. *S Afr J Sci. 2018;114(5/6),* 114(5/6), pp. 1-9.

Southern African Development Community, 2019. Food security early warning system food and nutrition security update 2019/2020 agricultural season. https://reliefweb.int/sites/reliefweb.int/files/resources/SADC%20Food%20and%20Nutrition%20Security%20Update_%20November%202019.pdf [Accessed 10/05/2020].

Thamaga-Chitja, J.M. and Morojele, P., 2014. The context of smallholder farming in South Africa: Towards a livelihood asset building framework. 45(2), pp. 147- 155.

Thatcher, R.W., 2010. Validity and reliability of quantitative electroencephalograph (qEEG). *Neurotherapy,* 14(1), pp. 122-152.

The Agriculture Sector Education and Training Authority, 2018. Red meat sub-sector skills plan *2018-2019.* https://www.agriseta.co.za/downloads/RED%20MSEAT%20FINAL%20v02.pdf [Accessed 19/10/2020].

Tricarico, J.M., Kebreab, E. and Wattiaux, M.A., 2020. Milk symposium review: Sustainability of dairy production and consumption in low-income countries with emphasis on productivity and environmental impact. *Journal of Dairy Science,* 103(11), p. 9791–9802.

Tselaesele, N.M., Bagwasi, N., Lepetu, J., Bahta, S. and Oladele, I.O., 2018. Training needs assessment for transformation of smallholder livestock farming in Botswana. *S. Afr. J. Agric. Ext.,* 46(1), pp. 92 - 105.

Ugochukwu, N.C., Ogundeli, A.A. and van der Westhuizen, C., 2020. Marketing information needs and seeking behaviour of smallholder livestock farmers in the Eastern Cape Province, South Africa. *Journal of Agricultural Extension,* 24(3), pp. 98-114.

Ugochukwu, N.C. and Chinyelu, N.I., 2020. A review of agricultural extension and advisory services in sub-Saharan African Countries: Progress with private sector involvement. https://www.google.co.za/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjVlPC45tTsAhWQXsAKHaPvAqoQFjAQegQIAxAC&url=https%3A%2F%2Fwww.preprints.org%2Fmanuscript%2F202003.0151%2Fv1%2Fdownload&usg=AOvVaw1EdYqMZ4tpZ7zeRHPfMwoP [Accessed 20/10/2020].

Vignola, R., Harvey, C.A., Bautista-Solis, P., Avelino, J., Rapidel, B, Donatti, C. and Martinez, R., 2015. Ecosystem-based adaptation for smallholder farmers: Definitions, opportunities and constraints. 2(11), p. 126–132.

Von Loeper, W., Musango, J., Brent, A. and Drimie, S., 2016. Analysing challenges facing smallholder farmers and conservation agriculture in south africa: A system dynamics approach. *SAJEMS Asset research NS,* 19(5), pp. 747-773.

Zantsi, S. and Bester, B., 2019. Revisiting the benefits of animal traction to subsistence smallholder farmers: A case study of ndabakazi villages in Butterworth, Eastern Cape Province of South Africa. *S. Afr. J. Agric. Ext.,* 47 (3), pp. 1- 13 .

Zwane, E.M. and Davis, K.E., 2017. Extension and advisory services: The African renaissance. *S.* Afr. J. Agric. Ext., 45(1), pp. 78-89.

Zwane, M. and Montmasson-Clair, G., 2016. Climate Change Adaptation and Agriculture in South Africa.https://www.tips.org.za/research-archive/sustainable-growth/green-economy-2/item/3140-climate-change-adaptation-and-agriculture-in-south-africa-a-policy-assessmen [Accessed 26/10/2020].

Appendices

FACULTY OF NATURAL AND AGRICULTURE SCIENCES

DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION

ANALYSIS OF EXTENSION SERVICES ON CAPACITY BUILDING OF SMALLHOLDER LIVESTOCK FARMERS AT MIDVAAL LOCAL MUNICIPALITY, GAUTENG PROVINCE

All information provided will be treated as **STRICTLY CONFIDENTIAL** for mutual benefit of both the researcher and the respondents.

Questionnaire number……..……

Municipality Name……..……

Area name…….....

Date...…….....

1. HOUSEHOLD INFORMATION

1.1 **Gender:**

Male ☐ Female ☐

1.2 **Age:** ☐

1.3 **Marital status:** Single ☐ Married ☐ Widow ☐

1.4 **Level of education**: Primary ☐ Secondary ☐ Tertiary ☐

Other (specify).....

1.5 **Home language**……

1.6 **Household size**: ☐

1.7 **Employment status:** Unemployed ☐ Employed ☐ Self- employed ☐

Other (specify)……..

1.8 **Source of income:** retirement pension ☐ Social grant ☐ Salary/ wages ☐

Specify other source of income……

1.9 How big (ha) is your farm/plot/area of operation? ☐

2. ANALYSES OF EXTENSION AND ADVISORY SERVICES ON CAPACITY BUILDING

2.1 What kind of livestock do you keep?

Types of livestock kept at site	**Poultry**	**Small stock**	**Large stock**	**Pigs**	**Horses/Donkey/Mules**	**Others…please specify**
Please tick the ones applicable to you.	1. Broiler 2. Layers 3. Both	1. Sheep 2. Goats 3. Both	1. Cattle 2. Bulls 3. Calves			
How many do you have currently?						
How many did you have two years ago?						

2.2 Do you have access to extension services? Yes ☐ No ☐

2.3 How would you rate the effectiveness of the extension services and services on capacity building

Extension services	**Yes**	**No**	**1: Strongly disagree**	**2: Disagree**	**3: Neither agree nor disagree**	**4: Agree**	**5: Strongly agree**
Technical farm visits							
Training on capacity building: 1. Formal training 2. Informal training							
Access to proper farm infrastructure							
Access to formal market							
Access to production inputs							

Access to finance							
Access to workshops							
Demonstration							

3. PERCEPTION OF SMALLHOLDER LIVESTOCK FARMERS TOWARDS EXTENSION AND ADVISORY SERVICE ON CAPACITY BUILDING

Perception based on the following: -	**Positive**	**Negative**	**1: Strongly agree**	**2: Agree**	**3: Disagree**	**4: Strongly disagree**
Technical farm visits						
Casp						
Training Formal training Informal training						
Commodity approach in use (Commodity specialized approach)						
Linkage with relevant stakeholders						

4. CONSTRAINTS FACING SMALLHOLDER LIVESTOCK FARMERS ON CAPACITY BUILDING

Challenges	**1: no constraints**	**2: low constraints**	**3: Medium constraints**	**4: high constraints**
Access to agricultural practitioners and advice				
Livestock management skills				
Access to formal market and informal market				
Access to modern technologies				
Access to relevant stakeholders				
Access to funding				
Poor record keeping				

Financial management skills				
Disease control				
High costs of feeds and medication				
Access to enough land				

Thank you

NWU®
NORTH-WEST UNIVERSITY
NOORDWES-UNIVERSITEIT
YUNIBESITI YA BOKONE-BOPHIRIMA

Private Bag X1290, Potchefstroom
South Africa 2520
Tel: 018 299-1111/2222
Fax: 018 299-4910
Web: http://www.nwu.ac.za

Senate Committee for Research Ethics
Tel: 018 299-4849
Email: nkosinathi.machine@nwu.ac.za

ETHICS APPROVAL LETTER OF STUDY

Based on the review by the **Faculty of Natural and Agricultural Sciences Ethics Committee (FNASREC)**, the Committee hereby clears your study as no ethical risk. This implies that the FNASREC grants permission that, provided the general conditions specified below are met, the study may be initiated, using the ethics number below.

Study title: Analysis of extension services on capacity building of smallholder livestock farmers in Midvaal Local Municipality, Gauteng province
Study Leader/Supervisor: Dr S Modirwa
Student: B Manyakanyaka

Ethics number: N | W | U | - | 0 | 0 | 5 | 3 | 9 | - | 2 | 1 | - | A | 9
Institution Study Number Year Status

Status: S = Submission; R = Re-Submission; P = Provisional Authorisation; A = Authorisation

Application type: Single **Risk Category:** No Risk

Commencement date: 01/02/2021
Expiry date: 31/08/2023

General conditions:
The following general terms and conditions apply:

- *The commencement date indicates the date when the study may be started.*
- *In the interest of ethical responsibility, the NWU-SCRE and FNASREC reserves the right to:*
  - *request access to any information or data at any time during the course or after completion of the study;*
  - *to ask further questions, seek additional information, require further modification or monitor the conduct of your research or the informed consent process;*
  - *withdraw or postpone approval if:*
    - *any unethical principles or practices of the study are revealed or suspected;*
    - *it becomes apparent that any relevant information was withheld from the FNASREC or that information has been false or misrepresented;*
    - *submission of the annual (or otherwise stipulated) monitoring report, the required amendments, or reporting of adverse events or incidents was not done in a timely manner and accurately; and / or*
    - *new institutional rules, national legislation or international conventions deem it necessary.*
- *FNASREC can be contacted for further information or any report templates via Roelof.Burger@nwu.ac.za 018 299 4269*

The FNASREC would like to remain at your service as scientist and researcher, and wishes you well with your study. Please do not hesitate to contact the FNASREC or the NWU-SCRE for any further enquiries or requests for assistance.

Yours sincerely,

Prof Roelof Burger
Chairperson Faculty of Natural and Agricultural Sciences Ethics Committee (FNASREC)

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
MAFIKENG CAMPUS

Department of Academic Literacy

28th July 2021
Private Bag X2046
Mmabatho
2735

CERTIFICATE OF EDITING A THESIS

TO WHOM IT MAY CONCERN

This serves to confirm that I have read and edited Mr. B. Manyakanyaka's thesis titled: **Analysis of extension services on capacity building of smallholder livestock farmers at Midvaal Local Municipality, Gauteng province.**

The candidate corrected the language errors identified. The document is of an acceptable linguistic standard.

Thank you

Yours Faithfully

.....

J.R. Moletsane (Academic Literacy)
Accr. No. 1002708
joel.moletsane@nwu.ac.za