

**Socio-economic factors that affect livestock herd size: A case study of
smallholder cattle farmers in Lepelle-Nkumpi municipality, Limpopo**

Province

by

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All the work submitted I declare it as my own and all sources accumulated and used are referenced with complete relevant references.

Furthermore, I declare that this work was not beforehand submitted, or segment of it, for consideration at UNISA for alternative qualification or another institutions for instruction.

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Abstract

The study was conducted at Lepelle-Nkumpi Municipality in the Limpopo Province of South Africa. The main objective of the study was to determine the socio-economic factors affecting cattle herd size in the study area. The research was quantitative in approach and used a proportionate stratified sampling technique that adopted the method proposed by Krejcie and Morgan to determine a sample size of two hundred and sixty-one (261) smallholder cattle farmers. Respondents were interviewed through a questionnaire to answer objectives of the study. Collected data were captured and analysed using the Statistical Package for Social Sciences (SPSS). SPSS was used to obtain descriptive statistics (the frequency, percentages, mean, variance, standard deviation, cross-tabulation) and OLS multiple linear regression model. Descriptive statistics results revealed that draught; practical knowledge; no/less grazing land; maintenance; water circulation; getting good breeding stock; poor market prices; small grazing land; stock theft; insufficient or no breeding stock and pest/parasites were prevailing factors affecting cattle herd size in Lepelle-Nkumpi Municipality.

Most of the farmers stated that they would like their livestock to increase by (94.8%). OLS multiple linear regression results revealed significant variables such as age; household size; sales per year; livestock keeping and planted pasture. The study revealed a link between significant independent variables, which will help smallholder cattle farmers to alleviate their vulnerability to cattle herd size and age.

This study recommends that smallholder livestock farmers should be provided with extension services, training, and stakeholder engagement to provide subsidies, and ensuring that distribution of policies are provided with equal benefits. Furthermore, this study recommend that farmers should plant pastures and practise camp system to avoid overgrazing and overstocking, while planting pastures would help them to minimise costs and increase forage for feeding livestock. Moreover, greater consideration in creating farmers assortations to support and monitor farmers should be encouraged.

Key words: cattle herd size; socio-economic factors; smallholder cattle farmers, Lepelle-Nkumpi Municipality.

Naganwago

Thuto ye e dirilwe masepaleng wa Lepelle-Nkumpi ka Profenseng ya Limpopo ka Afrika Borwa. Maikemišetšo a magolo a nyakišišo e be e le go laetša mabaka a ekonomi ya leago ao a amago bogolo bja mohlape wa dikgomo mo lefelong la nyakišišo. Nyakišišo e be e le ya boleng gomme e šomišitše thekniki ya go tšea mehlala ya go lekana ya stratified yeo e amogetšego mokgwa wo o šišintšwego ke Krejcie le Morgan go laetša bogolo bja sampole ya balemirui ba dikgomo ba makgolo a mabedi le masometshela-tee(261). Ba arabetšego ba ile ba botšološišwa ka lenaneopotsišo, go araba maikemišetšo a nyakišišo. Datha ye e kgobokeditšwego e ile ya thopša le go sekaseka ka go šomiša sephuthelwana sa dipalopalo sa mahlale a leago. SPSS e ile ya šomišwa go hwetša dipalopalo tše di hlalošago (maqhubu, diphesente, magareng, phapano, go fapoga ga maemo, sefapano-tabulation) le mohlala wa OLS multiple linear regression.

Dipoelo tša dipalopalo tše di hlalošago di utollotše gore go goga; tsebo e šomago; ga go/naga ya phulo ye nnyane; tlhokomelo; go dikološwa ga meetse; go hwetša setoko se sebotse sa tswadišo; ditheko tše di fokolago tša mmaraka; naga ye nnyane ya phulo; bohodu bja setoko; go se lekane goba go se be le setoko sa tswadišo le disenyi/diphelakadingwe e be e le mabaka ao a bego a ama bogolo bja mohlape wa dikgomo ka mmasepaleng wa Lepelle-Nkumpi. Bontši bja balemirui ba boletše gore ba rata gore diruiwa tša bona di oketšege ka (94.8%). Dipoelo tša OLS multiple linear regression di utollotše diphetogo tše bohlokwa tša go swana le mengwaga; bogolo bja lapa; thekiso ka ngwaga; go hlokomela diruiwa le mafulo a bjetšwego.

Thuto e utolotše kgokagano magareng ga diphetogo tše bohlokwa tše di ikemetšego tšeo di tlogo thuša balemirui ba dikgomo ba balemirui ba bannyane go fokotša go hlaselega gabonolo ga bona go bogolo bja mohlape wa dikgomo le mengwaga. Thuto e šišinya gore balemirui ba diruiwa ba bannyane ba swanetše go fiwa ditirelo tša katološo, tlhahlo, le go tsenela bakgathatema go aba dithušo tša ditšhelete, le go netefatša gore kabo ya melawana e fiwa ka mehola ya go lekana.

Thuto, go feta fao, e šišinya gore Balemirui ba swanetše go bjala mafulo le go itlwaetša tshepedišo ya kampa go efoga go fula kudu le go swara diruiwa go feta tekano, mola go bjala mafulo go be go tla ba thuša go fokotša ditshenyegelo le go oketša furu ya go fepa

diruiwa. Go feta fao, hlohleletša go ela hloko kudu go hloleng mehuta ya balemirui go thekga le go hlokomela balemirui.

Mantšu a bohlokwa: bogolo bja mohlape wa dikgomo; mabaka a tša leago le ekonomi; balemirui ba dikgomo ba bannyane, Masepala wa Lepelle-Nkumpi.

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Dedication

The dissertation is dedicated to my beloved daughter, Tlotliso Letecia Modiba, Mr Mautle Willie and my family (Modipadi, Lesiba, Lloyd, Aubrey and Ntswaki Modiba) for always believing in me and for remaining the best pillar of strength to my studies and mostly in my life.

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Abbreviations and acronyms

FAO- Food and Agricultural Development

IFAD- International Fund for Agricultural Development

CDM- Capricorn District Municipality

SA- South Africa

OLD- Ordinary Least Squares

Km- Kilometers

SPSS- Statistical Package for Social Sciences

DAFF- Department of Agriculture Fishery Forestry

GDP- Gross Domestic Product

UN- United Nation

DoA- Department of Agriculture

CHAPTER 1

Introduction

1.1 Background of the study

All domesticated animals, namely; cattle, sheep, goats and pigs are referred to as livestock and are purposefully, agriculturally reared for providing food, fiber or for breeding purposes (Ntsepe, 2011). Sere (2009) says that having livestock is considered not only as a means to escape from hunger, but also entail a risk of spreading, maximising capital goods and obstanary for climatic ups and downs, market, and disease shock. Cattle impose the standard of living on farmers worldwide, where their products and co-products help on nutritional feeding and to pay lobola (Mariara, 2009).

According to Schultze *et al.* (2009), livestock, particularly cattle, is characterised as the source of finance for farmers who keep them, especially for floating money uses, while on the other hand, they also help to ensure food availability or nutrition among smallholder farmers by providing working finances. Lubungu *et.al.* (2012) say that apart from cash benefits, cattle maintain the social and cultural livelihoods of smallholder farmers, where owners of livestock must ensure varying resources essential to the healthy living of individuals.

Universally, livestock is regarded as one of the mainstays of their keepers and the population as a whole. Okediran (2019) conducted a study in Nigeria which shows that there must be continuous provision of farming information to farmers. Many rural areas in African countries, including South Africa, make their living through agriculture, especially keeping livestock, where practicing livestock farming is a major source of wealth (Mandleni and Anim, 2012). It is reasonable to say that livestock farming sustains the livelihood of rural masses through its contribution to their social and economic development.

There is a drastic reduction in the quantity of livestock due to uncontrolled diseases. Smith *et al.* (2013) say that diseases that affect livestock may reduce profit by hampering individuals from acquiring food or perform duties that make them to earn an income to purchase food. Roger (2008) views disturbance in the health of livestock as a disease. It

can be caused by any factors related to animal health. Diseases that affect livestock include: hypocalcaemia; foot-rot; gastrointestinal parasitism and pregnancy toxaemia.

A study conducted in the Limpopo Province of South Africa by Munyai (2012) shows that there are major factors that hinder livestock production. The factors include, but are not limited to, feeds; rate at which most animals are kept at one area and shortage of forage in different seasons, especially winter. During winter, most cattle livestock lose body mass, there is less grazing and changes in the health and safety of animals. Most countries focus on cattle, sheep, pig, and goat farming. This farming is a source of nutrition, which also social and economic benefits to communities across the globe (Capper, 2013). Imai (2003) believes that livestock helps household smallholder farmers to cope with risks and uncertainties, as livestock diversifies income for many farmers.

There are those factors which cause changes to the herd size of livestock. According to Steinfield *et al.* (2006), economic growth and increased income, increasing purchases of livestock produce hinder cattle from maximising herd size. Furthermore, people have different food preferences and their affordability (FAO, 2009). The growth of production is dependent on the changes in climatic conditions (Mandleni, 2011) and breeding of livestock towards attaining a better genetic breed can be improved (Adkinson, 2013). Livestock keeping by smallholder cattle farmers supports many families, especially in rural areas. Looking at the smallholder system, some of the functions of livestock farming include providing food to households through meat provision, milk and protein supplementation.

Breeding is a major factor towards growth in livestock farming, but cross breeding allows farmers to gain better breeds by improving their traits for better health protection and disease minimisation and nutrition factors (Salem and Smith, 2008). One of the requirements of livestock survival is decent forage but due to the lack of forage and more demands of it, restricted forage crops and grain production threaten grain security (Smith *et al.*, 2013).

The key for reflecting the necessity of livestock is that they are a means for obtaining wealth, used for cultural purposes like paying bridal prices, ancestral veneration, slaughter for food catering at funerals, rituals such as child naming ceremonies and

religious ceremonies in honour of God. Cattle farming accomplishes multiple objectives, including the provision of draught power, manure and cash generation like in the past days where cattle keeping equated to having money. Livestock provides manure, food for both animals and plants through protein supplement provision and dairy products (Musemwa *et al.*, 2008).

Families of small-scale farmers obtain or generate wealth by keeping livestock such as cattle. Cattle are an asset (Fidzani, 1993; Schwalbach and Mafo, 2001). Cattle also function as sources of organic matter where their excreted matter is used as fertilizers to the soil. In the past, elderly people used cattle to till the land and with that, they resolved issues of labour intensiveness, or usage was minimised due to the minimisation of the work force.

Department of Agriculture, Forestry and Fisheries (DAFF, 2017) says cattle farming, majorly the red meat industry, is considered the most growing product followed by the broiler sector, due to their income growth, technical support and change in structure. In South Africa, stock farming is a predominant farming activity, where approximately 80% of the farming land is appropriate to practice extensive farming or grazing. However, due to human settlement and land tenure, the grazing land is either lost or minimised due to mining, forestry, crops, and conservation.

Smallholder livestock farmers are referred to as small-scale farmers. These farmers are identified thus looking at the quantity of livestock, size of land, and inputs of household. Excluding farming for cash, these farmers also keep livestock for cultural and social purposes (Lubungu *et al.*, 2012).

1.2 Problem Statement

Livestock is a source of wealth and food to the population. Therefore, an increase in population affects the livestock production. Some natural resources which affect livestock farming are water and area for agriculture; feed consumption and food to work on a carbon-constrained integration (Thornton, 2010). An essential strategy for providing income to rural individuals and sustaining food availability is the maintenance of livestock supplementation (diversification) and maximising their production through contribution

towards high share to communal farmers rearing cattle to soften their livelihoods, especially in rural areas (Thorton *et al.*, 2002).

In South Africa, agriculture largely involves livestock, which is an essential activity to consider. Livestock provides better economic sustainability, especially to the rural farm population (Meissner *et al.*, 2013). Livestock and game species make use of farming land, which is about 70% in South Africa. However, looking at the study area (Limpopo Province), it is the sixth province that produces cattle quantities compared to the remaining eight provinces (Table 1).

Lepelle-Nkumpi Municipality comprises approximately 9 989 agricultural households that focus on livestock farming (Lepelle-Nkumpi Local Municipality, 2018). Capricorn District Municipality (CDM), where Lepelle-Nkumpi Municipality is located, is characterised by livestock farming of goats (44%), cattle (38%), pigs (10%) and sheep (9%). In 1995 and 2001, cattle proportion at CDM within (Lepelle-Nkumpi Municipality) went up when the proportion of goats declined (Summit, 2007). This study examined and determined the socio-economic factors that affect livestock herd size since achieving a balance between human welfare and environmental integrity is a sustainable development challenge.

Table 1.2.1: Cattle estimates by province (August 2020 and August 2021)

Provinces	Cattle	
	August 2020	August 2021
North-West	1 578 000	1 576 000
Gauteng	246 000	246 000
Limpopo	898 000	860 000
Mpumalanga	1 243 000	1 248 000
Kwazulu-Natal	2 481 000	2 380 000
Eastern Cape	3 082 000	3 050 000
Free state	2 109 000	2 054 000
Northern Cape	433 000	419 000
Western Cape	488 000	466 000

Source: Department of Agriculture, Forestry, and fisheries (February 2022).

1.3 Aim of the study

The main aim of the study was to assess socio-economic factors affecting smallholder cattle herd size in Lepelle-Nkumpi Municipality of Limpopo Province.

1.4 Objectives of the study were to:

- i. Identify and describe socio-economic and demographic characteristics of smallholder cattle farmers in Lepelle-Nkumpi Municipality of Limpopo Province.
- ii. Investigate factors affecting smallholder cattle farmers in the study area.
- iii. Examine the socio-economic factors affecting smallholder cattle herd size in the study area.
- iv. Develop a framework showing how smallholder cattle farmers can alleviate their vulnerability to the socio-economic factors that affect their cattle farming.

1.5 Research Questions

- i. What are the socio-economic and demographic characteristics that affect cattle farmers in Lepelle-Nkumpi Municipality?
- ii. What are the factors affecting smallholder cattle farmers in the study area?
- iii. What socio-economic factors affect smallholder cattle herd size in the Lepelle-Nkumpi Municipality of Limpopo Province?
- iv. Which framework could be developed to assist Lepelle-Nkumpi Municipality smallholder cattle farmers on how they can alleviate their vulnerability to the socio-economic factors that affect their cattle farmers?

1.6 Hypothesis of the Study

H₀: Age, education level, farm size, gender, and farming experience have no positive and significant influence on livestock herd size in Lepelle-Nkumpi Municipality of Limpopo Province in South Africa.

1.7 Significance of the Study

The findings of the study may inform policies for addressing the economic development challenges faced by livestock smallholder farmers (cattle). They may also assist farmers in their cattle farming, and the Department of Agriculture or agricultural forums and

extension officers in planning, organising, leading, and controlling farming. Through this study, various factors, mainly socio-economic, experienced by livestock farmers such as herd size needs, contribution, opportunities, challenges, and strategies to development and bringing awareness to improve quantity of livestock will be identified. This study can be instrumental to cattle farmers in understanding and helping farming services for development, especially in rural areas.

1.8 Definition of key terms

Socioeconomic factors- these are the social and economic experiences and realities that are mandated for medical affordability care; activities in health; housing and stress management. For instance, working for money generation in turn ensures access to a better future through education, shelter, child maintenance; medical care, and all other essential necessities (Williams *et al.*, 2016).

Herd- this is a group of living animals that are from the same species; they are controlled, possessed and cared for as a group because they are domesticated (Coster-Longman *et al.*, 2022).

Smallholder- occurs when rearing livestock, planting at a minimum farmland capacity. In countries that are still getting civilised, a smallholder farmer is classified as one who uses family members as labour and farms at a farm space less than 10 hectares or 24 acres or 5 acres of land (Knight, 2002).

Smallholder farmer- Knight (2002) classifies these farmers, namely; as family labour-oriented farmers since more oriented towards producing for the family with family members doing farm works. These smallholder farmers are also known as small-scale farmers, including those who farm on their property and those who do not (Knight, 2002).

1.9 Limitations and delimitations related to this work

This study looked at socio-economic factors affecting the cattle herd size of agriculturists at Lepelle-Nkumpi Municipality. Delimitations of the study are boundaries for the study (Mugure, 2012). Factors such as biasness limited the study because some interviewees were biased during the interviews for data collection. Some farmers' response rate was

low, while in other villages, there was no or minimum access due to initiation schools. However, those villages were consulted again.

Most of the questions related to the farmers' perception, which created bias among the farmers. Some of the questions asked required farmers' reference from previous years (record keeping) and to those farmers who did not have a biased response. Confidentiality regarding reference to previous farming was strictly observed as the participants provided their responses on the questionnaire. Most respondents felt uncomfortable speaking or participating in another language except their local language. For this reason, some of the information might be neglected or wrongfully coded or integrated wrongfully. Farm visits in some instances were difficult because the farms were multitasked, which made some interviews to be a bit longer. Another limitation was lack of or inadequate funds, time, and resources on the part of the researcher.

1.9 Organisational structure of the study

Five chapters constituted this study. The first chapter introduced the study and provided motivation for conducting it, elucidated its objectives, aim, hypothesis, and research questions, respectively.

The second chapter consisted of the literature review and the theoretical framework for the study.

The third explained the research methodology of the study, including the study area, data collection methods, data analysis techniques and ethical considerations.

The fourth chapter presented and discussed the data on the factors that affect cattle herd size. It provided the outcomes of descriptive statistical analysis of variables and the analysis of regression results.

The fifth chapter provided a summary of the research findings, conclusions, and recommendations of the study.

CHAPTER 2

Literature Review

2.1 Introduction

A literature review explains the key concepts of a study and highlights what previous studies have done related to the study. This chapter provides a review of the existing literature related to the study, reflects on the trends in the field related to the study and discusses the theory that underpinned this study.

2.2 Theoretical framework

2.2.1 Cattle keeping and their roles in rural areas

Cattle are kept mainly for generating income or capital; for the provision of resources such as transport; traction, milk and for improving wealth. In the olden days, people believed that having livestock was a necessity, especially for the protection of their family (Hall, 2007). For example, if one family member had to go to school, they would sell livestock to raise money for school fees. Livestock was also a source of food to households. For example, Randela (2005) found that the average consumption of milk per farming family equals to 2-4 litres on a daily basis. Furthermore, the study highlighted that farmers' organisations grant farmers access, greater agricultural production, and market information, although the role of cattle in traditional system still unappreciated.

Blignaut *et al.* (2009) proffer that South Africa is largely characterised by the agricultural sector, where livestock plays a huge essential role in the national economy. Approximately 70% of farmers are classified as poor because their areas are unsuitable for growing crops; hence, they rely on livestock keeping (Mapiye *et al.*, 2009). In the study area, a large quantity of livestock is affected, suggesting that those areas should have focused on crop farming instead of livestock. Furthermore, the economic and political considerations towards these farmers decisions to contribute in marketing, practices and sustainability is not addressed.

2.2.2 Role of smallholder farmers rearing livestock

Smallholder livestock farmers support the standard of livelihood for rural people. Looking at smallholder farming systems, livestock fulfils multiple functions such as producing eggs, milk and food, especially meat and availing fertilizer, fuel, transport and draught power. Livestock functions as a source of cash investment, competes against the loss of

plantations; it is used for several traditional and spiritual purposes (FAO, 2005).

For multiple smallholder farmers, the provision of food to households is the greatest priority over profit generation. The social and traditional lives of smallholder farmers are connected mostly to livestock farmers whose farming management process strives for profitability and effectiveness. For example, most rural farmers rear livestock for their interrelated members and also sell them to improve their livelihoods. Thus, if the quantity of livestock is affected, then the livelihood of smallholder farmers will also be affected. Moreover, smallholder farmers rely on relatives' labour for farming activities and this helps them to reduce the costs incurred for and during production (Lubungu et al., 2012).

Smallholder cattle farmers rely on the commercialization of natural resources and human resources (Mathebula and Kirstein, 2000). Therefore, technographic and demographic change, innovations, particularly technical, development of infrastructure and policies (both macro- economic and trade) compel gravitation towards commercialization. The participation of smallholder sector in the public place of trade (marketing) is affected by various challenges and problems. Thus, more attention should be given to small-scale farmers in the market to increase their market penetration.

2.2.3 Socio-economic Factors

The socio-economic standing of farming enterprises often encourages to engage with extension officials who provide farming education on how to sustain their farming practices (Mogues *et al.*, 2009). Macleod *et al.* (2004) report that the availability and usage of land have bad and good effects on the production of livestock, depending on stock rates, levels of feed utilisation and the productivity of livestock under different grazing regimes. Land conditions deteriorate and thus reduce livestock numbers and results in an unhealthy breed stock performance, which in turn results in poor market value (low profitability). This study focused on land use and livestock productivity because there is a dearth of research on factors that affect the herd size of livestock.

Socio- economic and demographic factors contribute towards decreasing and increasing herd size of livestock. Such factors include growth in population, migration, economic development, and market related issues such as changes in marketing patterns.

2.2.3.1 Age

In terms of age, it is believed that the youngest age group is active and can perform duties in the least time and yet yield advanced, effective, and efficient results. Dlova, Fraser and Beleta (2004) cited by Machingura (2007) study concur that the age of a farmer determines their success or failure in farming field. Therefore, older people are unable to perform work more effectively like the youth.

Young people can use technology effectively and efficiently while older people often rely on the traditional methods learned from past. Age also necessitates that people should get pension at a certain age, policies also use age as a factor to determine the amount to be paid to join them and oftentimes, the oldest person pays more money and in some agencies, older people are denied opportunities because of their age. Matungul *et al.* (2001) says that age reflects increased trust and reputation (credibility within the network) obtained by always doing business with the same individual. Noteworthy, age cannot be returned or reduced, which means smallholder farmers must maximise their time and energy in their farming enterprises before they reach an age that might restrict their labour.

2.2.4 Livestock herd size and climate change

IFAD (2009a) shows that a high dependence on resources from nature for livestock farming to improve livelihoods is risky because of climate change. Another study by FAO (2008) found that climate change results in the loss of food and resources, especially on developing countries where the cost of food necessities is high. Both FAO (2008) and IFAD (2009a) consider the effects of climate change on livestock in developing countries but do not theorise on the factors that characterise smallholder farming practices.

2.3 Review of previous studies

In South Africa, livestock production is mainly for ensuring that there is nutrition and conservation of biodiversity. In all the nine provinces, livestock is produced with different herd sizes, species, breeds and different management styles, grazing environment and methods of production. Llea (2009) highlights that livestock production does not remain the same. However, it is estimated that in 2050, the number of herds will increase.

Nkadimeng (2019), on the study mentioned that our farmers should be given formal

training, seminars and workshops to improve monetary state of the farming. This study supports recommendations that was also made by the study which addresses the issue of our government at the local level (department of agriculture) to subsidise the farmers so that they can be able to increase productivity which in turn will lead to increase in herd size, that is why the study had to find out those socio-economic factors that affect herd size.

Livestock farming is one of the significant ways to ensure food security (Godber and Wall, 2004). Therefore, livestock can eradicate poverty in numerous households. Livestock production contributes approximately 40% of the global GDP, it contributes to the production of protein supplement and 70% of people in rural areas improve their livelihood through livestock production (Statistics South Africa, 2004).

Factors such as economic improvement, urbanisation, market fluctuation demands, changes in climatic conditions, scientific innovations and technological information cause changes in livestock herd size (Mwangi, 2013). Furthermore, when in densely populated areas, there is more competition for natural resources such as land and animals. This has an impact on the sustainability of livestock farming as natural resources meant to aid the enterprise run the risk of depletion. The main objective of the study was to determine the socio-economic factors that that affect rural cattle herd size.

Cattle act are used to improve livelihoods and wealth creation, among other reasons (Ouma *et al.*, 2003). Cattle may also be used for bridal payment, to till the land, for soil preparations and manure, and decoration of homes using cow dung. Extension is essential for the acquisition of agricultural education. Agricultural extension provides practical knowledge and useful information to the farmers. Farmers' needs, mainly those of rural farmers, are often addressed through extension.

Extension officers educate farmers on the use, acceptance, adoption and implementation of new technology. Both private and public sectors provide agricultural extension. In the past, extension offices went to farmers for training and visiting purposes. However, currently, extension services are provided to farmers based on the demand-driven approach (Moyo, 2012). When farmers consider the inputs of extension officers, there are prospects of success for both the farmers and the extension officers in their practices. According to Coetzee *et al.* (2004), agricultural extension is classified based on following concepts:

- i. Extension as an educational process. This phase entails knowing trends in developed and developing areas, providing suggestions and growing suggestion phases; doing and evaluating phases.
- ii. Extension as change. This is about changes encountered in manners, attitudes, and talents of farmers.
- iii. Lastly, extension a saleswomanship. Brings the knowledge for growth in farmers and improvement of standards of living.

Overall, extension services involve bridging the gap between farmers and agricultural institutions, creation of policies, provides information about agriculture to farmers, brings innovations and adoption to the farmers. Generally, extension contributes to rural development, identification of problems, provision of solutions and encourages participation and innovation.

Red meat farming is one of the best ways of farming used to improve food availability and accessibility especially for trade, land areas like communal areas across the globe (Musemwa *et al.*, 2008). Warburton *et al.* (2011) say that world food production depends on the availability of smallholder farmers all over the world, where more percentages of food comes from them.

Smith *et al.* (2013) state that one of the solutions to food security is making sure that there is sufficient provision of required food and livestock can play an important part in this regard. However, it must be borne in mind that drought, rainfall, floods and changing temperatures are some of the weather conditions that affect farming (Benton *et al.*, 2012). Such conditions result in livestock damage. Cattle must be kept indoors due to floods and sometimes this might not work as some buildings get damaged. Drought causes reduction in the production of yield for feed, which minimises breed or livestock quantity because of less feed.

Heat and drought cause reduction in the production of crops, fodder, forage and livestock experiences heat stress, which affects skin, especially on sheep which pre-shear. A decrease in grass silage causes a reduction in forage management for livestock, further affecting the marketing industry for livestock (Benton *et al.*, 2012).

2.4 Conclusion

This chapter shows that livestock farming is important to smallholder farmers, households, population and to agriculture as a whole. Livestock is a source of food, income, and therefore important for livelihood. However, there are factors that affect their productivity and their quantity. Extension services contribute towards helping smallholder farmers sustain their farming practices and their services bring in innovations for adoption by farmers. However, there is still a need for research on the socio-economic aspects that impact cattle herd size.

CHAPTER 3

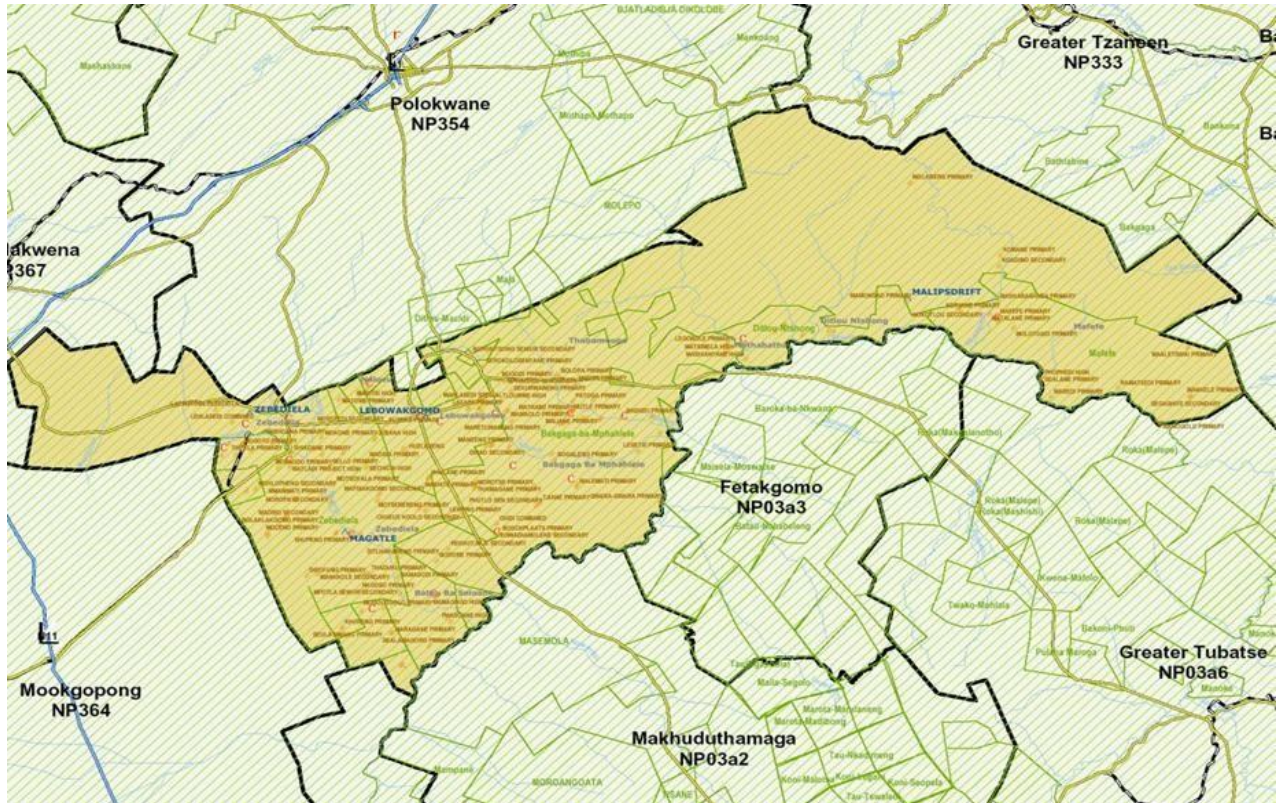
Research Methodology

3.1 Introduction

The chapter elucidates the study area, research design, the data collection, sampling and data analysis in relation of the study's objectives. The chapter also explains how the researcher adhered to research ethics while conducting research.

3.2 Study Area

Lepelle-Nkumpi Municipality (LNM) is located within Limpopo Province of South Africa. This local municipality is found at the southern side of Capricorn District Municipality. The municipality covers an area of approximately 3.500km² and approximately 20% of the CDM area in the Limpopo Province of South Africa, which forms part of the border separating the Republic of South Africa from its neighbours, Zimbabwe and Mozambique. LNM comprises 30 Wards consisting of a median size of 8 000 people who occupy 110 settlements (Lepelle-Nkumpi Local Municipality, 2008). LNM is located 55km South of the CDM and Polokwane municipality. According to Stats SA Census (2011), the municipality's estimated population was 230 350 and its total households were 59 682 households with members of each household size being 3.9. Livestock production in the area is about 9 989, including poultry production (7 809), production of other crops (5 808), vegetable production (2 441) and other (1 738).



Source: *Lepelle-Nkumpi Municipality, 2018.*

Figure 3.2.1: Map of the Lepelle-Nkumpi Municipality

3.3 Research design

The programme that accounts for the motives for collecting, analysing, and interpreting data and provides a full plan showing how a research will be conducted is called a research design (Bless and Higson-Smith, 1995). According to Ntlhare (2015), a research design is a plan that a researcher uses when conducting a study. The study used quantitative data. Boeije (2010), Denzin and Lincoln (2011) say that quantitative research is a systematic method that uses statistical, mathematical, or computational techniques. The study used a questionnaire that takes into consideration quantitative data methods.

3.4 Data collection

The study collected secondary and primary data. A questionnaire and interviews were used to collect primary data. Responses from the potential respondents were analysed with the aid of quantitative methods. Secondary data were obtained from published

books, articles, journals, internet and from Department of Agriculture in the Lepelle-Nkumpi Municipality for comparison with the primary data.

3.5 Sampling procedure

A sample is a small portion selected from entire population of interest. Its results may be a representative of the entire population group (Leedy and Ormrod, 2004). The study used the Proportionate Stratified Random Sampling technique. The study adopted the method proposed by Krejcie and Morgan (1970) for determining the sample size. The formula is constructed as follows:

$$s = \frac{X^2(1 - P)}{d^2(N - 1) + X^2P(1 - P)}$$

Where:

s = Required sample size

x^2 = Table value of chi-square for 1 degree of freedom at a desired confidence level (3.841)

N = Population size

P = Population proportion (assumed to be 0.5 since this would provide the maximum sample size)

d = the degree of accuracy expressed as a proportion (0.05)

$$s = \frac{(3.841)(822)(0.5)(1 - 0.5)}{(0.0025)(822 - 1) + (3.841)(0.5)(1 - 0.5)}$$

$$s = \frac{789.3255}{3.01275}$$

$$s = 261$$

According to the Department of Agriculture (2022), there were 822 smallholder cattle farmers in the study area. In this study, 261 smallholder cattle farmers were involved. A population of 822 was used to obtain a sample size of 261 for the study. This was stratified over the 30 Wards within the municipality. A sample for each stratum was then selected randomly.






Table 3.5.1 shows the population and sample size used by the study: NS (number of smallholder farmers) was first clustered according to 30 wards where agriculture was practiced by 822 farmers. A portion of cattle farmers within those wards was selected using proportionate stratified sampling technique and the overall sample size the study used was 261 cattle farmers in LNM were selected. Ward A was divided mainly from Ward 1 to Ward 10 and a sample of 88 cattle farmers was acquired; from Ward B, a sample obtained from Ward 11 to 20 entailed 93 farmers, and lastly, Ward C encapsulated Ward 21 to Ward 30 where 80 cattle farmers were sampled. All wards (A; B and C) gave a total sample size of 261 farmers respondents.

Table 3.5.1: Population and Sample size of the study

District wards	Number of smallholder farmers (NS)	Sample Size
Ward A	277	88
Ward B	292	93
Ward C	253	80
TOTAL	822	261

Source: Krejcie and Morgan (1970)

The below figure shows the keys which were used to describe the stratified sampling techniques on how the proportionate stratified sampling technique was used. Below is a diagram that shows how the proportionate stratified sampling technique was used in the study.

Keys	
	Lepelle-Nkumpi municipality
	Ward (from ward 1-30)
	Village
	Sample fraction
	Sample size

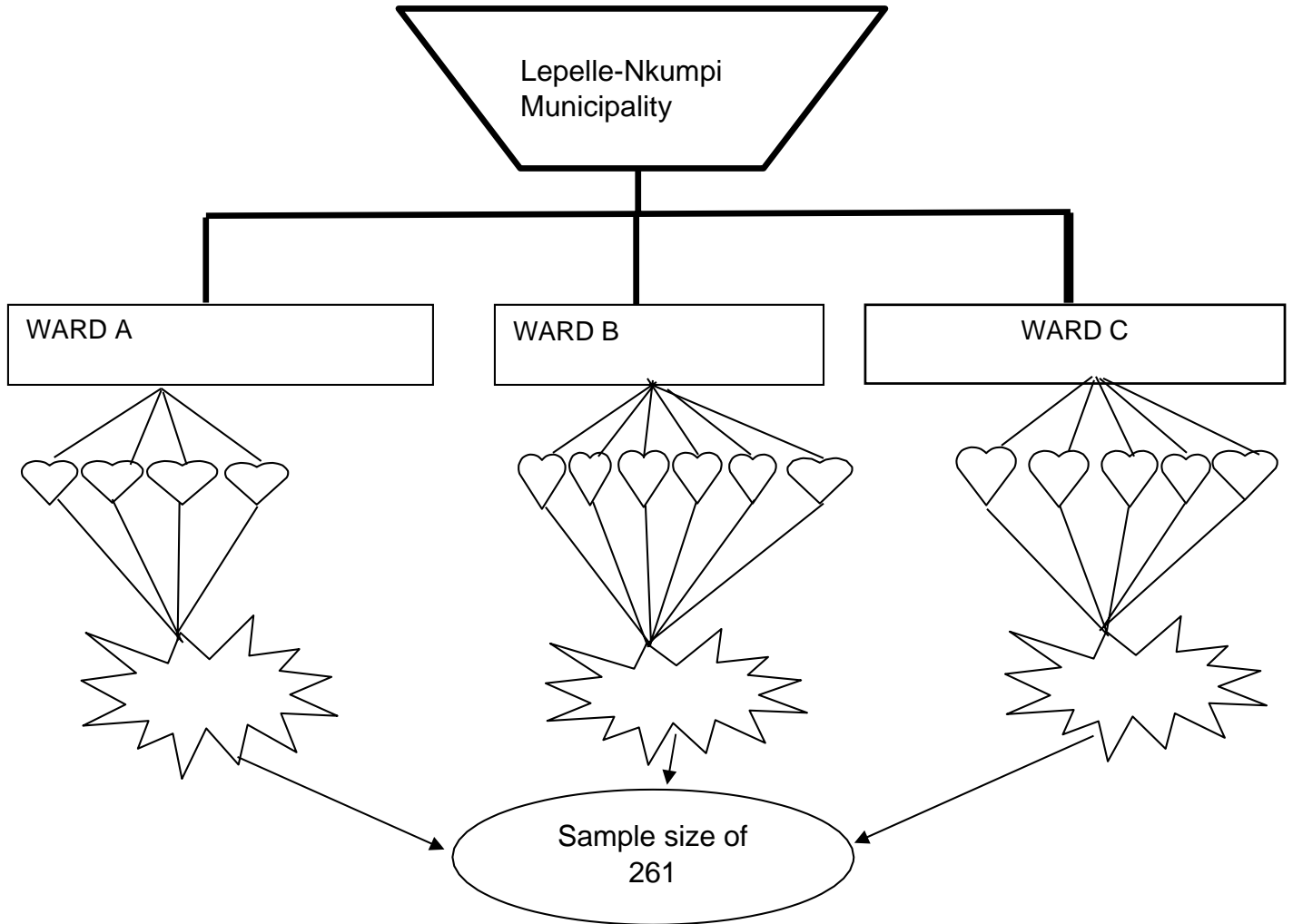


Figure 3.5.2: Drawing showing the proportionate stratified sampling procedure of the study area.

3.6 Research instruments

3.6.1 Validity and Reliability of Questionnaire

An instrument is said to be reliable if it provides similar results when used many times under constant incidence or condition (Mugure, 2012). The questionnaire was used to address the critical issues studied. Before collecting empirical data, a sampled number of farmers (10 to 15) in the study area was tested on the questionnaire to review the success and proficiency of the respondents. After a week, the same process was done on the same sampled population size to determine if the questionnaire was reliable.

The questionnaire was based on demographic details, biological characteristics, human capital endowments, financial management, livestock production, livestock management, marketing management, transportation, marketing channels, marketing institutional arrangement and land tenure systems. Questions that seemed to be difficult to the respondents were explained in their local language (Sepedi) when conducting interviews. The time limit for each interview was at least 35-40 minutes. This interview length was intended to obtain clear opinions and appropriate details from the respondents. Personal observations and a feasibility study were conducted to gain a clear image about the study area and to confirm some of the questions raised to the respondents.

3.7 Data analysis

The study used descriptive statistics and the Ordinary Least Squares (OLS) multiple regression model. OLS is a mathematical model approach imposed to look at the relation between observed variable and explanatory once (Maree, 2012). The OLS regression model is one of the major techniques used to analyse data and provides a basis for multiplying other techniques (Rutherford, 2001). OLS multiple regression is probably the most widely used statistical methodology in existence. This model is effective, particularly as it is relatively easy to check assumptions such as linearity, variance, and effect of outliers (Hutcheson and Sofroniou, 1999)

Descriptive statistics, mainly the mean, standard deviation and frequencies, were used to calculate the statistical package, which involved drawings of graphs, tables, and provision of data analysis methods.

Objective 1: The study used descriptive statistics to identify and describe the socio-economic characteristics and demographic characteristics of smallholder cattle farmers in the study area.

To accomplish this objective, the study used explanatory variables as measures of central tendency. This measure of central tendency estimates frequency and percentage. The following demographic and socio-economic characteristics were analysed:

Table 3.7.1: demographic and socio-economic characteristics

Variable	Description of the variable	Tick appropriate number✓
Household size	The number of household members are..... 0-5 6-10 >10	1..... 2..... 3.....
Gender	If the household head is Male Female	1..... 2.....
Marital position	If the household head is Married Single Widowed Divorced	1..... 2..... 3..... 4.....
Age	How old is the household head?years. 18-35 (youth) 36-50 (youth adult) 51-60 (adults) >61 (elderly)	1..... 2..... 3..... 4.....

Level of education	Level of education of the farmer is..... No formal education Primary Secondary Tertiary	0..... 1..... 2..... 3.....
Occupation	Occupation of the respondent Farming Civil servant Unemployed Business Self-employed Other	1..... 2..... 3..... 4..... 5..... 6.....
Farming as Source of income	Source of income if its farming to the respondent Yes No	1..... 2.....
Experience in farming	Number of years in farming is..... 1-6 7-12 >12	1..... 2..... 3.....
Household income	Amount in rands that the farmer obtains per year is..... <60 000 60 000-120 000 120 000- 200 000 200 000-300 000 >300 000	1..... 2..... 3..... 4..... 5.....

Farm ownership	If the household owns the farm as	
	Private	1.....
	Family members ownership	2.....
	Co operative	3.....
	Farmers group	4.....
	Tradition heads	5.....
	Trust	6.....
Individual company	7.....	

Objective 2: To investigate factors affecting smallholder cattle farmers in the study area, the study used descriptive statistics for this objective. Measures of central tendency, mainly percentages, mean, standard deviation, variance, and drawing of tables and graphs, were used based on the given variables.

Table 3.7.2: Factors affecting smallholder cattle herd size

Variable (Factors-affecting smallholder cattle farmer)	Description of the variable
Problem with camp system	Is there a problem encountered with the system of camp use? Yes=1 No =0
Factors on camp	Factors influencing camp is it. A. Infrastructure (fence, equipment's, and facilities) 1=yes 0=no B. Water circulation 1=yes 0=no C. Inadequate water points 1=yes 0=no D. Insufficient camps 1=yes 0=no E. No camp system

	<p>1=yes 0=no</p> <p>F. No factors</p> <p>1=yes 0=no</p>
Climatic factors	<p>State if the climate change factor affects your farming.</p> <p>A. Draught</p> <p>1=yes 0=no</p> <p>B. Floods</p> <p>1=yes 0=no</p> <p>C. Increased temperature</p> <p>1=yes 0=no</p>
Feeding factors	<p>Factors affecting feeding of cattle if it is.</p> <p>A. No/ less grazing land.</p> <p>1=yes 0=no</p> <p>B. High feed costs</p> <p>1=yes 0=no</p> <p>C. Inadequate or less feed</p> <p>1=yes 0=no</p> <p>D. Poor forage quality</p> <p>1=yes 0=no</p> <p>E. No prevalent factor</p> <p>1=yes 0=no</p>
Access to Service/training factors	<p>Service, advise/ training related factors.</p> <p>A. Practical knowledge</p> <p>1=yes 0=no</p> <p>B. Poor veterinary services</p> <p>1=yes 0=no</p> <p>C. Less or no access to credit</p> <p>1=yes 0=no</p> <p>D. Less or no extension services</p> <p>1=yes 0=no</p> <p>E. Skills development factor</p>

	<p>1=yes 0=no</p> <p>F. No prevalent factor</p> <p>1=yes 0=no</p>
Land acquisition	<p>The process of land acquisition is.</p> <p>Easy=1</p> <p>Very easy=2</p> <p>Difficult=3</p> <p>Very difficult=4</p> <p>Don't know=5</p>
Grazing land	<p>The condition of grazing land for the cattle</p> <p>Very poor with less grass=1</p> <p>Poor with some grass=2</p> <p>Fair with reasonable grasses=3</p> <p>Good with plenty grasses=4</p> <p>Very good with plenty of grass=5</p>
Factors affecting grazing land	<p>Factors affecting grazing land of animals if it is.</p> <p>A. Small grazing land</p> <p>1=yes 0=no</p> <p>B. Weed encroachment</p> <p>1=yes 0=no</p> <p>C. Water issues or factors(supply)</p> <p>1=yes 0=no</p> <p>D. Veld fires</p> <p>1=yes 0=no</p> <p>E. Overgrazing</p> <p>1=yes 0=no</p> <p>F. Overstocking</p> <p>1=yes 0=no</p> <p>G. Insufficient grass for grazing</p> <p>1=yes 0=no</p> <p>H. Water and weed encroachment</p>

	<p>1=yes 0=no</p> <p>I. No prevailing factors</p> <p>1=yes 0=no</p>
Animal health	<p>Animal health related factors as</p> <p>A. Pest/ parasites</p> <p>1=yes 0=no</p> <p>B. Diseases</p> <p>1=yes 0=no</p> <p>C. Vaccines and medications</p> <p>1=yes 0=no</p> <p>D. Dosing product purchasing</p> <p>1=yes 0=no</p> <p>E. No prevalent factor/ other factors</p> <p>1=yes 0=no</p>
Animal loss	<p>Factors related to animal loss it is.</p> <p>A. Stock theft.</p> <p>1=yes 0=no</p> <p>B. High mortality</p> <p>1=yes 0=no</p> <p>C. No or other prevalent factors</p> <p>1=yes 0=no</p>
Reproduction factors	<p>Factors related to reproduction of animals.</p> <p>A. Insufficient or no breeding stock</p> <p>1=yes 0=no</p> <p>B. Premature death</p> <p>1=yes 0=no</p> <p>C. Poor breeds</p> <p>1=yes 0=no</p> <p>D. Low birth weight</p> <p>1=yes 0=no</p> <p>E. No or other prevailing factors.</p>

	1=yes 0=no
Market factors	<p>Factors related to marking of the animals.</p> <p>A. High transportation cost 1=yes 0=no</p> <p>B. No or less market access 1=yes 0=no</p> <p>C. Poor market price 1=yes 0=no</p> <p>D. Market competition 1=yes 0=no</p> <p>E. No or other prevailing factors. 1=yes 0=no</p>
Management factors	<p>Factors related to management if is.</p> <p>A. Lack of resources (equipment) 1=yes 0=no</p> <p>B. Maintenance 1=yes 0=no</p> <p>C. Grazing land management 1=yes 0=no</p> <p>D. No or other prevailing factors 1=yes 0=no</p>
Increase livestock	<p>Would you like to increase stock? Yes=1 No=0</p>
Increase livestock factors	<p>Increase stock through.</p> <p>A. Increasing land size 1=yes 0=no</p> <p>B. Good breeding stock 1=yes 0=no</p> <p>C. Accessing bigger land 1=yes 0=no</p> <p>D. Good breeding stock</p>

	1=yes 0=no E. Fencing and dividing the grazing camp
	1=yes 0=no F. Not increasing stock
	1=yes 0=no

Objective 3: the study used the Ordinary Least Squares Multiple Regression model to examine the socio-economic factors affecting smallholder cattle herd size in the study area. The data were coded, captured, and analysed using SPSS version 28.0 of 2015.

Description of the Ordinary Least Squares model

The OLS multiple regression model (linear) was adopted to test the constant dependent variable cattle herd size. OLS usage was for investigating socio-economic factors that affect livestock herd size in LNM. The OLS model is articulated by Gujarati (2003) as follows:

$$Y_i = \beta_0 + \beta_1 X_i + \dots + \beta_n X_n + \epsilon_i \quad (1)$$

Anywhere:

- Y_i = depended variable or observable variable (Livestock herd size)
- B_0 = intercept
- B_i = Estimated parameters
- X_i = Explanatory or independent variables which are socio-economic factors which affect cattle herd size
- $i= 1; 2; 3 \dots n$ number of explanatory variables used
- ϵ_i =disturbance term

$$\sum_{i=1}^n (Y_i - \hat{Y}_i)^2 \quad (2)$$

The n was the figure of data spots ordering the sample. When Y was for dependent looking at one or more variables, then,

$$Y_j = a + \beta_1 X_{1j} + \beta_2 X_{2j} + \beta_3 X_{3j} + \dots + \beta_{in} X_{mj} + \epsilon_j \quad (3)$$

Or, more succinctly,

$$Y_j = a + \sum_{i=1}^m \beta_i X_{ij} \quad (4)$$

The model estimation

To estimate the population's sampled parameter, the simplest equation was used, where the independent variables were being m .

$$Y_j = a + b_1 X_{1j} + b_2 X_{2j} + b_3 X_{3j} + \dots + b_m X_{mj} \quad (5)$$

$$\hat{Y}_j = a + \sum_{i=1}^m b_i X_{ij} \quad (6)$$

Equation (6), the value for b is determined to be:

$$b = \frac{\sum xy}{\sum x^2} = \frac{\sum (X_i - \bar{X})(Y_i - \bar{Y})}{\sum (X_i - \bar{X})^2} = \frac{\sum X_i Y_i - \frac{(\sum X_i)(\sum Y_i)}{n}}{\sum X_i^2 - \frac{(\sum X_i)^2}{n}}$$

then,

$$Y = a + \beta X$$

And

$$a = Y - \beta X$$

The greatest approximate of respondents a is sample indicator.

$$a = Y - bX$$

Linear, independent, homoscedasticity and normality were looked after to determine the legality of the OLS model. Durbin-Watson statistics look at Autocorrelation and multicollinearity. The study used SPSS version 28.0 of 2015 to analyse model parameters from OLS model results, which gets in touch with: Durbin-Watson; constant; coefficient β , standard error, t-values; R^2 ; adjusted R^2 , and Residual analysis.

Table 3.7.3: illustrates the explanatory variables, variable description, and measurement of the variable

Dependent variable	Variable description	Measurement
Cattle herd size	Number of cattle that the farmer has	Numbers
Independent variable	Variable description	Measurement
X ₁ =Age	The age of the household head	Years
X ₂ =Gender	1. Male 0. Female	Dummy
X ₃ = Experience in farming	Number of cattle farmers in farming	Years
X ₄ = Education	How long school was attended	Years
X ₅ =Household size	Each household members total	Number
X ₆ =Household income	Money obtained by the family head	Rand
X ₇ = Land ownership	1. if the household head owns the land or farm 0. otherwise	Dummy
X ₈ = Access to extension services/training/advice	1. if there is access to extension services/training/advice 0. otherwise	Dummy
X ₉ = Access to veterinary services	1. if there is access to veterinary services 0. otherwise	Dummy
X ₁₀ = Access to credit	1. Access to credit by household head 0. otherwise	Dummy
X ₁₁ = Sales per year	Total number of sales per year	Numbers
X ₁₂ = Problem with transportation	1. If a farmer has problem with transportation 0. No	Dummy
X ₁₃ = Land Acquisition	1. if the farmer can acquire land 0. otherwise	Dummy

X ₁₄ = Grazing Land condition	1. if land for grazing is in very good condition 0. otherwise	Dummy
X ₁₅ =livestock keeping	1. Keep livestock objectively for acting as a source of income. 0. Otherwise	Dummy
X ₁₆ = Camp system	1. If the respondent uses camp system. 0. Otherwise	Dummy
X ₁₇ = Type of grazing	1. If the respondent uses natural veld /grazing 0. Otherwise	Dummy
X ₁₈ = Planted pasture	1. If the respondent has planted pasture 0. Otherwise	Dummy
X ₁₉ = Dosing products purchase	1. If the respondent has problem in purchasing dosing products 0. Otherwise	Dummy

Objective 4: to develop a framework to show in what way cattle farmers can decrease openness to socio-economic factors impacting their agriculture, the study made recommendations based on the results from the model.

3.8 Ethical consideration

COVID-19 protocol was adhered to, which was in line with the Disaster Management Act ((as amended by Gazette 43168 of 26 March 2020). Participants and the researcher were encouraged to wear their masks, use sanitizers, and maintain social distancing. Over-crowding was avoided during farm visits and at Separako where farmers usually met. The use of online facilities such as email and Microsoft Teams were only used to call officials (extension officers). No respondent was interviewed using these channels as most of the respondents showed up in person to complete the research questionnaire. Before conducting the study, approval from Unisa's Ethics Committee was obtained and shared with the Department of Agriculture.

Before using data obtained from secondary sources, permission to use the sources was asked from the officials or information handlers. For the researcher, it was very important

to consult the Councilor or traditional leader to secure an authority agreement to carry out the study. The study did not commence until a signed agreement was received and this was obtained through the help of extension officers who acted as a link to communicate with the tribal authorities. Furthermore, the purpose of the study was explained clearly to the respondents to inform them of their rights before participating. The information obtained by the study was kept confidential and will never be acquired by everyone. This was done to protect the respondents.

CHAPTER 4

Results and discussions

4.1 Introduction

The major aim of this study was to assess the socio-commercial issues affecting smallholder cattle herd size in Lepelle-Nkumpi Municipality (LNM) of Limpopo Province. The objectives of the study were as follows: to identify and describe socio-economic and demographic characteristics of smallholder cattle farmers; to investigate factors affecting smallholder cattle farmers; to examine socio-economic factors affecting smallholder cattle herd size using OLS multiple linear regression model, and to develop a framework showing a way in which smallholder cattle agriculturalists can assuage their susceptibility to the socio-economic factors that disturb their livestock agribusiness.

The fulfilment of the first, second and last objectives necessitated the use of descriptive statistics. SPSS was used to obtain the results of the study. This chapter presents the results using tables, figures and diagrams representing how the variables were found by the study and the interpretation of those results. All the sources used were derived from the SPSS.

4.2 Descriptive statistical results to determine the socioeconomic and demographic characteristics

This section responds to the first objective of the study, which was to identify and describe the socio-economic and demographic characteristics of smallholder cattle farmers at LNM. It focuses on the respondents' sexual category, nuptial status, age, level of schooling, occupation, farming as a source of income, knowledge in farming, farm ownership; household income and household member numbers in total.

Gender was obtained through cross tabulation with household head age, level of education (Table 4.2.2); marital status and household size (Table 4.2.1). Pie charts were used to determine household income and farm ownership, and graphs were used to show the occupation of the respondents, experience in farming, and farming as a source of income.

Table 4.2.1 below shows the cross tabulation of gender on marital position and household size. Results show that most cattle farmers in LNM were married (73.2%), while the less marital position category was divorced (1.5%). Moreover, more males were married (81.3%) than females (61.3%), but divorced males (1.3%) were less than females divorced (1.9%). Therefore, more males were married, followed by those who were single (13.8%), widowed (11.5%), and divorced (1.5%), respectively. This shows that most farmers were married and stable at their residential areas and this provided them with enough family labour. Ogunkoya (2014) revealed contradicting results, where (80.8%) were married and (6.4%) single. Mkhize (2015) conducted a study in Zimbabwe (Tsholotsho) and found that about 69.7% of the respondents were married.

In terms of household size, it was found that most households consisted of several 0-5 (53.3%) members, followed by a household size of members greater than 10 (5.7%) and a household with a minimum of members from 6-10 (4.2%). Similarly, Ouma *et.al.* (2003) conducted a study in Kenya and reported the same statistics as found by this study. Successful herd management for obtaining and making high profits requires family labour (Majekolunm, 2011). A bigger household size results in more demand for market goods, which increases participation in smallholder cattle farming (Schwalbach and Mafo, 2001). This does not mean that larger households must be promoted but rather increase farming participation.

Table 4.2.1: Marital position and household size of the smallholder cattle agriculturalists in LNM per gender

Gender			
	Females	Males	Amount to
Marital position			
Married	61.3%	81.3%	73.2%
Single	17.9%	11.0%	13.8%
Widowed	18.9%	6.5%	11.5%
Divorced	1.9%	1.3%	1.5%
Household size			
0-5	56.6%	51.0%	53.3%
6-10	38.7%	42.0%	4.2%
>10	4.7%	6.5%	5.7%

N=261

Source: Generated from study results

Table 4.2.2 below shows the age and level of education per gender from cattle farmer respondents at LNM, where most of the cattle farmer respondents were farmers aged above 60 (43.7%), followed by those aged 36-50 (22.6%); then those aged 51-60 (21.5%). Most females were aged above 60 (44.3%) while less males (11.6%) were aged 18-35 years. The youth (12.3%) was the age group with a less percentage, both among the females and males. Myeni *et.al* (2019), Setshedi and Modirwa (2020) note that the least number of youths participate in the agricultural sector. Ramoroka (2012) revealed a household aged at 51-60 (35%) as highest, which opposed the results of this study, as most households had people aged above 60. The statistics show that smallholder farming in Polokwane Local Municipality is practiced by pensioners or older people. People aged 18-35 usually get employed at the formal and informal sectors because they mostly view agriculture as a dirty business (Musemwa *et.al.*, 2007).

Table 4.2.2: Age and level of education of smallholder cattle farmers in LNM per gender.

Gender			
	Female	Males	Total
Age of household head			
18-35	13.2%	11.6%	12.3%
36-50	27.4%	19.4%	22.6%
51-60	15.1%	25.8%	21.5%
>60	44.3%	43.2%	43.7%
Level of education			
No formal education	20.8%	5.8%	11.9%
Primary	23.6%	27.7%	26.1%
Secondary	43.2%	43.2%	43.3%
Tertiary	12.3%	23.2%	18.8%

N=261

Source: obtained from study field survey

Most of the respondents' level of education was secondary (43.3%), with a majority of educated females (43.4%); (18.5%) of the respondents had tertiary education, (11.9%) had no formal education and 26.1% had primary education. In contrast, Hlatshwanyo *et al.* (2021) revealed that respondents with secondary education were (36.2%), (31.6%) with primary education, (12%) with tertiary education and (20.2%) with no formal education.

Education is the key to understanding basic principles of farming (Moloi, 2008). The results also show that the total gender is (58.1%) of males more than that of females (39.7%) at the study area. Nkadimeng (2019) found that there were more males (82%) more than females (18%) in the Limpopo Province's agricultural sector. Figure 4.1.1 below shows that out of 261 cattle farmers sampled, (39.7%) were females and (58.1%) were males. Hence, more male respondents were interviewed than females. This also shows that agriculture at the study area is mostly practiced by the males than females. Females are often expected to perform domestic chores such as cooking while males as heads are expected to perform farm duties or operations and herd management (Moyo, 2010).

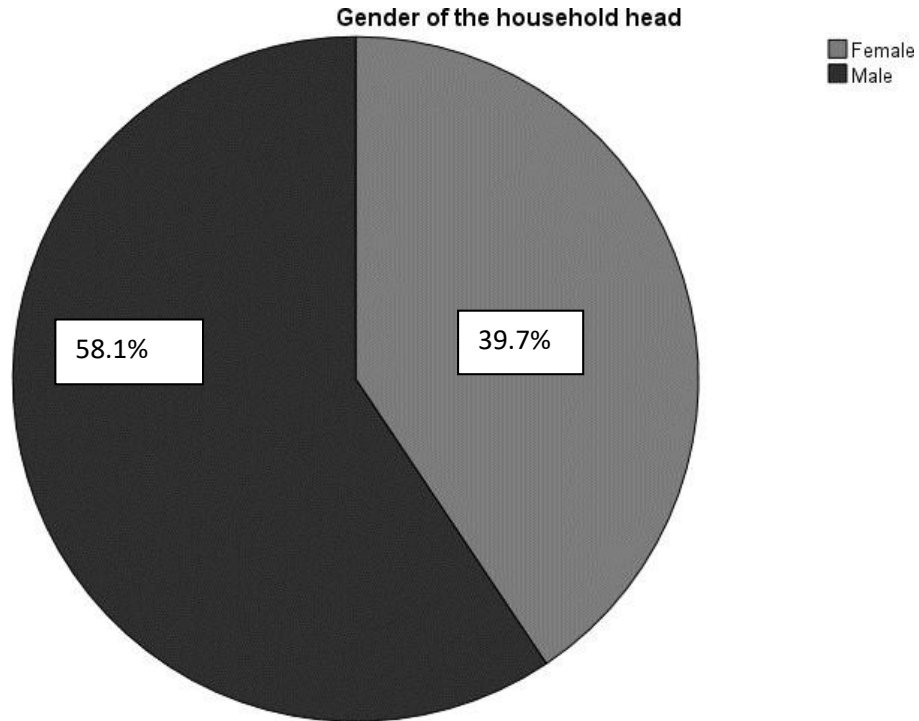
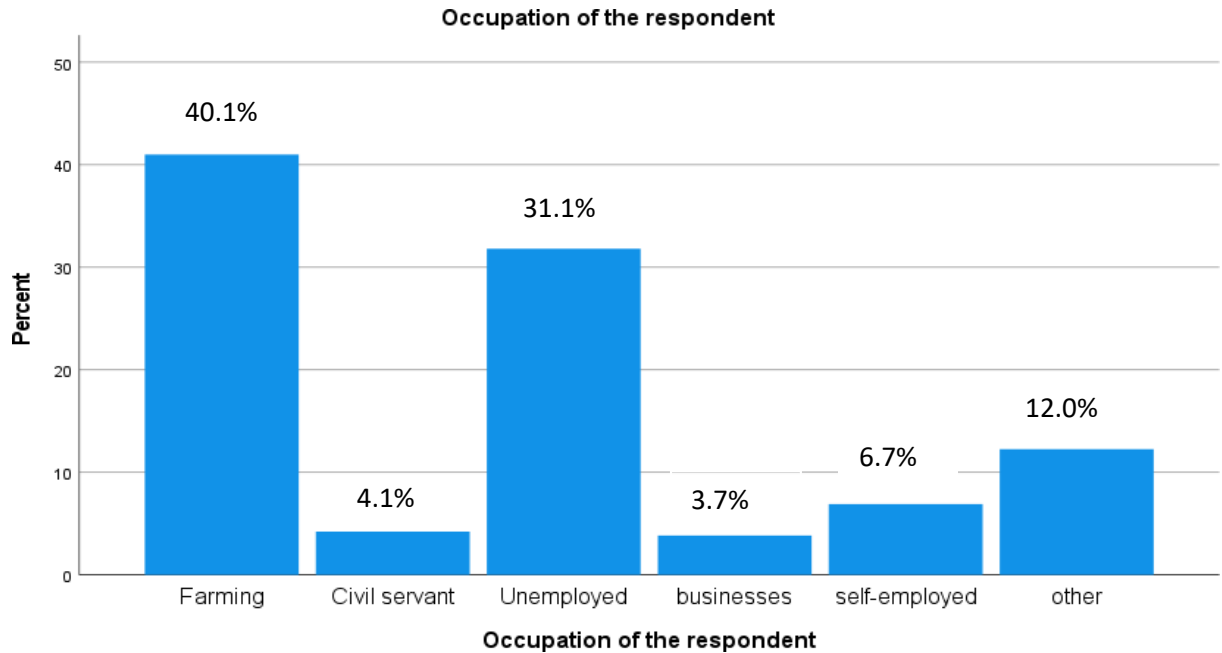


Figure 4.1.1: Percentage of gender

Source: generated from study results

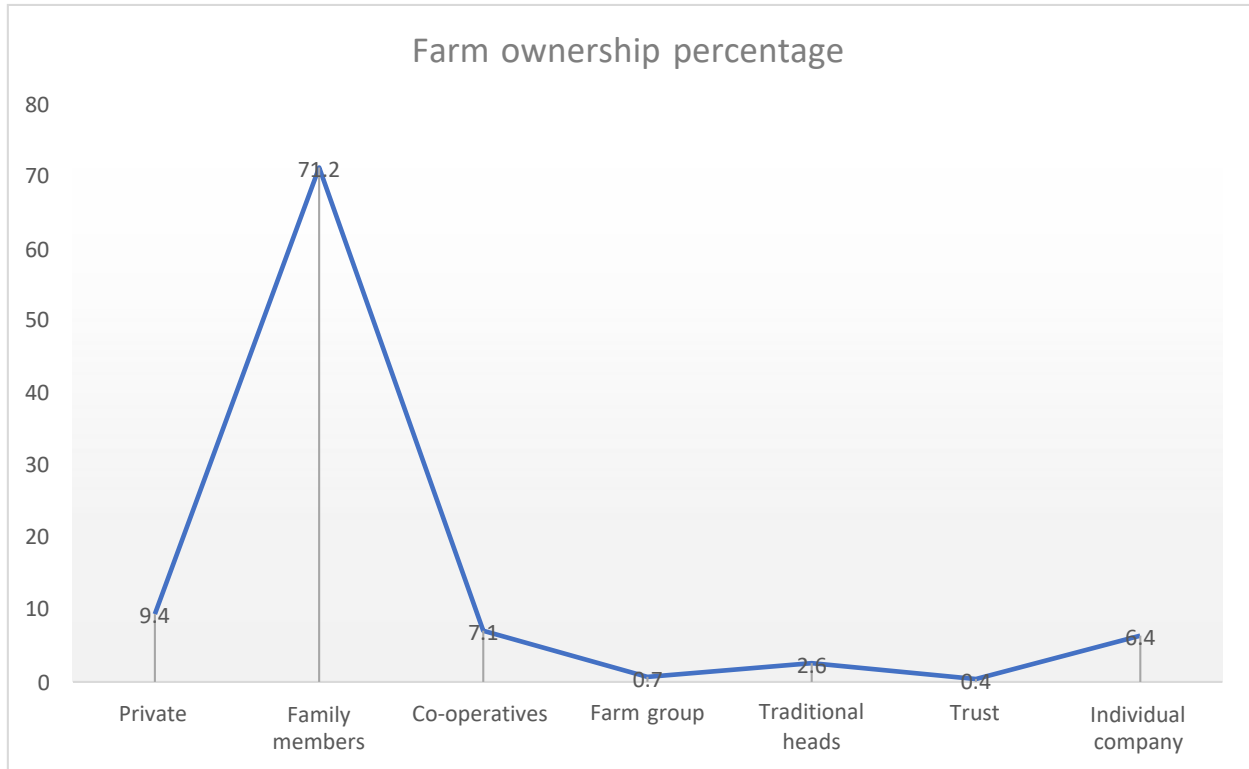
Figure 4.1.2 shows that (40.1%) of the respondents were using farming as their occupation whereas the remainder was in business. At the study area (31.1%) of the respondents were an unemployed group while (12.0%) entailed those who were involved in other occupations except the ones mentioned. Most of the respondents used farming (40.1%) as their occupation because they were above 60, which means they are pensioners and had make their living through farming. Results also depicted that (3.7%) respondents were business oriented, (6.7%) were self-employed and (4.1%) were civil servants. This result shows that agriculture is a source of employment to many respondents at the study area and less people rely on business as their occupation. The study results are in line with the study conducted in Limpopo by Ramoroka (2012), where (64%) of the respondents' occupation was mainly farming. Additionally, Ogunkoya (2014) conducted a study in Free State where about (77.20%) respondents participated farming as their occupation.



Source: Generated from study results

Figure 4.1.2: Occupation of respondents

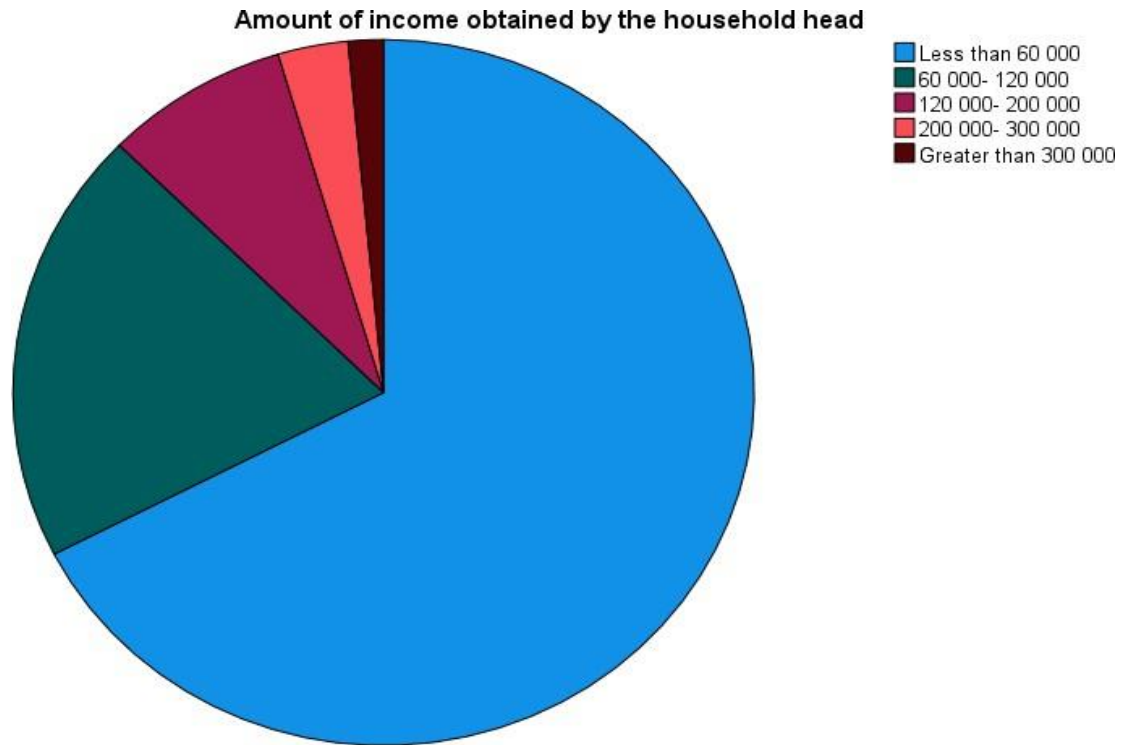
Figure 4.1.3 shows that out of 261 smallholder respondents, the ownership of farms per cattle farmer percent was found as follows: those respondents who own land through a trust comprised (0.4%), respondents who owned a farm through a farm group were (0.7%); respondents who had traditional heads as heads were (2.6%); farm ownership of (6.4%) was used individual company; (7.1%) of the respondents used ownership by co-operatives; (9.4%) used private ownership and the largest number of respondents used land owned by family members (71.2%). The percentage of land ownership from biggest to smallest was found to be family members (71.2%); private (9.4%), co-operatives (7.1%), individual company (6.4%); traditional heads (2.6%); farm group (0.7%) and trust (0.4%). Jacobs (2011) mentioned that the type of land ownership has influence on agricultural development. Ogunkoya (2014) found the farm group (33.60%) to be the dominant form of ownership. Martey *et al.* (2012) concluded that land ownership and farm size have influence on productivity and investment in farmers.



Source: Generated from study results.

Figure 4.1.3: farm-ownership

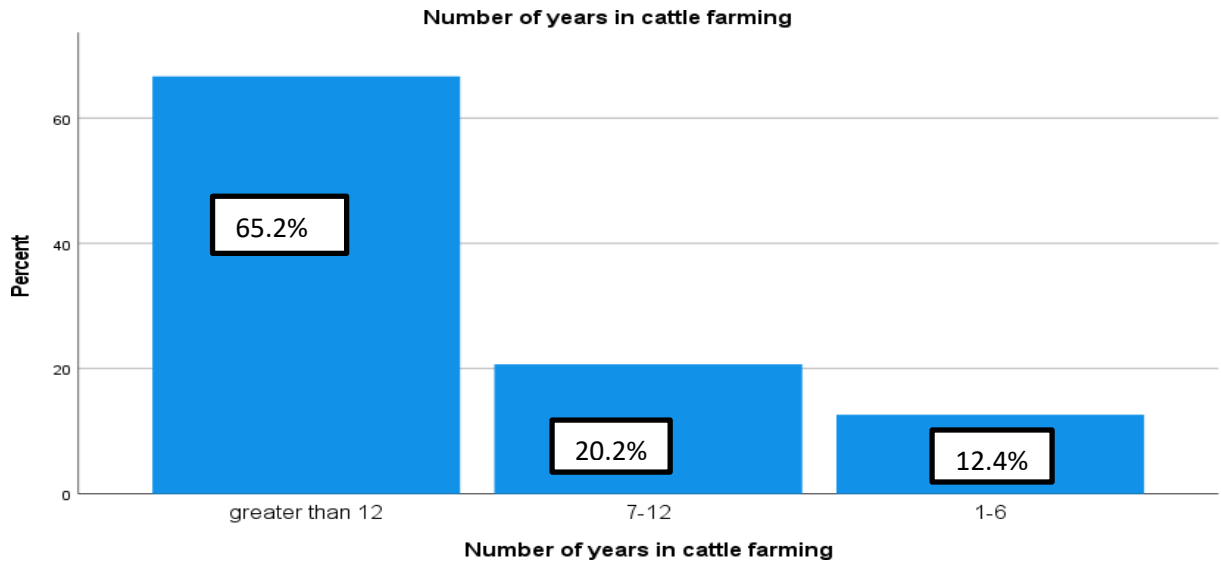
The percentage of the amount obtained by smallholder cattle farmers annually is depicted by Figure 4.1.4 below. The figure depicts the respondents according to ranks, namely; those who earned less than R60 000 (65.9 %) from the sampled size; and the respondents who earned R60 000-R120 000 (19.5%); 7.9 respondents farmers who earned R120 000-R200 000; (3%) who earned R200 000-R300 000 and (1.5%) who earned greater than R300 000 at the study area. Most of the respondents earned an amount of income less than R60 000 based on depicted pie chart below. The income group of 120 000-200 000 (82%) contradicted the results obtained by Nkadimeng (2009). Ogunkoya (2014) revealed the highest percentage of income earning group of the respondents was earning less than 60 000 (86.60%).



Source: Generated from study results.

Figure 4.1.4: Percentage of income obtained by household head

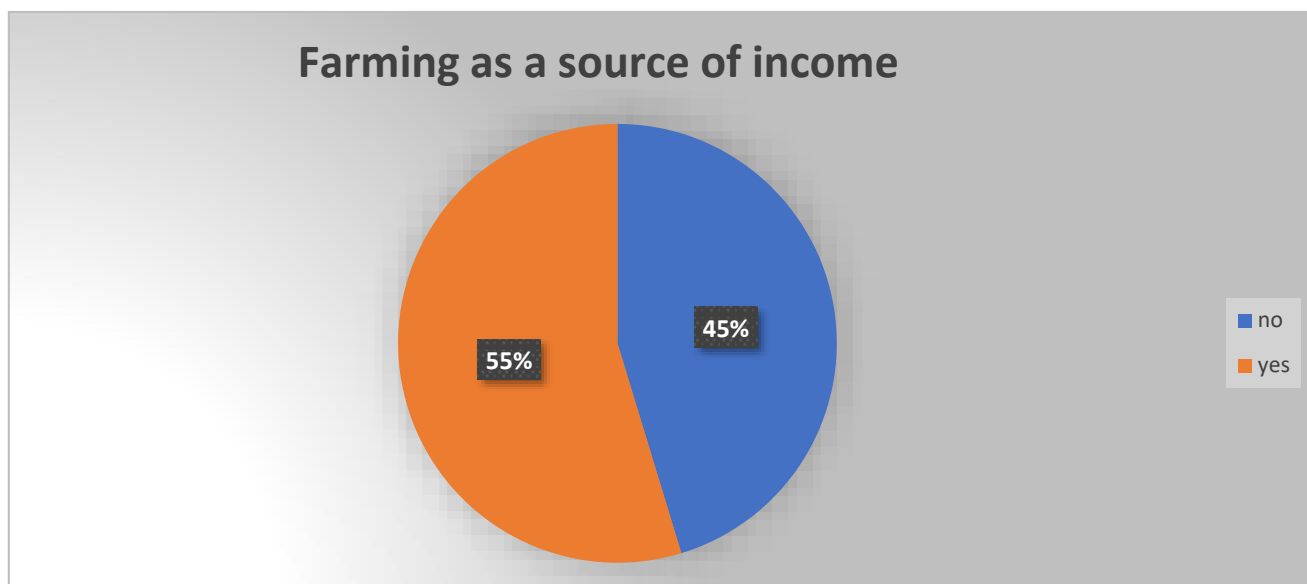
As reflected by figure 4.1.5, the number of years in cattle farming was categorised as follows: those with greater than 12 years; those with 7-12 years and those with 1-6 years of experience. However, with respect to the above table, there was a lesser percentage in terms of the number of years with agricultural knowledge at 1-6 year/years (12.4%). Most respondents had experience in cattle farming at years greater than 12 with a percentage of (65.2), and (20.2%) had 7-12 years in cattle farming when a less percentage was obtained from cattle farmers with 1-6 years of farming experience. Makhura (2001) revealed that older farmers were once dominant in horizontal markets although they tended to sell at a minimum unlike the growing group which was motivated to participate in multiple farm duties. However, Ramoroka (2012) found that there were more respondents with greater than 12 years of experience in farming.



Source: Generated from study results

Figure 4.1.5: Respondents years of experience in farming

Figure 4.1.6 below shows the respondents' perspectives on farming as a source of income. The results from the 261 cattle farmers interviewed show that about (55%) of the respondents used farming as their source of income whereas (45%) did not use farming as their source of income. This shows that most of the farmers' farm mainly to generate income and their dependence on agriculture improves their standard of living. Alene *et al.* (2008) noted that non-farming income contributes to more marketed output, if non-farming income is invested in technologies and improvement of farming. Montshwe (2006), Nkadameng (2019) and Ramoroka (2012) revealed farming as a source of income.



Source: Generated from study results

Figure 4.1.6 If source of income by household is farming

4.3 Prevalent aspects affecting smallholder cattle farmers

This section presents prevalent parameters, percentages, standard deviation and mean as well as variance to do descriptive statistics to determine prevalent factors faced by cattle agriculturists at LNM. Frequencies and percentages showed dominant parameters from the questionnaire completed by the respondents. The study used the following prevailing factors to determine second objective: problem with camp system; camp factors; climatic factors; feeding factors; access to service/training factors; land acquisition factors; grazing land condition; factors affecting grazing land; animal health factor, animal loss factor; reproduction factors; market factor; management factor; and increase in livestock factors. Tables were generated from the study using SPSS to show the factors affecting cattle farmers.

Table 4.3.1 shows the camp factors, namely; infrastructure, water circulation, water points, insufficient camps, no camp system and no factors in relation to whether there is a problem with the current system used by cattle farmers in LNM. The study results revealed that (45.3%) cattle farmers had a problem with the current camp system while (52.4%) had no problem with the current camp system. About (28.6%) of the cattle farmers mentioned that they had no camp factors while water circulation was one of the most camp factors that affect (83.6%) of smallholder cattle farmers. Camp factors that

affected cattle farmers classified in ascending order were: water circulation (72.3%); infrastructure (67.4%); water points (67.0%); insufficient camps (59.0%), no camp system (58.2%) and no factors (26.4%). Those camp factors that ranged between 80% and 90% were water circulation (83.6%) and water points (80.0%). Camp system is a prevalent factor with (65.0%) of the respondents affected by camp factors. The results contradict results found by Ogunkoya (2014), conducted in Free State where the highest value of camp factors was found on no system (77.2%) and least on insufficient camp (7.6%).

Camp factors named water circulation affected about (83.6%) of smallholder cattle farmers. Camp factors that cattle farmers showed to be affected by them classifying them in ascending order were: water circulation (72.3%); infrastructure(67.4%); water points (67.0%); insufficient camps (59.0%), no camp system (58.2%) and no factors (26.4%). Those camp factors that ranged between 80% and 90% were water circulation (83.6%) and water points (80.0%).

Camp system is a prevalent factor with (65.0%) of the respondents affected by camp factors. The results contradict results found by Ogunkoya (2014), conducted in Free State where the highest value of camp factors was found on no system (77.2%) and least on insufficient camp (7.6%).

Table 4.3.1: Camp factors affecting smallholder cattle farmers against problem with camp system

Any problem with current camp system			
Camp factors	No	Yes	Total
Infrastructure			
No	43.8%	22.9%	32.6%
Yes	56.2%	77.1%	67.4%
			100%
Water circulation			
No	39.7%	16.4%	27.2%
Yes	60.3%	83.6%	72.8%
			100%
Water points			
No	47.9%	20.0%	33.0%
Yes	52.1%	80.0%	61.0%
			100%

N=261

Source: Obtained from study field survey.

Table 4.3.1: Camp factors affecting smallholder cattle farmers against problem with camp system (continued)

Any problem with current camp system			
Camp factors	No	Yes	Total
Insufficient camp			
No	51.2%	32.1%	41.2%
Yes	48.8%	67.9%	51.9%
			100%
No camp system			
No	49.6%	35.0%	41.8%
Yes	50.4%	65.0%	58.2%
			100%
No factors			
No	49.6%	35.0%	73.6%
Yes	50.4%	65.0%	26.4%
			100%
Problem with current camp system	45.3%	52.4%	100%

N=261

Source: Obtained from study field survey

Table 4.3.2 shows feeding factors (no/less grazing land; high feed costs; inadequate/less feed; poor forage quality, and no prevailing factors) encountered by cattle farmers in relation to land acquisition. This sought to show if the respondents' ways of getting land were easy, very easy, difficult, very difficult; and those who did not know. Out of 261

respondents, (50.2%) of those under land acquisition found it easy to acquire land; (12.4%), showed that it was very easy to acquire land; (22.1%) found it difficult to acquire land and others said it was too difficult/very difficult to acquire land because land to be obtained needed money; (7.5%) found it very difficult to acquire land and about (5.6%) did not know how land was acquired. It was found very easy to acquire land by many respondents whose land belonged to their parents and had inherited it.

The 261 respondents addressed the following feeding factors: Inadequate/less feed and high feed costs revealed the same results as (64.3%) per land acquisition. Most of the respondents had no prevalent factor (79.7%). About (80.0%) of the respondents found that there was no/less grazing land in relation to land acquisition (very difficult). Poor forage quality (73.3%) was a feeding factor that affected mostly cattle farmers who did not know how their land was acquired. Nouman *et al.* (2014) say that the more land is acquired for livestock, the higher the chances of minimising overgrazing, overstocking, land degradation, low meat quality due to less grazing land, which in turn minimises selling price and purchasing power of livestock. Most previous studies show that land is one of the factors that is very difficult to increase and maintain due to high population increase and other major uses exceptional to agriculture (housing, rentals). Increase in livestock herd size is hindered by the struggle of gaining enough feeding plots (Vithanage *et al.*, 2014).

Table 4.3.2: feeding factors affecting cattle farmers in relative to land acquisition

Land acquisition						
Feeding factors	Easy	Very easy	difficult	Very difficult	Don't know	Total
No/less grazing						
No	30.6%	36.4%	27.1%	20.0%	46.7%	30.7%
Yes	67.4%	63.6%	72.9%	80.0%	53.3%	69.3%
						100%
High feed costs						
No	38.1%	45.5%	25.4%	30.0%	33.3%	35.2%
Yes	61.9%	54.5%	74.6%	70.0%	66.7%	64.8%
						100%
Inadequate/less feed						
No	33.6%	42.4%	32.2%	45.0%	33.3%	33.2%
Yes	66.4%	57.6%	67.8%	55.0%	66.7%	64.3%
						100%
Poor forage quality						
No	37.3%	45.5%	27.1%	45.0%	26.7%	36.0%
Yes	62.7%	54.5%	72.9%	55.0%	73.3%	64.0%
						100%
No prevalent factors						
No	82.1%	87.8%	72.9%	85.0%	60.0%	79.7%
Yes	17.9%	12.1%	27.1%	15.0%	40.0%	20.3%
						100%
Land acquisition	50.2%	12.4%	22.1%	7.5%	5.6%	100%

N=261

Source: Obtained from study field survey

Table 4.3.3 shows factors affecting grazing land, namely; small grazing land (81.5%); weed encroachment (77.7%); water issues (73.6%); veld fires (75.1%); overgrazing

(69.0%); overstocking (79.1%); insufficient grass for grazing (65.9%); water and weed encroachment (37.1%), and no prevailing factors (17.6%) per grazing land conditions experienced by smallholder cattle farmers interviewed. Out of 261 respondents, (34.1%) described the feeding plot condition as very underprivileged with fewer grass; (33.7%) designated the land state as fair-minded with sensible grass, (17.2%) labeled the land as good with plenty of grass, (3.4%) designated the land state as very decent with sufficient grass. Furthermore, about (2.6%) showed that there were other factors to describe their land condition for grazing such as small grazing land (89.0%) consisting of land condition which was poor with some grass (93.5%) at LNM. Outcomes disclose land condition (very poor with less grass), as the prevalent factors affecting grazing land (89.0%); (84.4%) mentioned that land with reasonable grass was the dominant factor affecting land for grazing; (94.4%) stated that the land condition good with plenty of grass showed that weed encroachment was the factor mostly affecting grazing and others (88.9%) mentioned that the land was very good with plenty of grass but the threat of veld fires affected grazing. About 50% of cattle farmers farmed in areas with good and plenty grass although there was weed encroachment. Farm size impacts the concentration of commercialisation in agricultural science (Martey *et al.*, 2012).

Following grazing land factors, water issues, veld fires and overgrazing revealed same results (28.6%) and overstocking, insufficient water and weed encroachment revealed same results (42.9%) on factors affecting grazing land per grazing land condition total. Most of the respondents found it hard to purchase feed; hence they relied on natural grazing, which was used by every farmer and small land size used for grazing. Affordability, poor market concentration and participation hindered most of the cattle farmers' profitability, productivity, and effectiveness at the study area. Rises in costs of multiple goods and services used in agricultural enterprises such as the cost of fuel, management, and maintenance costs; operational costs; resources such as labour; machinery, animal loss factors reduce farming profits (Nkonki-Mandleni *et.al.*, 2019).

Table 4.3.3: factors affecting grazing land per grazing land condition experienced by cattle farmers

Grazing land condition								
Factors affecting grazing	Very poor with less grass	Poor with some grass	Fair with reasonable grass	Good with plenty grass	Very good with plenty grass	Other	Total	
Small grazing land								
No	11.0%	6.5%	24.4%	33.3%	55.6%	28.6%	18.4%	
Yes	89.0%	93.5%	75.6%	66.7%	44.4%	71.4%	81.6%	100%
Weed encroachment								
No	10.5%	21.7%	25.8%	5.6%	66.9%	42.9%	22.3%	
Yes	83.5%	78.3%	74.2%	94.4%	33.3%	57.1%	77.7%	100%
Water issues								
No	25.3%	37.0%	15.6%	38.9%	66.7%	28.6%	26.4%	
Yes	74.7%	63.0%	84.4%	61.1%	33.3%	71.4%	73.6%	100%
Veld fires								
No	15.4%	23.9%	24.4%	44.4%	88.9%	28.6%	24.9%	
Yes	84.6%	76.1%	75.6%	35.6%	11.1%	71.4%	75.1%	100%
Overgrazing								
No	28.6%	21.7%	28.9%	55.6%	77.8%	28.6%	31.0%	
Yes	71.4%	78.3%	71.1%	44.4%	22.2%	71.4%	69.0%	100%

N=261

Source: Obtained from study field survey results

Table 4.3.3: factors affecting grazing land per grazing land condition experienced by cattle farmers (continued)

Factors affecting grazing	Very poor with less grass	Poor with some grass	Fair with reasonable grass	Good with plenty grass	Very good with plenty grass	Other	Total
Overstocking							
No	20.9%	21.7%	37.8%	50.0%	77.8%	57.1%	20.9%
Yes	79.1	78.3%	62.2%	50.0%	22.2%	42.9%	79.1%
							100%
Insufficient grass for grazing							
No	20.9%	30.4%	44.4%	38.9%	66.7%	42.9%	34.1%
Yes	79.1%	69.6%	55.6%	61.1%	33.3%	57.1%	65.9%
							100%
Water and weed encroachment							
No	23.1%	39.1%	42.2%	42.2%	50.0%	55.6%	42.9%
Yes	76.9%	60.9%	57.8%	57.8%	50.0%	44.4%	37.1%
							100%
No prevailing factors							
No	79.1%	76.1%	85.6%	88.9%	100%	85.7%	82.4%
Yes	20.9%	23.9%	14.4%	11.1%		14.3%	17.6%
							100%
Grazing land Condition	34.1%	17.2%	33.7%	6.7%	3.4%	2.6%	100%

N=261

Source: Obtained from study field survey results.

Table 4.3.4 shows climatic change factors with five categories, namely; drought, floods, increased temperature and no other factors. Most of the interviewed population experienced drought (89.7%), followed by increased temperature (76.6%); then other factors affected (13.0%) of the participants and floods affected (4.6%) of the respondents.

A few smallholder cattle respondents (10.3%) had no climatic factors that affected their cattle herd size as they faced no drought, (95.4%) did not experience floods; (23.4%) never experienced increased temperature and (87.0%) had no other climatic factors affecting their cattle farming in the study area. Ogunkoya (2014) revealed drought (96.4%) as the highest climate factor. Growth of production depends on the changes in climatic conditions (Mandleni, 2011). Benton et al. (2012) shows that changes in climatic conditions like over or no raining, drought and other climatic factors affect agricultural practices.

Table 4.3.4: Climate change as a factor affecting cattle farmers

Climate factors	Percentages
Drought	
No	10.3%
Yes	89.7%
	100%
Floods	
No	95.4%
Yes	4.6%
	100%
Increased temperature	
No	23.4%
Yes	76.6%
	100%
Other	
No	87.0%
Yes	13.0%
	100%

N=261

Source: obtained from field survey study results.

Table 4.3.5 below shows animal loss factors, which were among the issues disturbing cattle farmers. The results were generated from 261 respondents who reported that stock theft (77.8%) was the highest major animal loss factor, followed by high mortality rate (66.3%) while (22.2%) stated that there was no animal loss. The results depicted that about (77.8%) respondents reported no other prevailing animal loss factors. Another prevailing factor mentioned by the respondents as an animal loss factor was that cattle farmers were affected by predators which attacked their livestock.

Montshwe (2006) found a partial effect of a unit increase in stock theft on the conditional probability of participating in the mainstream market as 0.078598. Furthermore, Montshwe (2006) concluded that smallholder farmers' inclination must be to avoid risk assortiated with stock theft, and then other economically viable farming options or limitations. Montshwe (2006) mentioned that feedlots should be implemented to combat mortality and improve the health status of animals.

Table 4.3.5: Animal loss factors affecting cattle farmers in percentage

Animal loss factor	Percentages
Stock theft	
No	22.2%
Yes	77.8%
High mortality rate	
No	33.7%
Yes	66.3%
No or other prevailing factors	
No	77.8%
Yes	22.2%

N=261

Source: obtained from study field survey results

Table 4.3.6 shows that the frequency and percentage of the factor access to service/training were out of 822 cattle farmers a minimum number of 261 interviewed

smallholder cattle farmers were sampled. It was proved by the study that (73.2%) respondents lacked practical knowledge; (54.4%) lacked veterinary services; (52.1%) had no/less access to credit; (54.8%) had no access to extension services; (63.2%) lacked skills development and no other prevailing factors constituted (18.0%) on access to service/training factor. Getting in contact with extension officers by farmers (average and large quantity scale agriculturalists) was minimal among smallholder farmers. Nevertheless, smallholder farmers obtained advice from successful agriculturalists, radios and input dealership (Adhiguru *et al.*, 2009). Most respondents (73.2%) showed that lack of knowledge mostly hindered their access to service/training at the study area. (82.0%) of the respondents mentioned no prevailing factors affecting them while the lowest no option was for those respondents lacking practical knowledge. Furthermore, the results show a frequency from the highest to the smallest number obtained as follows: practical knowledge (191), skills development (165), lack of extension (143), poor veterinary services (142), less/no access to credit (136) and no prevailing factors (47).

Mogues *et al.* (2009) says that the provision of agricultural services does not always succeed due to the lack of political power and lack of proper knowledge. Nkadimeng, (2019) conducted a study in Limpopo and highlighted that the farmers were visited by extension officers from government once in three months, making it (16%) of extension visitation thus contradicting the finding of this study, which found (45.2%) of extension visitation. According to Moloji (2008), the influence of extension services can or cannot fulfil the farmers' needs and wants for farm operations. Subsequently, Jari (2009) says those agriculturalists who get extension help are benefiting immensely through engagement in the extension activities. Furthermore, investigations show services of officials from agriculture being biased towards farmers' co-operatives, as these farmers receive excellent services.

Table 4.3.6: Access to service/training factors percentages and frequency

Access to service/training factors	Frequency	Percentage
Practical knowledge		
No	70	26.8%
Yes	191	73.2%
Poor veterinary service		
No	119	45.6%
Yes	142	54.4%
Less/no access to credit		
No	125	47.9%
Yes	136	52.1%
Lack of extension		
No	18	45.2%
Yes	143	54.8%
Skills development		
No	96	36.8%
Yes	165	63.2%
No prevailing factors		
No	214	82.0%
Yes	47	18.0%

N=261

Source: generated from study results.

Five categories were used in the study to classify animal health factors and reproduction factors that affect smallholder cattle herd size. Table 4.3.7 above shows the frequency and percentage of animal health and reproduction factors which were rated using 'yes' or 'no' for the respondents. Farmers affected by pest and parasites were 224 with (86.6%) being the highest percentage; 215 (82.4%) respondents were affected by diseases; 178 (68.2%) respondents affected vaccines and medications, and (31.8%) were not affected

by vaccines and medications; 148 (56.7%) were faced with purchasing of dosing products and lastly, about 40 (15.3%) respondents had no prevailing factors affecting animal health. Makhura (2001) found that overcoming the highest costs for transactions makes it difficult for farmers to participate in buying products necessary for farm operations. Moyo (2010) said that farmers can grow their agriculture business by using additional drugs to prevent diseases. Reproduction factors highlighted on Table 4.3.7 show a frequency of 197 farmers having insufficient or no breeding stock, 189 with poor breed; 175 on premature death; 173 experiencing low birth weight and 43 with no prevailing factors. The respondents had insufficient or no breeding stock as the highest reproduction factor whereas the lowest rated reproduction factor was no prevailing factor. Breeding is a major factor towards growth in livestock farming, but cross breeding allows better breeds through traits' improvement (Salem and Smith, 2008).

Table 4.3.7: Animal health and reproduction factors affecting cattle farming in LNM

Prevailing factors	Frequency	Percentages
Animal health		
Pest and parasites		
No	36	13.8%
Yes	224	86.2%
Diseases		
No	46	17.6%
Yes	215	82.4%
Vaccines and medications		
No	83	31.8%
Yes	178	68.2%

N=261

Source: obtained from study field survey results.

Table 4.3.7: Animal health and Reproduction factors affecting cattle farming in LNM (continued)

Prevailing factors	Frequency	Percentage
Dosing product purchasing		
No	113	43.3%
Yes	148	56.7%
No or prevailing factors		
No	221	84.7%
Yes	40	15.3%
Reproduction factors		
Insufficient or no breeding stock		
No	64	24.5%
Yes	197	75.5%
Premature death		
No	87	33.0%
Yes	125	67.0%
Poor breed		
No	72	27.3%
Yes	189	72.7%
Low birth weight		
No	88	33.7%
Yes	173	66.3%
No or other prevailing factors		
No	218	83.2%
Yes	43	16.5%

N=261

Source: Generated from study results.

The market factor was categorised with five aspects, namely; high transport costs; no or less market; poor market price; market competition; and no or other prevailing factors. Table 4.3.8 reveals that market factors had highest mean (2.67) than management factors

(2.26), the smallest value of standard deviation was from the management factors (1.754), which revealed that less data points are closer to the mean while market factors (2.294) had the highest standard deviation showing that more data points are further away from the mean. Variance was found to be (1.275) for market factors and (0.724) for management factors, respectively. Category (70.1%) was the highest obtained for the prevailing factor, that is, poor market price and (17.2%) was less than all market factors and it was for no or other prevailing factor. Musemwa *et al.* (2008) proffer that costs of transport to be incurred by the agriculturists during transactions they participate in cause rise in costs; also, the marketing industry for farmers' produce is affected as the distance between markets is considered. Makhura (2001) says that amounts incurred for different transactions disturbs the participation of agriculturists in markets, especially to those farmers living far from formal markets in Limpopo Province.

The market factor, no high transport factor, was at (42.9%) and then there was a 'no' from farmers with no or less market access as a prevailing factor at (35.0%) and no market competitions was at (41.4%). Nkhori (2004) states that better infrastructure and roads are survival friendly to multiple farmers who want to participate in marketing their produce while Bailey (1999) insists that the information from markets can help to maintain the participation of different farmers in different choices of markets.

In relation to factors on management, (72.4%) respondents showed that their prevailing factor was maintenance; (68.5%) showed that their management factor was lack of resources; for (69.3%), it was grazing land management and for (17.2%), there were no other factors. Ntshepe (2011) highlighted that heavy-weighted animals fetch good prices. The management factor, which was rated highest for no option, was for no or other factors (82.8%). Ogunkoya (2014) revealed lack of equipment at (56%), (39.2%) for grazing land management and (6.8%) on maintenance. These results are not valued the same as the study results; however, the lack of resources was rated high.

Table 4.3.8: Market and management factors that affect smallholder cattle farming in LNM.

Variables	Percentage	Mean	Standard deviation	Variance
Market factors		2.67	2.294	1.278
High transport cost				
No	42.9%			
Yes	57.1%			
No/less market access.				
No	35.0%			
Yes	65.0%			
Poor market price				
No	29.9%			
Yes	70.1%			
Market competition				
No	41.4%			
Yes	58.6%			
No or other prevailing factors.				
No	83.9%			
yes	16.1%			

N=261

Source: obtained from study field survey results.

Table 4.3.8: Marketing and management factors that affect smallholder cattle farming in LNM. (Continued)

Variables	Percentage	Mean	Standard deviation	Variance
Management factors		2.26	1.754	0.724
Lack of resources				
No	31.5%			
Yes	68.5%			
Maintenance				
No	27.6%			
Yes	72.4%			
Grazing and land management				
No	30.7%			
Yes	69.3%			
Other or no prevailing factors				
No	82.8%			
Yes	17.2%			

N=261

Source: Generated through field survey results.

One of the factors that was considered most by the cattle farmers (see Table 4.3.9) was that they would like their livestock to increase (94.8%). Moreover, 6.1% did not need their livestock to increase because of the prevailing factors that affect their production, such as small or no enough grazing land, affordability and more costs for feeding; health and management factors, current animal loss factors such as high stock theft; more land used for housing and other purposes except for agriculture and lack of stakeholder engagement in the LNM. R52 will be obtained from rise in production of Zea maize sales (Makhura, 2001). Despite the factors affecting smallholder cattle farming, (75.0%) of 261 farmers showed that there was no access to bigger land and good breeding stock and better infrastructure. However, most farmers' interest was to increase their stock (85.1%) and (86.2%) showed that the best way to get good breeding stock; (78.2%) was interested

in getting both bigger land and breeding stock. (70.9%) of the respondents required infrastructure and veld diving while (6.1%) did not show increase in stock. According to Ortmann and Machete (2003), one of the obstacles to improvement in agriculture is a better distribution of resources such as land where inappropriate distribution can affect their sustainability.

Table 4.3.9: factors in relation to increase in livestock

Increasing livestock factors	Increase livestock		
	No	Yes	Total
Increase land size			
No	50.0%	13.8%	14.9%
Yes	50.0%	86.2%	85.1%
Getting good breeding stock			
No	87.5%	11.5%	13.8%
Yes	12.5%	88.5%	86.2%
Accessing bigger land and good breeding Stock			
No	75.0%	19.8%	21.5%
Yes	25.0%	80.2%	78.5%
Getting better infrastructure			
No	75.0%	27.7%	29.1%
Yes	25.0%	72.3%	70.9%
Not increase stock			
No	87.5%	94.1%	93.9%
Yes	12.5%	5.9%	6.1%
Increase in livestock	3.0%	94.8%	100%

N=261

Source: obtained from study field survey results.

4.4 Empirical results for socio-economic factors that affect smallholder cattle herd size

Table 4.4.1 below shows the estimated results of the ordinary least square multiple linear regression model, which was used to determine the relationship between independent variables (socio-economic) and dependent variable (cattle herd size). Table 4.4.1 also shows the independent variables with their corresponding estimated coefficients (std. error), t-value, significance, and standardised coefficients beta (B). The B values measures the expected change in the dependent variable for the unit of change in each independent variable if all the independent variables are kept constant. The sign of significance determines whether the independent variable is positively or negatively significant. For the study, the positive sign implies that an increase in the independent variable will likely increase the cattle herd size.

As portrayed by Table 4.4.1, out of 19 independent variables used by the model Ordinary Least Squares multiple linear regression, only five independent variables were significant. The independent variables that significantly had effect on cattle herd size were age, livestock keeping, planted pasture, household size, and sales per year.

The significant level (P) for the independent variables indicates that sales per year was (0.01) significant, while livestock keeping and planted pasture were (0.05) significant to the study. Age and household size were independent variables found to be significant level at (0.10). The other remaining 14 variables for the study were found to be insignificant but included in the model. Adjusted R square standards of OLS regression for cattle herd size were (0.664). This indicates that the explanatory variables of (66.4%) of the total variation in the cattle herd size. The adjusted R square shows explanatory variables that are not encompassed disturbing variation in cattle herd size (33.6%).

Durbin Watson value represents a test for autocorrelation in the residuals from a statistical model. Based on the study Durbin Watson was (1.879), this number value ranges from 0 to less than 2, which represented positive autocorrelation for this study.

4.5 Discussion of the results

Livestock keeping indicated a negative effect at a significant level of (0.01) on cattle herd size. This implies that an increase in livestock keeping as a source of income decreases the cattle herd size. Since livestock is the source of income, farmers get additional income in order to get additional income and this in turn reduces the number of herds. Animal keeping or husbandry is an important activity practiced nowadays in South African societies (Ntshepe, 2011). Machete (2004:4) says that livestock farming is a source of more than (40%) of money used by households to sustain their living. FAO (2009) found that many smallholder livestock keeping farmers lower end production were resources to be used when increased, picks up the agriculturists and enables them to overcome farming challenges. Imai (2003) revealed that the necessity of livestock is helping household smallholder farmers to cope with risks and uncertainties, as livestock diversifies income for many farmers through its sales for cash.

Planted pasture was found by the study to be positively significant to cattle herd size at significant level (0.05). Agronomists will likely feed animals, thus many livestock farmers can move away from reliance on natural/veld grazing; instead, plant pastures, as shown on Table 4.3.3, grazing land was very poor with less grass, farming in small grazing land (89.0%). Insufficient feed was a challenge, which affected the productivity, profitability, and health of the animal while supplements can be used as a source for feeding. Mulaudzi (2015) says that the typical cost-effective factor acts to cover up livestock nutritional needs, this only include the incurred costs for feeding animals while other costs are still to be incurred and reduce sustainability. Most previous studies show that land to be used for planting pasture is one of the factors that is very difficult to increase and maintain due to high population increase and other major uses exceptional to agriculture (housing, rentals). Increase in livestock herd size is hindered by the difficulty of obtaining enough planting and grazing land (Vithanage *et al.*, 2014). Over-usage of natural grazing results in overgrazing, which in turn leads to degradation and extinction of vegetable resources and other plantations (Macharia and Ekaya, 2005). Integration of forage is another way of subsidising animal feed through growing of legumes and pasture.

Sales per year (0.01) was found positively affecting cattle herd size at a significant level. An increase in sales per year increases livestock numbers. Most of the high costs generated by farming operations hinder smallholder agriculturalists from marketing products. Such costs will not be observed because of poor record keeping (selling) and supervision skills to provide clear evidence for credit acquisition (Alene *et al.*, 2008). NDA (2005) argues that products not easily marketable to consumers because transportation costs hamper smallholder agriculturalists from getting markets rewards. Lubungu *et al.* (2012) say that the number of cattle increases also increases the level of category of a farmer. Ogunkoya (2014) says that socio-economic factors affecting cattle and sheep size showed positive significance on sales per year which is the same as the results of this study.

Age was negatively significant to cattle herd size at a significant level of (0.10). Results of the study imply that as the age of household respondents grows, the cattle herd is minimised. Age tends to be at a high risk as most of the youth get employed in the formal and informal sector because they take agriculture as a dirty business (Musenwa *et al.*, 2007). Age, especially of the family head, is very crucial as most of the family heads take decisions in the household and those decisions also affect the youth in the family. It also makes it difficult to respond to opportunities (Makhura, 2001). It is often difficult to explain experience in farming, as it often goes with the age of farmer; so, farmers who are old and with more years in farming are likely to invest in farming (Ngyangweni and Delgado, 2003). Makhura (2001) highlights that most older farmers are likely to participate in horticultural markets; however, they tend to sell significantly less compared to young farmers.

Household size had a positive significant at a significant level of (0.10) to cattle herd size, according to Table 4.4.1. This means an increase in unit of cattle herd size increases livestock figures with (23.3%). Agricultural arrangements in Africa show that family size is an essential aspect in the provision of farm workers and their availability to farm, to accomplish the farming duties and are cheap to work for. Kaimba *et al.* (2011) found household size with positive significance (0.10) on herd size, showing that small family size is more disadvantaged than large family members, as a large household consist of

more labour. Productive management of huge herds has a maximum benefit for a household where the family household can require external members from both genders to assist in farming (Majekodunmi, 2011).

Table 4.4.1: Ordinary least square regression results

	B	Coefficient Std. error	T value	Significance
Dependent variable Y= Cattle herd size				
Independent variables				
X1= Age	-0.062	0.037	-1.801	0.090*
X2= Gender	0.004	0.867	0.068	0.946
X3=Experience in farming	-0.035	0.037	-0.836	0.404
X4=Education	0.023	0.068	0.561	0.675
X5=Household size	0.233	0.129	1.176	0.075*
X6=Household income	0.057	0.461	1.386	0.167
X7=land ownership	0.041	1.591	0.660	0.510
X8=access to extension	-0.037	0.872	-0.878	0.381
X9= Access to veterinary services	-0.022	0.934	-0.486	0.628
X10=Access to credit	-0.060	0.813	-1.466	.0144
X11= Sales per year	0.535	1.132	11.476	0.000***
X12=Problem with transportation	0.033	0.854	0.779	0.437
X13=Land Acquisition	0.018	2.026	0.334	0.738
X14=Grazing Land condition	-0.023	0.327	-0.568	0.571
X15=Livestock keeping	-0.083	0.268	-2.008	0.047**
X16=Camp System	-0.043	1.771	-0.149	0.882
X17= Type of grazing	-0.017	1.336	-0.404	0.687
X18=Planted pasture	0.114	1.300	2.161	0.042**
X19=Dosing products purchase	-0.012	0.935	-0.256	0.798

N=261; R- Square= 0.664; Durbin Watson =1.879; ***p<0.01; **p<0.05; *p<0.10.

4.6 Framework of smallholder cattle farmers

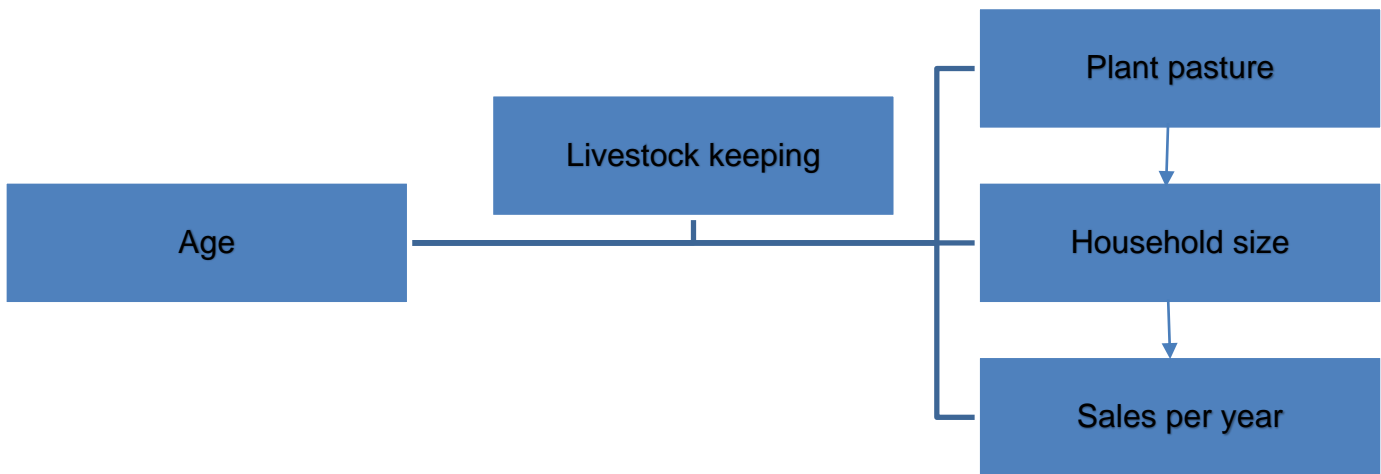
The diagram below shows the means by which smallholder cattle agriculturalists can avoid their susceptibility to socio-economic factors which disturb agribusiness. The diagram shows those variables that were found significant by the study, which are: age, livestock keeping, planted pastures, household size and sales per year. It links them to how farmers can use them to alleviate their vulnerability to cattle farming.

The framework below (Diagram 1) shows all socio-economic factors that were found significant by the model. Age is the main source and all other significant variables link to it. It is connected to livestock keeping, which shows that the age of the farmers determines the way they keep their cattle to increase herd size is determined by age, where if most of the youth farmers are involved in farming participation, this would increase their experience and most herd will be obtained as the youth often likes new improvement and innovation. Machingura (2007) mentions that farmers' age is an influencing factor in determining success or no success for the farmer.

Livestock keeping acts as a source of income to different aged individuals and the livestock requires pastures. Livestock keeping is linked to planting pasture which shows that enough feed maintains livestock. This would create an opportunity for the livestock numbers to increase as more feed will be provided to subsidise feed. Furthermore, when household size increases, it creates an opportunity for labour to maintain farms and compete in markets through sales per year mainly to generate income. Societies rear livestock in agriculture to obtain admittance to land for grazing. Conversely, livestock herds differ because of their presence to help farmers get land, and the invention routines (Meissner, 2013; Scholtz *et al.*, 2013).

All these three variables, namely; plant pastures, household size and sales per year are linked to livestock keeping where they are used because there is livestock kept. Respondents' results showed that their socio-economic characteristics, which can improve their cattle herd size are age, livestock keeping, plant pastures, household size and sales per year. However, other variables had an impact on cattle numbers even though they tested insignificant.

Diagram 1: Significant socio-economic factors



CHAPTER 5

Summary, conclusion, and recommendations

5.0 Introduction

Data obtained from the field were evaluated or analysed in Chapter 4 of this study. Livestock farming is practiced by the nine provinces of South Africa and in all farming levels (smallholder, emerging and commercial farming). Moreover, there are certain socio-economic factors which hinder the livestock herd size. The study was conducted at Lepelle-Nkumpi Municipality (LNM) to achieve the objectives and to test the hypothesis and answer the research questions provided in Chapter 1. This chapter provides an overall summary of the study results and draws conclusions based on the results of the study and recommendations are made based on the research findings. In addition, this chapter provides and evaluates the initial study objectives and hypothesis with respect to the results presented and discussed in Chapter 4.

5.1 Summary based on study findings

The findings of the study based on the objectives of the study are highlighted below:

- To identify and describe socio-economic and demographic characteristics of smallholder cattle farmers in Lepelle-Nkumpi Municipality.

The study revealed that most of the smallholder cattle farmers in the study area were males (58.1%) and elderly (43.1%) with the highest level of education being secondary education (43.3%). Furthermore, the study found that most of the male respondents were married (81.3%) and with a household size of (53.3%) on 0-5 members. Respondents from the study area considered farming as their main occupation (40.1%) because many farms were owned by family members (71.2%) and farming was the main source of income (55%). Many respondents earned an income of less than 60 000 and most had greater than 12 years of experience in farming (62.2%). Educated farmers are likely to understand the factors that lead to reduction in production, focus on herd management and building even though most of the farmers use traditional way to practice farming unlike learning farming from school (Montshweni *et al.*, 2005; Bizimana *et al.*, 2004).

- To investigate factors affecting smallholder cattle farmers in the study area.

The study used descriptive statistics, which revealed that smallholder cattle farmers in LNM were affected by the camp factor and water circulation (72.8%) more than other camp factors. Most smallholder cattle farmers found it very easy to acquire land (50.2%). The feeding factor that affected farmers most was no/less grazing (69.3%). Most of the farmers grazed their cattle in a small grazing land (81.6%) with land condition being very poor with less grass (89.0%). The climatic factor that affected the cattle farmers was drought (89.7%) and most cattle were lost through stock theft (77.8%) at the study area. Furthermore, the study results revealed that in terms of access to service/training, practical knowledge (73.2%) was most likely not applied to many farmers.

Pest and parasites (86.2%) as a prevailing factor against animal health affected reproduction factors and thus resulted in insufficient or no breeding stock (75.5%). Maintenance (72.4%) of management factors was revealed to be the most prevalent factor and the market factor was poor market price (70.1%), as the highest factor. Most of the farmers would like their livestock to increase (94.8%) and this could be attained by the farmers being able to get good breeding stock (86.2%). These were the factors mostly affecting the farmers in the study area in LNM.

- To examine the socio-economic factors affecting smallholder cattle herd size in the study area.

The study used the OLS multiple linear regression model, which revealed that five variables were significant. Two variables (2) variables (age and household size) were significant at level 0.10; two (2) variables (livestock keeping and planted pasture) were significant at level 0.05 and only one (1) variable (sale per year) was found significant for the study at the significant level 0.01. The other used fourteen (14) variables (gender; experience in farming; education; household income; land ownership; extension provision; veterinary availability; availability of credit; problem with transportation; land acquisition; grazing land condition; camp system; type of grazing, and dosing products purchase) in the model were found insignificant.

- To develop a framework showing in what way smallholder cattle farmers can alleviate their helplessness to the socio-economic factors affecting their cattle farming.

The study further revealed that farmers can link those variables found significant, namely; age, livestock keeping, plant pasture, household size and sales per year to alleviate their vulnerability. These five major significant independent variables linked to others show how the socio-economic factors affect the farmers in cattle farming and how to use them to help improve cattle herd size.

5.2 Conclusion

The study intended to answer the following research questions: what are the socio-economic and demographic characteristics that affect cattle farmers in LNM?; what are factors affecting smallholder cattle farmers in the study area?; what socio-economic factors affect smallholder cattle herd size in LNM of Limpopo Province and lastly, which framework could assist LNM smallholder cattle farmers to alleviate their helplessness to the socio-economic factors that affect their cattle farmers?

Male (58.1%) respondents were more than the females (39.7%), most of the respondents were elders above 60 years (43.7%) and the OLS model found age (0.090) to be negatively significant to the study. The study area consisted mainly of married farmers (73.2%) and most people considered farming (40.1%) as their occupation, with 65.2% of farmers having 12 years more knowledge in agriculture. Moreover, farming land ownership was owned mostly by family members (71.2%). Most respondents had a household income of less than 60 000 per annum and farming was the main source of income (55%) for many households. The OLS model found sales per year significant, allowing farmers to generate additional cash and making a living or improving standards of living through livestock keeping.

The study found that most respondents had a problem with the current camp system because it affects cattle farmers negatively. One of the things that farmers do not have control over them is the climate changes, especially drought (89.7%), and animals do not have enough pasture as a result. This implies that farmers must be assisted or supported to identify and utilise the full potential of their natural, social, and physical assets available to them for sustainability and living off farming. Feeding factors which were mostly experienced by farmers were less grazing land, high feed costs, less feed and poor forage quality. The reason might be that most of the farmers' land-based livelihoods require more

substantial investments in the relocation of land to alleviate shortage of land. Access to extension services (54.8%) was not considered regarding the factors affecting cattle farming. These can happen because of less/no enough labour (extension) issued to the group of farmers; so, more jobs allocated to a few people make it difficult to cater for the target group. Respondents stated that the condition of their grazing land was very poor with less grass (34.1%). This was because most of the land was used for residence, which in turn resulted in small grazing lands (89.0%), further causing overgrazing (71.4%), overstock (79.1%), and high mortality rate (66.3%) due to malnutrition or less forage.

Factors affecting animal health were pest and parasites (86.2%); animal loss was caused by stock theft (77.8%); reproduction was either insufficient or there was no breeding stock (75.5%), which in turn might have been caused by lack of proper farming management, diseases (82.4%); less feed (65.9%); market factor (poor market price (70.1%). The farmers showed that they would like their livestock to increase (94.8%), and some did not like their livestock to increase (3.0%) because they could not maintain huge herds. The farmers who would like their livestock to increase wanted more wealth and therefore required a good breeding stock (78.5%).

Based on the study results obtained from Ordinary Least Squares multiple linear regression model, the study shows that the following variables were negative significant to the study, namely; age and livestock keeping. Household size, sales per year and planted pastures were found to be positive significant by the study.

With respect to the empirical results, a larger household owned a large herd of cattle than small households because agriculture mostly uses family labour; so, there is enough labour to perform farming activities. Age was found negatively significant because most of the youth grow and relocate to better areas that promote development, as such, more labour remains for the remaining elders who are pensioners. This also affects experience in farming because there is less adoption, innovation and focus on farming by youth.

Livestock keeping was mostly done by the households owned and controlled by man, especially in the agricultural sector. Livestock numbers appeared positively significant because most respondents owning herds were elders and elders do not like selling; instead, they keep more livestock. Household farmers rear livestock in small numbers but

as years go on, their livestock increases. Macharia *et al.* (2007) revealed a downward movement in multiple factors affecting returns in livestock farming practices in the past 30 years.

The study found that sales per year was positively significant, which means more money was used to do other operations instead of buying feed since the type of grazing used mostly is natural/veld grazing. Instead of focusing on minimising costs where the farmers should plant pastures and as a result, most of the farmers showed that they rely on rain so they only plant in rainy seasons because they are enough water points. Sales per year enable farmers to cater for their expenses such as buying medications, supplements as well as feed to improve the production and productivity of livestock. Most of the farmers categorised the way of acquiring land as easy, which resulted in less camp system because everybody could access it easily.

The study rejects the hypothesis: Age, education level, farm size, gender, and farming experience have no positive and significant influence on livestock herd size in LNM area.

5.3 Recommendations

The study recommends that land management must be adhered to by the people. The land givers (municipalities or tribal authorities) has to consider the ways of distributing communal resources to smallholder agriculturists, so that an increasing population does not affect grazing in that area. Policies should provide guidance on how people should utilise commonage land and strict penalties should be imposed to avoid ignorance.

Farmers' group, organisations or association must be encouraged, as they will help in the establishment of monetary services, trainings, suggested services, skills growth as well as transmission of knowledge, market access, youth empowerment and participation. Animal loss prevention factors such as establishing a minimisation committee and service provider engagement to promote support and solutions to farmers should be encouraged. Farmers should buy or sell goods or their livestock in bulk so that they can share transport costs. In this way, they will be able to share costs of production, purchasing and maintenance of farming.

Goods fluctuate and that could be one of the factors that hinder better production. As such, farmers can plant pastures instead of always buying feed and then the money for buying feed will be saved or used for other purposes. This in turn will help the farmers improve their livestock feeding where grass is very poor or less for grazing. Smallholder agriculturists should receive training on how to make other resources available such as planting animal feeding crops to increase feeding availability during rainy or no rain seasons. Training should also be forced to diversify farming and allow merged farming. Farmers should take advantage of using feed to reduce more dependence of animals to natural veld and uses of other crops such as legumes into pasture to allow production throughout the year.

Smallholder cattle farmers must engage in the process of using a camp system, which consists of rotational farming or rotational grazing, which will minimise the effect of overgrazing and overstocking. This in turn will help to maintain good breeding stock by not always mixing males with females always. Instead, they will mix them in times of need, which will also help to increase mating. There should be farm reviews to check management and maintenance. Thereafter, workshops should be organised to encourage youths and other aged groups to participate in farming. A farming school should be established, especially at junior levels so that the passion for farming starts at a younger stage. This will encourage the youth's involvement in farming and increase skills, thinking and participation in farming at an early age.

Extension, veterinary and purchasing of dosing products should be encouraged and practiced to help farmers know and be taught on animal health, animal loss factors, maintenance, management factors, record keeping, market related factors, feeding factors and other factors that might be hindering their production. Extension officers should be utilised to equip farmers with necessary resources, knowledge, and practice so that farmers can detect both negative and positive outcomes in farming. Professional advice should be encouraged to develop farmers' interest so that they remain in farming and increase their livelihood through it.

More studies should be encouraged on farming so that problems encountered by farmers are addressed. Most agriculturalists do not know how to enter formal markets, which

makes them to remain producing only for their families or local producers. More stakeholders should be encouraged so that some of the related production factors are dealt with by the most sourced group. Stakeholders will help farmers to recognise that they are not only producing food, but that they are recognised as drivers of the economy (for example, creating jobs, educating people by giving them skills and recognised by organisations that emphasise productivity).

The study recommends that the local government under Department of Agriculture should engage with farmers, help them by providing subsidies so that they can purchase goods and services and avoid high transactional costs needed in their field. Investments made by the government could develop institutional capability (including remote sector) for the availability of ideas, channels and funding services needed by farmers for survival. This will create an expansion of production, which will help in marketing since access to credit is minimised. Such institutions could aid with growing industries to help poorer households, particularly those headed by single ladies or widowed households.

Furthermore, there should be a greater consideration of protocols that govern farming, which are planned to serve residents with ownership of shared areas to be developed, adopted, and implemented to share grazing arrangement that can stimulate growth in farming.

5.4 Potential further studies

Future studies can be conducted in these areas:

- Influence of economic and political considerations towards smallholder farmers decisions to contribute in agricultural marketing, practices, and sustainability.
- Marketing by looking at how farmers can informally and formally market their products.
- Feeding factors on how farmers can ensure better nutrition and growth.
- Stock theft minimisation.
- Land management, especially grazing land using different landforms.

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APPENDIX 1 (QUESTIONNAIRE)

Title:

Socio-Economic Factors that Affect Livestock herd size: A Case Study of Smallholder Cattle Farmers in Lepelle-Nkumpi Municipality, Limpopo Province.

The purpose of this study is purely academical and above all, the outcome of the study will help inform policies for addressing economic development challenges of smallholder farmers and will also assist farmers in their cattle farming. The study is to determine the socio-economic factors affecting smallholder cattle herd size in Lepelle-Nkumpi Municipality of Limpopo Province. As a respondent you are kindly requested to participate voluntarily in answering this questionnaire and you are assured that any information shared was strictly confidential. The information generated will help rural households, our extension officers, Municipality planners and decision makers, farmers as well as our traditional leaders in deciding the appropriate decision on livestock farming especially on maintaining their quantity to make economically viable decision.

General Information

1. Date of interview _____
2. Name of enumerator: Lekgoathane D.F
3. District: Capricorn District
4. Ward _____
6. Village _____
7. Number of years in the area is Years.

SECTION A. DEMOGRAPHIC CHARACTERISTICS OF THE HOUSEHOLD

RESPONDENT (tick ✓ appropriate answer on options for selection)

How many are you in your family? The size of households (in numbers) is

Gender of respondent	
Male	1.
Female	2.

Is farming major source of income	
Yes	1.
No	0.

Household marital position	Educational level	Occupation of the respondent	Number of years in cattle farming	Age of the respondent
1.married..... 2. single..... 3.widowed..... 4.divorced.....	The respondent has this education. 1.primary 2.seconary 3.tertiary 4. No formal education Number of years....	1. farming..... 2.civil servant..... 3.unemployed..... 4. business..... 5. self-employed..... 6. other	The farmer has Years in cattle farming.	The respondent isyears old.

A.2. Household income- the income amount obtained by the household head farmer is. _____

(In Rands). Choose the appropriate ranking for the provided income.

Household income is	< 60 000	200 000-300 000	120 000-200 000	60 000-120 000	>300 000
	1.	2.	3.	4.	5.

A.3 Main source of income

What is your household's main source of income?		(Please tick✓ appropriately)	
		Yes	No
1.	Crop sales		
2.	Livestock keeping		
3.	Off-farm casual work		
4.	Off-farm permanent employment		
5.	Remittance		
6.	Food Aid		
7.	Grants		
8.	Other (specify)		

A4. Livestock herd size. What is the number of (cattle) did you have in 2017 (Write the correct number)?

Cattles
1.

How many cattle did you have in 2022-2023 (write the correct number)?

Cattle
1.

SECTION B. LAND CHARACTERISTICS

B1. Farm ownership. Who owns the farmland? (Tick✓ the appropriate box)

private	family member s	Cooperatives	farmer sgroup	traditiona lheads	trust	individua l company
1	2	3	4	5	6	7

B2. Stock number (tick ✓ the appropriate box)

Do you have camp system?	1.	Yes
	0.	No

B2.1 If answer is Yes, what are the Number of camps

B2.2 Do you use natural veld/ grazing? tick ✓ the appropriate box			
1.	Yes	0.	No

B2.3 Do you plant pastures?

Does the farmer plant pasture?	1.	Yes
	0.	No

B3. Do you encounter any problem with the current camp system or the grazing field you are using?

(Tick ✓ the appropriate box)

1.	Yes
0.	No

If yes, which of these factors affect your camp system? (Tick ✓ the appropriate box)

Factors that affect camp system		Tick ✓ the appropriate answer
1.	Infrastructure	
2.	Water circulation	
3.	Inadequate water points	
4.	Insufficient camps	
5.	No camp system	
6.	No factors	

SECTION C. LIVESTOCK PRODUCTION PROBLEMS

C.1. Factors/ problems that are encountered in cattle farming.

C.1.1 Feeding factors encountered by the cattle farmer that may reduce quantity may be (tick ✓the appropriate box)

No/less grazing land		High feed costs		Inadequate or less feed		Poor forage quality		Another prevailing factor	
1.Yes	0.No	1.Yes	0.No	1. yes	0. no	1.yes	0.no	1.yes	0.no

C.1.2 Service/training/advice related factor that the farmer encounters (tick ✓the appropriate box)

Practical knowledge		Poor veterinary services		Less or no extension services		Less or no access to credit		Skills development factors		No prevalent factors	
1.yes	0.no	1.yes	0.no	1.yes	0.no	1.yes	0.no	1.yes	0.no	1.yes	0.no

C.1.3 Climate change factors (tick ✓the appropriate box)

Draught		Floods		Increasing temperature		Other	
1.yes	0.no	1.yes	0.no	1. yes	0.no	1.yes	0.no

C.1.4 Market related factors on cattle (tick ✓the appropriate box)

High transport costs		No/less market access		Poor market prices		Market competition		No/ other factors	
1.yes	0.no	1.yes	0.no	1.yes	0.no	1.yes	0.no	1.yes	0.no

C.1.5 Management factors (tick ✓the appropriate box)

Lack or resources		Maintenance		Grazing land management		No/ other factors	
1.yes	0.no	1.yes	0.no	1.yes	0.no	1.yes	0.no

C.1.6 Reproduction factors (tick ✓the appropriate box)

Insufficient/ no breeding stock		Premature death		Poor breeds		Low birth weight		No/other factors	
1.yes	0.no	1.yes	0.no	1.yes	0.no	1.yes	0.no	1.yes	0.no

C.1.7 Animal health prevailing factors (tick ✓the appropriate box)

Pest/parasites		Diseases		Vaccine and medication		Dosing product purchasing		No/ other prevailing factors	
1.yes	0.no	1.yes	0. no	1.yes	0.no	1.yes	0.no	1.yes	0.no

C.1.8 Prevailing animal loss factor (tick ✓the appropriate box)

Stock theft		High mortality rate		No/ other prevalent factors	
1.yes	0.no	1.yes	0.no	1.yes	0.no

C.2 Does the farmer encounter the following? (Tick ✓the appropriate box)

If the farmer encounters the following from C.2.1 -C.2.6		1.YES	0.NO
C.2.1 Problems to access services/training/advice			
C.2.2 Can the farmer afford to purchase vaccines, dosing, and inoculation			
C.2.3 Do you have access to veterinary services			
C.2.4 Are you a member of an farmers assortment			
C.2.5 Do you have any transportation problems			
C.2.6 Do you have any issues with availability of labors			

C.3 Livestock identification (tick ✓the appropriate box)

C.3.1 Are your livestock identified?

1.	Yes
0.	No

C.3.2 What are the issues encountered with identification (tick ✓the appropriate box)

Lack of resources		Lack of knowledge		Affordability		No factors	
1.yes	0.no	1.yes	0.no	1.yes	0.no	1.yes	0.no

SECTION D: Feeding of Livestock

D.1 How can you best describe Condition of grazing land used for feeding cattle (tick ✓the appropriate box)

Very poor with insufficient grass	Poor condition but has grass	fair-reasonable grass	Good	Very good	Other
1	2	3	4	5	6

D.2 Factors that affect the grazing of cattle (tick ✓ the appropriate box)

Grazing factors	1.yes	0. No
Small grazing land		
Weed encroachment		
Water issues		
Veld fires		
Overgrazing		
Overstocking		
Insufficient grass for grazing		
Water and weed encroachment		
No prevailing factors		

D.3 How did you acquire land or what was your process of land acquisition (tick ✓ the appropriate box)

Easily	Very Easy	Difficult	Very difficult	do not know
1	2	3	4	5

D.4 Would you like your stock to increase? (Tick ✓ the appropriate box)

1.	Yes
0.	No

Factors to increase stock	1. Yes	2. No
getting a bigger land		
Getting good breeding stock		
Getting bigger land and good breeding stock		
Better infrastructure and veld dividing		
Not increase stock		

SECTION E. The major objective for keeping livestock (tick ✓ the appropriate box)

source of income	self-consumption	Local status, success as a farmer and wealth	Lobola	Other
1	2	3	4	5

SECTION F. Which parasites affect your cattle (tick ✓ the appropriate box)

internal parasites	External parasites	Both parasites
1	2	3

SECTION G: Productivity of livestock.

G1: How many Cattle have been sold in January – December 2017-2019? _____

Ranking of number of cattle sold in January-December 2017-2019 (Tick ✓ the appropriate box)

50	50-100	100-200	200-400	>400
1	2	3	4	5

G.2 How much did you make for the purchase in January-December 2017-2019 (in Rands)? _____

Rankings of amount made (Tick ✓the appropriate box)

0-100 00	100 000-300 000	300 000-500 000	Above 500 000
1	2	3	4

G.3 How many cattle did you sell for the last two years 2020-2021? _____

Rankings of number of cattle to sold in last two years (Tick ✓the appropriate box)

<50	50-100	100-200	200-400	Above 400
1	2	3	4	5

G.4 How much (in Rands) have you made from selling cattle on the year 2020-2021? _____

Ranking of the amount a farmer makes from 2020-2021 in Rands (Tick ✓the appropriate box)

0-100 000	100 000-300 000	300 000-500 000	500 000 above
1	2	3	4

THE END OF QUESTIONAIRE....

Motho ke motho ka batho (Thanks for your participation)

APPENDIX 2: ETHICAL CLEARANCE LETTER

UNISA-CAES HEALTH RESEARCH ETHICS COMMITTEE

Date: 10/03/2023 Dear

Ms Modiba

NHREC Registration # : REC-170616-051 REC
Reference # : 2023/CAES_HREC/038 Name :
Ms ML Modiba
Student #: 67471218

**Decision: Ethics Approval from
09/03/2023 to 28/02/2026**

Researcher(s): Ms ML Modiba

modibakopanolucia@gmail.com; 079-745-8697

Supervisor (s): Mr MJ Mamashila

mamasmj@unisa.ac.za; 011-471-2440

Working title of research:

Socio-economic factors that affect livestock herd size: A case study of smallholder cattle farmers in Lepelle-Nkumpi municipality, Limpopo Province

Qualification: MSc Agriculture

Thank you for the application for research ethics clearance by the Unisa-CAES Health Research Ethics Committee for the above mentioned research. Ethics approval is granted for three years, **subject to further clarification and submission of yearly progress reports. Failure to submit the progress report will lead to withdrawal of the ethics clearance until the report has been submitted.**

The researcher is cautioned to adhere to the Unisa protocols for research during Covid-19.

Due date for progress report: 28 February 2024

Yours sincerely,

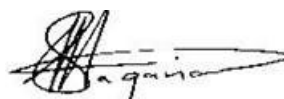


Prof MA Antwi Prof SR Magano

Chair of UNISA-CAES Health REC

E-mail: antwima@unisa.ac.za

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Executive Dean: CAES

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APPENDIX 3: Permission to conduct study.



LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF AGRICULTURE AND RURAL DEVELOPMENT

Ref: 12R
Enquiries: Dr T. Raphulu

09 February 2023

Modiba Matjatji Lucia (Student No. 67471218)
UNISA

RE: APPLICATION TO CARRY OUT RESEARCH UNDER THE DEPARTMENT OF AGRICULTURE & RURAL DEVELOPMENT: LEPELLE-NKUMPI MUNICIPALITY

1. Kindly take note that your request to conduct research titled "**Socio-Economic Factors that Affect Livestock herd size: A Case Study of Smallholder Cattle Farmers in Lepelle-Nkumpi Municipality, Limpopo Province**". The permission to conduct research in the department is valid from 23rd January 2023 to 30th November 2023.
2. The permission entails interviewing sampled smallholder cattle farmers in the Lepelle-Nkumbi Municipality using a questionnaire.
3. Kindly take note that you will be expected to hand over a copy of your final report to the Department for record purposes. You may also be invited to share your findings in the Departmental Research Forum.
4. Hoping that you will find this in order.

Kind regards



Dr. T. Raphulu
Chairperson: Research Committee

09/02/2023
Date

67/69 Biccard Street, POLOKWANE, 0700, Private Bag X9487, Polokwane, 0700

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Socio-Economic Factors that Affect Livestock Herd size: A Case Study of
Smallholder Cattle Farmers in Lepelle-Nkumpi Municipality,
Limpopo Province

by

Modiba Matjatji Lucia
(67471218)

Submitted in accordance with the requirements for
the degree

MASTER OF SCIENCE (AGRICULTURE)

in the
COLLEGE OF AGRICULTURE AND ENVIRONMENTAL SCIENCES
DEPARTMENT OF AGRICULTURE AND ANIMAL HEALTH

at the

University of South Africa

Supervisor: Mr. Mamashila M.J

July 2024

APPENDIX 5: LANGUAGE EDITOR'S REPORT.



WriteRight Language Editing Services
640 Munnik Avenue, Bendor, Polokwane, 0699
Registration No. 2023/162786/07
moffatsebola@gmail.com, 0697110718
DATE: 05 April 2024

Re: Certificate of Editing

I hereby advise that I edited a research proposal titled: **"Socio-Economic Factors that Affect Livestock Herd size: A Case Study of Smallholder Cattle Farmers in Lepelle-Nkumpi Municipality, Limpopo Province"** by **Modiba Matjatji Lucia**. My editorial interventions entailed the following:

- English academic language editing, including grammar, spelling, tenses and subject/verb agreement. Efforts were made to ensure that UK English instead of US English was used consistently in the text. Therefore, verbs such as "organize", "emphasize", "realize" and "behavior" were spelled thus, "organise", "emphasise", "realise" and "behaviour", respectively.
- Style and full reference editing according to the Institution's style guide. Here, I checked consistency in the formatting of in-text references and the list of references, including checking that all the sources cited in text were duly acknowledged and that all the sources on the list of references appeared in the text. Addressing inconsistencies in the use of font types and sizes throughout the document.

Please note that I have not had sight of the manuscript since editing, with Lucia either accepting or rejecting suggested changes or corrections, as is usual. Unless tampered with prior to your reception of the edited work, I trust you will find the editing quality in order.

Regards
Dr Moffat Sebola,

APPENDIX 6: Article publication report.

FACTORS AFFECTING LIVESTOCK HERD SIZE IN THE LEPELLE- NKUMPI MUNICIPALITY OF LIMPOPO PROVINCE, SOUTH AFRICA: ACASE OF SMALLHOLDER CATTLE FARMERS

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ABSTRACT

Purpose: This study aimed to investigate factors affecting cattle herd size in the Lepelle-Nkumpi Municipality, Limpopo Province.

Method: A proportionate random sampling technique was used and a total of 261 smallholder cattle farmers were selected as participants in this study. Primary data were obtained using a well-structured questionnaire, where the participants were interviewed face to face. The data obtained were captured and analysed using Statistical Package for Social Sciences (SPSS) version 28.0. Descriptive statistics and ordinary least squares (OLS), using a multiple linear regression model, were employed to analyse factors affecting cattle herd size in the study area.

Results and conclusion: Descriptive statistics results revealed that the prevailing factors that affect cattle herd size in the study area included the following: draught; practical knowledge; no/lack of; maintenance; water circulation; access to good breeding stock; poor market prices; grazing land; stock theft; insufficient or no breeding stock and pests/parasites. The OLS regression results, derived from a multiple linear regression model, revealed the variables that significantly affected cattle herd size, and this included age, household size, sales per year, livestock keeping, and planted pasture. Most farmers (91.4%) would like to increase their livestock numbers. It was recommended that extension services should be encouraged, training should be provided, and stakeholders should be engaged to help cattle farmers in the study area. Policies aimed at improving livestock production among smallholder farmers should be informed by the factors and determinates found in this study. Value: This study contributes useful information for potential livestock farmers. In addition, the outcome of this study could be used as the basis for informed policy formulation to improve livestock production which will ultimately improve food security status of farmers.

Keywords: cattle herd size, ordinary least square, smallholder cattle farmers, lepelle-nkumpi municipality.

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