Investigating the impact of the National Red Meat Development Programme in improving household food security and the perception of farmers on grass biodiversity in uMzimkhulu Local Municipality, KwaZulu-Natal

By

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ABSTRACT

The study aimed to investigate the role of the National Red Meat Development Programme on household food security and grass biodiversity in rural areas at uMzimkhulu. Self-administered questionnaires achieved this for all the 77 smallholder beef farmers under the St. Paul feedlot project between July and September 2021. Lived experiences of the farmers were identified, characterized, and presented into themes. This is a phenomenological study using a mixed research approach. Data analysis was conducted using the Household Food Insecurity Access scale (HFIAS) developed by the USAID to determine St. Paul feedlot beneficiaries' household food security status, and descriptive statistics were used to assess farmers' perception of grass biodiversity loss in the study area. The study findings reveal that the majority (80.50%) of the beneficiaries were food insecure while 19.50% were food secure. Food insecurity was mostly associated with farmers who were unable to sell their cattle or those whose cattle were not ready to be marketed when bureaucratic obstacles such as inadequately funding of the programme, lot of red tapes in policy implementation, Service Level Agreement (SLA) not signed on time and lack of integration of government departments supporting the programme. Farmers have indicated that feed challenges were the main constraints to the programme. The feedlot will spend most of the time without the feed, at some point there was not operational cash to purchase feed and treatment. Therefore, farmers lost opportunities to earn an income due to such challenges. Most of the farmers perceived that the was a grass biodiversity loss in the area. Chi-square results show a significant difference (p = 0.001) between gender and factors that threaten grass biodiversity. Most of the farmers report that climate change is a threat to biodiversity. The study indicates that farmers are aware of the grass biodiversity loss, and their perception is that livestock and rangeland burning is one of the main causes of this biodiversity loss. However, most of them indicated that they feel like they were not informed about biodiversity loss, but they can notice it.

The programme to be effective in addressing food insecurity and grass biodiversity the SLAs must be signed on time and budget must be given a greater attention to prevent facilities to have shortages of feed and treatments. Efficient of budgeting for the programme will allow it to be sustainable and be able reduce food insecurity and grass biodiversity loss. The marketing platform for the output in the programme need to be revisited because the classification system used in South Africa's formal markets do not favour cattle from smallholder farmers. And there is a need of efficient capacity building for smallholder farmers for the management of cattle before it is sent to the feedlot and cattle breeds and age required. The government need to

intervene by reduce red tapes in policy implementation and revise the tendering system used in procurement of agricultural products. Moreover, the programme it need to implement a policy that accepts younger animals in the custom feedlot.

DECLARATION

I, **Sibongiseni Peacock,** declare that:

- The research reported in this dissertation, except where otherwise indicated, is my original research.
- This research has not been submitted for any degree or examination at any other university.
- This dissertation does not contain other persons" data, pictures, graphs or other information unless expressly acknowledged as being sourced from others.
- This dissertation does not contain other persons' writing unless expressly acknowledged as being sourced from other researchers. Where other written sources have been quoted, then:
    - Their words have been re-written, but the general information attributed to them has been referenced.
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- This dissertation does not contain text, graphics or tables copied and pasted from the Internet unless expressly acknowledged, and the source is detailed in the dissertation and the References sections.

Signed: ……………………………………………………… Date.................................. 11 July 2022

Sibongiseni Peacock

As the research supervisor, I agree to submitting this dissertation for examination.

Signed: ………………………………………………………….. Date…………………… 11 July 2022

Mr. D.K Naidoo

As the research co-Supervisor, I agree to submission of this dissertation for examination.

Signed: PP.……………………………………………………… Date…………………… 11 July 2022

Prof. S Dube

DEDICATION

To my late grandmother Nofezile Notsona Yali ntombi ka Mcholweni le-degree ziziqhamo yembewu owayihlwayela ndisengumntwana, Nongetheni Corencia. Peacock enkosi ntomb' endala ngesandla sakho esingatefisiyo and most of all, to my son Sibongise 'Ndindi' Peacock.

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LIST OF ABBREVIATIONS

CFP   Custom Feedlot Programme

DAFF: Department of Agriculture, Forestry and Fisheries

DALRRD: Department of Agriculture, Land Reform and Rural Development

DRDLR: Department of Rural Development & Land Reform

FAO: Food and Agriculture Organization

HFIAS: Household Food Insecurity Access Scale

IPA: Interpretive Phenomenological Approach

KZN: KwaZulu-Natal

NAMC: National Agricultural Marketing Council

NRMDP: National Red Meat Development Programme

PACSA: Pietermaritzburg Agency for Community Social Action

SANHANES: South African National Health and Nutrition Examination Survey

SANBI: South African National Biodiversity Institute

SPSS: Statistical Programme for Social scientists

STATS SA: Statistics South Africa

SDGs: Sustainable Development Goals

UKZN: University of KwaZulu-Natal

UNICEF: United Nations Children Fund United Nations International Children's
                    Emergency Fund

CHAPTER 1: INTRODUCTION

1.1 Background information

More than 3.1 million South Africans live in poverty, with 60% of the population living in communal areas (World Bank, 2018). While 3.1 million South Africans live below the poverty line, 14 million are food insecure despite South Africa producing enough food to feed the nation (Department for Agriculture, Forestry and Fisheries, (DAFF), and Department for Social Development, (DSD), 2013; Shelembe, 2018). At the household level, South Africa is food insecure (Abdu-Raheem, 2013). Export surpluses contribute to meeting national food requirements; imports are simply used to compensate for country-produced or country-required shortages (Abdu-Raheem, 2013). High poverty persistence, food insecurity, and low-income levels are the rural population's primary threats. Livestock is an essential and biggest productive asset of smallholder farmers (Lubinga at el., 2018). Thus, cattle productivity and socio-economic contribution should be improved and sustained to boost the poor's well-being.

Cattle production is an important sub-sector of agriculture in South Africa. It contributes approximately 25-30% to the total agricultural production per year (Musemwa *et al.,* 2008). Forty percent of the country's total cattle herd was made up of communal cattle farmers in 2012 (DAFF, 2013). Livestock ranching in South Africa is a vital source of livelihood and income for rural women and the poor (Sotsha *et al.,* 2017). Smallholder cattle producers have a substantial cattle population that can significantly contribute to nutrition, food security, and income at a household level (Tada *et al.,* 2012). Fakudze (2015) reported a lack of practical programmes to assist communal livestock producers. With declining natural resources, ever-increasing population pressure, and rising living standards, examining solutions that endorse household food security and farm-level conservation objectives is now more important.

Food-insecure and impoverished populations reside in countries with the most significant biodiversity resources (Abdu-Raheem, 2013). This suggests that the endeavours geared towards solving food security problems and biodiversity conservation should not be in isolation from each other (Abdu-Raheem, 2013). Von Bormann (2019) reported that worldwide food production practices are approximately 40% of the Earth's land surface and 70% of freshwater resources. Simultaneously, meat production alone is associated with 18% of emissions (FAO, 2006).

South Africa covers an area of 122 million hectares representing 2% of the world's land surface. South Africa ranks as the third most biologically diverse country globally and contains three of the world's 34 biodiversity hotspots (Government of South Africa, 2015). Driver *et al.* (2012) revealed that in South Africa's terrestrial ecosystem types, 40% are threatened, with 9% critically endangered, 11% endangered, 19% vulnerable, and while 35% have no protection. Still, over 50% of the grassland biome in South Africa is threatened (South African National Biodiversity Institute (SANBI, 2013). The United Nations have intervened by setting Sustainable Development Goals (SDGs). Goal 2 of the SDGs aims to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture (Von Bormann, 2019).

Degradation of rangeland can be due to multiple contributing factors, ranging from grazing management, plant harvesting, bush encroachment, and forest plantation. Livestock grazing is particularly responsible for rangeland degradation (Palmer and Bennett, 2013) and the loss of biodiversity (Watkinson and Ormerod, 2001) through biomass reduction, trampling, and root destruction. The study by Nyingi *et al.* (2018) claims that overgrazing contributes to the loss of perennial and palatable species, which leaves the land bare or covered by annuals, including *Aristida congesta*, and that leads to the loss of biodiversity. Nyingi *et al.* (2018) argue that overgrazing facilitates bush encroachment and the resulting invasion of alien species, which replace the herbaceous vegetation and native plants, respectively.

According to Nyingi *et al.* (2018), livestock overgrazing presents a significant threat to plant diversity, and stakeholders within the red meat industry will also have to act quickly and begin a programme to preserve plant biodiversity and provide household food security in communally managed areas. The program may be designed to keep farming impacts to a minimum and offer training on land management techniques such as veld condition assessment, grazing, and fire management strategies. For this reason, the preservation of the natural ecosystem and sustainable food production will both coincide with biodiversity conservation.

According to the DAFF (2013), the red meat sub-sector has contributed 15.4% to the total gross value of agricultural production during the 2011/2012 fiscal year, with cattle accounting for 10.7%. Musemwa *et al.* (2010) and Ndoro *et al.* (2013) found that the 3 million smallholder livestock farmers in communal areas provide only between 5 and 10 % of the overall off-take in the formal beef sector. According to Sotsha *et al.* (2017), livestock products remain among the few rapidly rising markets in the agricultural sector for households affected by poverty.

The studies of Delgado *et al.* (1999) and Sotsha *et al.* (2017) show that the lower-income earners derive a higher income from livestock than the higher income earners. According to Mapiye *et al.* (2009), cattle production is an integral part of communal farming, where cattle are raised on extensive systems to improve livelihood by providing both cash and milk and ceremonial purposes. Organic beef can be raised by cooperative farmers in South Africa using adaptable breeds reared on the veld (Kunene-Ngubane, 2015).

Kunene-Ngubane (2015) asserts that beef is an appropriate protein source in South Africa, and it is the second from poultry in the region. Livestock marketing is critical for the growth of the public sector, consequently impacting food security and biodiversity (Sotsha *et al.,* 2017). Even though this study can be used to determine the effect of the National Red Meat Development Programme (NRMDP) on household food security, this analysis will only be limited to the Kwa-Zulu Natal Province. Despite the importance of beef production in the South African economy, much less is known about the role of NRMDP on household food security and grass biodiversity. The demand for beef in Southern Africa evokes an opportunity for enhanced socio-economic and ecological stewardship of the local resources. Therefore, the study will identify critical drivers behind communal farmers' food security status and grass biodiversity reflected through their participation in the NRMDP.

1.2 Background of the National Red Meat Development Programme (NRMDP)

The National Red Meat Development Programme is a livestock marketing and community engagement initiative that seeks to increase farmer participation in formal markets. The study by Sotsha *et al.* (2018) describes that the initiative was originally driven from 2005 by ComMark as the Eastern Cape Red Meat Project (ECRMP) sought to increase the formal market participation of communal livestock farmers. However, its funding ended in 2008, after which the program was inherited by the National Agricultural Marketing Council (NAMC) (Fakudze, 2015; Sotsha *et al.,* 2017). The Department of Rural Development and Land Reform (DRDLR) has since sponsored the initiative. Sotsha and Mazibuko (2017) mentioned that the NRMDP affords the communal farmers to generate an additional value from the sales of their animals than they otherwise would have generated had they not participated in the programme. This is accomplished by the provision of feed, water, and immunizations in a controllable way (Sotsha and Mazibuko, 2017). The revenue earned by the animals sold through this programme

is typically greater than the revenue generated by the animals sold without this intervention (Sotsha and Mazibuko, 2017; Sotsha *et al.,* 2018; Ntombela *et al.,* 2013; Myeki *et al.,* 2014; Lubinga *et al.,* 2018).

Currently, the program has five operating CFPs in KZN, with the one located in St. Paul, the biggest of these, with a capacity of 500 animals. The project's primary purpose was to increase internal market structures and reform the institutions regulating the livestock industry while also encouraging the growth of the private sector's capacity in assisting communal farmers (Fakudze, 2015). To reduce the marketing constraints faced by smallholder livestock farmers in formal marketing. Furthermore, the programme aims to increase the income for communal livestock farmers through participation in formal marketing. To enable farmers to understand the structure, operation, and requirements of formal red meat markets (Fakudze, 2015; Sotsha *et al.,* 2017).

They are called custom feeding facilities because they accommodate all kinds of animals regardless of the age condition (Sotsha and Mazibuko, 2017; Sotsha *et al.,* 2018; Ntombela *et al.,* 2013). The livestock is put in a feeding programme for three months and in return, farmers are paying a seven per cent fee per livestock. The fee is deducted from the money paid by the buyer for the livestock during auctions (Fakudze, 2015; Sotsha *et al.,* 2017).

The NAMC is working in collaboration with the Department of Rural Development and Land Reform (DRDLR) as a funder, Provincial and Local Department of Agriculture, development agencies, and district and local municipalities and other relevant stakeholders (Fakudze 2015; Sotsha *et al.,* 2017). Currently, the programme is being funded by the Department of Agriculture, Land Reform and Rural Development (DALRRD). The department was formed because of a merger of the Department of Agriculture, Forestry and Fisheries (DAFF) and the DRDLR following a redefinition of national priorities by President Ramaphosa in June 2019.

1.3. Problem statement

In Harry Gwala Municipality District, about 33% of the population lives in poverty, 52% of households in the municipality have no revenue, and grazing lands are depleted (uMzimkhulu IDP, 2019). Though NAMC, with support from DRDLR, has intervened by implementing the

NRMDP at uMzimkhulu Local Municipality, and smallholder farmers have cattle to be sold to generate income. However, household food insecurity is still major challenge to the area. The study seeks to investigate the impact of the NRMDP on household food security and grass biodiversity in communal areas.

1.4. Research question

What is the impact of the NRMDP on household food security and grass biodiversity in a communal area of KwaZulu-Natal?

1.4.1 Project hypotheses

NRMDP is contributing to household food security among smallholder farmers in Kwa-Zulu Natal

What changes have taken place in food security and biodiversity conversation in communal areas since the introduction of NRMDP in KZN?

1.5 Objective of the study

The study's broad objective is to investigate the role of the National Red Meat Development Programme in improving household food security and communal livestock farmers' perception of biodiversity in the uMzimkhulu Local Municipality.

The specific objectives are to:

a) To determine the household food security status of communal farmers since the implementation of the national red meat development programme

b) To explore communal livestock farmers' perceptions of biodiversity conservation in livestock management

c) To identify policy coherence implemented for all stakeholders involved in the programme to improve food security and biodiversity sustainability.

1.6 Importance of the study

South Africa's government should prioritize attaining household food security and natural resources at once. Smallholder farming is a vital tool for poverty alleviation, food production, and sustainability of natural resources. Hence, communal livestock production is the main stakeholder in improving the livelihoods of the rural populace and biodiversity conservation.

Therefore, this research suggests that the National Red Meat Development Programme can facilitate achieving both food security and biodiversity conservation. However, to achieve that goal, it will need an appropriate approach for the NRMDP, the national agriculture department, and other stakeholders to develop integrated policies. Communal livestock production is expected to improve livelihoods in communal areas; however, some farmers cannot do that because some farmers are not receiving an income from their livestock.

The study aims to highlight smallholder farmers' responsiveness to NRMDP and if their participation in the programme has any significance in their household food security. The study will further provide a deeper understanding of the role of the NRMDP in fulfilling the national government's objectives in achieving food security and biodiversity conservation. Also, identify the constraints that hinder the programme from reaching its potential at uMzimkhulu local municipality; thus, this study will contribute to addressing agricultural sustainability.

1.7 Definition of terms

Food Security

Food security is a situation that exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 1996).

Agricultural Biodiversity

Agricultural biodiversity refers to the biological variety exhibited among crops, animals, and other organisms used for food and agriculture and the web of relationships that bind these forms of life at the ecosystem, species, and genetic levels. It includes crops and livestock directly relevant to agriculture and many other organisms that have indirect effects on agriculture, such as soil fauna, weeds, pollinators, pests, and predators (SANBI, 2013).

Smallholder Farmers

Farmers whose production exceeds their requirements and who sell excess produce directly to consumers or to collection centres or co-operatives which process and market the products. Due to the variability of production, fair and stable market access is a huge challenge for such individuals.

Sustainable Use

The use of components of biological diversity, or natural resources, in a way and at a rate that does not lead to the long-term decline of the resource and does not disrupt the ecosystem's ecological integrity in which it occurs, thereby maintaining its potential to meet the needs and aspirations of present and future generations (Booth and Commack, 2013).

Poverty Line

The poverty line is one of the primary measures of income poverty and refers to the income required to achieve a minimum acceptable standard of living to meet minimum household consumption requirements and may be expressed on a per person or per household basis (World Bank 2018).

Household

A group of people who are generally bound together by kinship or joint financial decision-making and who live together under a single roof or in a compound. These people are normally answerable to one person as head of the household and share food provisions.

Perceptions

A person's frame of reference emerges from previous experiences, beliefs, likes, dislikes, opinions, feelings, and other psychological factors of unknown origin (Barrios and Costeil, 2004).

1.8 Study assumptions

It is assumed that NRMDP can be a crucial driver of food security and biodiversity conservation in communal areas. Abdu-Raheem (2013) reported that smallholder farmers are critical stakeholders and role-players to achieve food security and biodiversity conservation. Moreover, it is assumed that all the study participants answered all the questions asked honestly and the frame was enough for data collection to complete the study.

1.9 Study limitations

The study only covered a purposively selected sample of smallholder farmers in St. Paul custom feedlot. Therefore, the findings cannot be generalized as the sampled farmers were not a representation of the entire population.

1.10 Summary and organisation of the study

This study contains five chapters. The first chapter is the introduction. It explains the study's background, the problem statement, the objectives, hypothesis, importance of the study, significance, the definition of terms, assumptions, limitations, and delimitations of the study and organization. The second chapter discusses the literature review; it provides research and facts about livestock production and the NRMDP from other authors. The third chapter articulates the research methodology. The study area is provided in this chapter and explains the sampling methods used and the methods employed in data collection and analyses. Chapter four presents a description of the respondent farmers' socio-economic characteristics, food security status, and the biodiversity conservation perception of farmers. Also, this chapter describes the outcome of regression analyses and the discussion. Finally, chapter five provides the conclusions of the study's findings and makes recommendations that will improve the role of NRMDP in food security and biodiversity conservation efficiency.

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CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Livestock farming forms the backbone of agriculture in most of South Africa's most impoverished rural areas (Lubinga *et al*., 2018), where approximately 70 % of agricultural land is suitable for extensive livestock farming; with the largest percentage of the land found in communal areas (Musemwa *et al.,* 2008). South Africa's rural areas have the highest poverty concentration, and KwaZulu-Natal had the largest share of the poor at 26 % (World Bank, 2018), and households contribute with 1 187 thousand of livestock (Stats, 2012). Ntombela *et al.* (2013) confirm that livestock farming is a crucial component of South Africa's agricultural sector due to its economic and non-economic benefits. Hence, Lubinga *et al*. (2018) support this by claiming that livestock is an essential and biggest productive asset in many households. The communal livestock is an underutilized resource for beef production, even though it can reduce beef imports between 10 and 15% of the local output per annum (Kunene-Ngubane, 2015; Mngomezulu, 2010). With World Bank (2018) reported that almost half of South Africa's population is considered chronically poor at the upper-bound national poverty line of ZAR 992 per person per month. Therefore, it is vital to increase smallholder agriculture's productivity to ensure food security (Mbanjwa, 2016; Mngomezulu, 2010; Nqeno, 2008).

According to DAFF (2013), the red meat sub-sector has contributed 15.4% to the total gross value of agricultural production during the 2011/2012 financial year, with cattle being the main contributor at 10.7% in South Africa. However, Musemwa *et al.* (2010) and Ndoro *et al.* (2013) reported that the contribution of the 3.3 million smallholder livestock farmers in communal areas to the formal beef sector remains low, off-take rate estimated at between just 5 and 10%. Therefore, smallholder farmers will obtain low economic returns. The low economic returns received by smallholder farmers in the proper marketing setup can be associated with various factors. These factors include low market off-take rate, transaction costs, unsuitable body condition of beef cattle, and carcass grading classification systems. Therefore, it is of utmost importance to eliminate the above burdens amongst smallholder farmers to increase their economic returns, subsequently enhance household food security.

Livestock farming contributes significantly to food production, income, job creation, soil fertility improvement, and the maintenance of livelihoods (Mahlobo, 2016). Smallholder farmers own 40% of the 14.1 million cattle available in South Africa (Musemwa *et al.,* 2008),

despite those communal farmers rear cattle under low-input production systems (Muchenje *et al.,* 2007). Kunene-Ngubane (2015) revealed that cattle can graze on a diversity of plants and can be reared on minimal land not suitable for crop production. However, Marandure (2015) mentioned that increasing cattle productivity might strain communal areas' ecological capacity. Hence, there is a need to address food security and biodiversity conservation challenges simultaneously effectively (Abdu-Raheem, 2013).

In South Africa, most communal areas keep non-descript cattle since there has been uncontrolled crossbreeding with imported breeds (Nqeno, 2008), and indigenous breeds such as the Nguni have the potential to ensure food security for communal farmers (Kunene-Ngubane, 2015). The household ownership of these breeds has a significant role in household food security and sustainable livelihoods (Kunene-Ngubane, 2015; Nqeno, 2008). A study conducted by Musemwa *et al.* (2010) revealed that keeping cattle for milk consumption in communal areas is more than meat consumption. However, livestock degrades the land and depletes water and biodiversity if the production systems are not well managed (Meissner, 2013). To effectively address biodiversity and food security concerns, smallholder farmers are important stakeholders (Abdu-Raheem, 2013). Kwa-Zulu Natal has the third most significant number of households involved in agricultural production in South Africa (Stats SA, 2012), which indicates the importance of livestock production.

2.2 The Four Pillars of Food Security Are Defined:

2.2.1 Food availability

According to Scialabba (2011), food availability is achieved when an adequate quantity of appropriate provided through domestic production or imports, including food aid. Furthermore, Scialabba (2011) argues that food is closely linked to the availability and use of natural, human, and economic resources, especially the scarcity of natural resources. Hence, Godfray *et al.* (2010) indicated that food production is determined by several components that changes can influence rainfall and temperatures. Food availability can be increased in a household through subsistence production (Shelembe, 2018).

Burchi *et al.* (2011) mentioned that food should be made available at the national level by transportation, distribution, storage, and processing of food, food production, and food trade. Smallholder farmers have been deemed to have the potential to improve household food

security in rural and urban areas by improving food supply and reducing dependence on purchasing food in a context of high food price inflation (Shelembe, 2018).

2.2.2 Food access

Food access suggests the availability of enough resources at the household level to obtain appropriate food for a nutritious diet (Dube, 2013). However, a household may either produce or purchase food if there are resources (Shelembe, 2018). Hence, households can access food through markets, transfers, gifts, and grants (Zungu, 2017; Shelembe, 2018). In contrast, Zungu (2017) revealed that food access does not guarantee that every household member will consume a nutritious diet due to the type or kind of food/s purchased and who can consume the food. Households' lower access to nutritious food is associated with the lack of employment opportunities and household size (Shelembe, 2018).

2.2.3 Food utilization

According to Dube (2013), food utilization is the eventual use of the household or individual's food once it has been obtained. Food utilization is generally understood as the way the body makes the most of various nutrients in the food, and that is connected with the nutrient intake, food preparation, diversity of the diet, and intra-household distribution of food (www.foodsec.org/docs/concepts_guide.pdf). Thus, Zungu (2017) pointed out that food utilization involves adequate nutritional adsorption, good nutritional outcomes, and ensuring nutritional security. Dube (2013), citing Devereux and Maxwell (2003), reported that food must be selected, stored, prepared, distributed, and eaten properly for adequate absorption of nutrients. Education regarding safe food preparation, sanitation, and nutrition can influence household food utilization (Shelembe, 2018; Zungu, 2017).

2.2.4 Food stability

Food stability is the process of maintaining food and nutrition security over a certain period (Dube, 2013). Furthermore, Dube (2013) indicated that food stability refers to food availability and access consistency. Zungu (2018) reported that stability in access involves households implementing different livelihood strategies to sustain household safety nets, prevent loss of entitlements, and focus on realizing a diversified diet for the household. Dube (2013) agrees that food stability ensures people have a long-term entitlement to food and protection means for providing safety nets that protect against shocks.

2.3 Food security in KwaZulu-Natal

South Africa produces adequate food to feed the nation, but household food insecurity is still a significant concern for several households (Shelembe, 2018). A study by Kataneksza *et al.* (2012) mentioned that Kwa-Zulu Natal has 5.7 million poor people, which means that 61% of the population lives in poverty, representing 22.5% of the total share of poverty in the country. However, Zungu (2017) reported that dietary diversity, particularly for children, has improved in KZN due to agricultural support, school feeding programmes, and social grants, but households still face food insecurity and hunger challenges.

Rural households, particularly female-headed households, have been reported as economically disadvantaged (Kataneksza *et al.,* 2012). In 2012, Kataneksza *et al.* (2012) revealed that households lack adequate cash income to buy food to enhance nutritional security, and in rural areas, very few inhabitants produce agricultural commodities for sale. In Jozini, Nyakurimwa's (2011) study findings show that approximately 85% of households were food vulnerable, 6% were hungry, and only 4% were food secure. A study conducted in KZN by Kataneksza *et al.* (2012) reported that unemployment is prevalent in all five communities, and households' primary source of income comes from government social grants.

The NAMC (2020), for instance, reports that, on average, food prices in rural areas are higher than in urban areas, thus raising the relative and absolute cost of living in rural areas. Community members stated that low income and unemployment were the two main factors preventing them from accessing food, and the findings state that most individuals eat once a day (Kataneksza *et al.,* 2012).

2.4 Measuring household food security

Food security is a complex, multidimensional phenomenon, and measurement has remained debatable (Kabalo *et al.,* 2019); however, there are still advantages of using a sophisticated measuring tool. The multiple dimensions of food security measurement tools increase the complexity of accurately measuring food security status at a macro or micro-level (Tandon *et al.,* 2017). Hence, food insecurity might be reduced and monitored by defining food insecure individuals and why and how they are suited to vulnerable (Shelembe, 2018). According to FAO (2002) and cited in Shelembe (2018), food insecurity must be defined by acquiring information on numerous specific conditions, experiences, and behaviours that indicate the changing degrees of the situation's severity. In line with Shelembe (2018), Bickel *et al.* (2000) reported that no one indicator could be used to assess food insecurity. Webb *et al.* (2008)

confirmed that no single measure is perfect for capturing all aspects of food insecurity. Dube (2013) stated that multiple indicators had been used to assess the various aspects or dimensions of food security worldwide. Therefore, the current study deployed a household food insecurity access scale and copying strategy.

2.4.1 Household Food Insecurity Access Scale

The household food insecurity access scale (HFIAS) is a continuous measure of the degree of food insecurity (access) in the household (Coates *et al.,* 2007). The tool was developed by Food and Nutrition Technical Assistance (FANTA) to evaluate whether a household has experienced problems with food access during the last 30 days. The score varies from 0 to 27, and the higher the score, the greater the food (access) insecurity the household experienced. Households are categorized as increasing food insecure as they respond affirmatively to more severe conditions or experience those conditions more often (Coates *et al*., 2007). The poorer the score, the less food insecurity the household experienced (Crush *et al.,* 2018). Therefore, the HFIAS tool would help measure if the income obtained from livestock sales is enough for food purchased in the household after selling cattle.

2.5 An overview of the National Red Meat Development Programme

The South African livestock production setup represents a primary under-tapped income source for many of the country's poorest households (NAMC, 2018/2019). Even though many smallholder farmers own livestock, they are often faced with numerous challenges in marketing their stock. Promising opportunities exist through increasing their participation in formal red meat markets. However, distance, lack of appropriate marketing channels, inadequate information, and poorly suited animals (Fakudze, 2015). To deal with the marketing constraints facing communal livestock farmers, the National Red Meat Development Programme (NRMDP) was designed and implemented in 2005 as the Eastern Cape Red Meat Project (Fakudze, 2015; Sotsha *et al.* 2017).

Thus, the NRMDP is a market facilitation programme that allows the developing farmers to upscale their involvement and role-playing in the marketing of their stock. The farmers are trained on the various markets, grading and classification, pricing, and formal markets such as livestock auctions, custom feeding programmes, and feedlots (NAMC, 2019; Fakudze, 2015). The programme is operational in KwaZulu Natal (four CFP functional and five under construction). The NAMC collaborates with the Department of Rural Development and Land

reform as a funder, the Provincial Department of Agriculture, development agencies, and other relevant stakeholders to yield positive results for the NRMDP (NAMC, 2019; Fakudze, 2015; Sotsha *et al.,* 2018).

2.5.1 The objectives of NRMDP

The programme aims to increase the income of communal livestock farmers through participation in formal marketing. However, Fakudze (2015) revealed that the programme has the following objectives:

- To enable farmers to understand the structure, operation, and requirements of formal red meat markets,
- To provide initiatives to develop marketing channels that will increase their participation in formal red meat markets; and
- To provide training and practical assistance to align animals' age, health, and breeding more closely to market demand.

According to Fakudze (2015), for the programme to achieve the objectives mentioned above, the programme has been designed to familiarise the farmers with formal markets through visits to commercial auctions, feedlots, and abattoirs through the dissemination of information on grading pricing and current prices. Farmers are also educated on animal husbandry and markets for livestock as a requirement for animals' intake (Ngetu 2013). In 2018, NAMC published an annual report showing livestock statistics sold through the programme. The report indicates that 1762 sellers, with 291 women, generated total revenue of R34 688 156.00.

2.5.2 Auction pens

According to Fakudze (2015), the establishment of auction pens was introduced to increase communal livestock farmers' participation in the formal market by bringing the market to the farmers, which benefits in reducing transaction costs and the distances to markets. NAMC report revealed that KZN conducted about 26 auctions in the 2018/19 period. The auction provides a link for communal farmers to the formal market but also acts as a means of assessing and negotiating prices that commercial farmers obtain for their livestock transparently and beneficially (Fakudze, 2015).

2.5.3 Custom feeding programme

Custom feeding refers to communal feedlots set up to fatten cattle before being sold to improve the condition and quality of the cattle, thus attracting better prices (Ngetu, 2013). Currently, four feeding programme sites are operational, namely St. Paul, Mhlumayo, Nongoma, and Jozini, while five custom feeding programmes are still under construction (NAMC, 2018/2019). The livestock is put in a feeding programme for three months (Fakudze, 2015). In return, farmers are paying a seven percent fee per livestock. The fee is deducted from the money paid by the buyer for the livestock during auctions. Weaners between the ages of nine and seventeen months and steers between three and four years are put under a fattening cycle for three months. In the custom feeding programme, the livestock remains under the care of the programme while the ownership, benefits, and risks remain with the livestock owners (NAMC, 2018/2019; Fakudze, 2015).

2.6 Contribution of smallholder beef farmers to household food security and communal natural resources

According to FAO (1996), food security is a condition that exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life. South Africa is considered a secure food country at the national level, but at the household level, food security is a challenge (Hendricks, 2014; Shelembe, 2018). In alleviating poverty and improving food security status among smallholder farmers, cattle production plays a key role (Nqeno, 2008; Musemwa *et al.,* 2010). Livestock provides nutrition for smallholder farmers by directly consuming animal products such as milk and meat (Ndlovu, 2010). It contributes up to 30% of the protein in the human diet (Steinfield *et al.,* 2006). Beef consumption falls second to poultry, increasing with urbanization (Kunene-Ngubane, 2015). In Limpopo, 90 % of smallholder farmers failed to access financial support (Mapiye, 2017), and thus cattle provide smallholder farmers with opportunities to accumulate capital and guarantee financial security (Marandure, 2015). Creating food security, particularly household food security, is widely acknowledged as an important milestone in advancing the rural poor's living standards (Abdu-Raheem, 2013).

Cattle play a significant role in nutrient cycling by enhancing soil fertility through manure and urine (Mahlobo, 2016; Marandure, 2015). Manure improves soil fertility by supplying nutrients like potassium, phosphorus, and nitrogen, increasing soil structure stability (Mahlobo, 2016). According to Marandure (2015), cattle play a critical role in preserving biodiversity through

grazing and Marandure (2015), citing Herrero *et al.* (2010), indicated that grazing reduces the vigour of the most dominant grass species, thereby increasing the competitiveness of the less dominant grass species. Simultaneously, Lesoli (2011) revealed that severe grazing reduces litter cover and increases the bare ground portion of land through reduced plant density and vigour. However, Meissner *et al.* (2013) stated that the need to maintain the biodiversity of vegetation species with the related ecosystems had become a global concern. Nevertheless, Marandure (2015) and Lesoli (2011) asserted that cattle ultimately support seed distribution throughout the rangeland. Grazing can increase the palatability of forages by increasing the aboveground biomass's nitrogen content (Lesoli, 2011). Grazing stimulates aboveground biomass production and increases tillering, rhizome production, and root respiration (Lesoli, 2011).

2.7 Risk factors contributing to communal farmers getting low economic returns in the formal markets

2.7.1 Low market off-take rates

The cattle market off-take rate is calculated as the number of cattle sold as a proportion of the total herd per given period (Marandure, 2015; Fakudze, 2015). The marketing rate is the percentage of animals marketed in total herd size (Fakudze, 2015). Market off-take rates are low in the communal sector of South Africa, with off-take rates between 5 % and 10 % compared to 25 % to 30 % in commercial farmers (Musemwa *et al.,* 2010; Marandure, 2015; Sotsha *et al.,* 2018). Fakudze (2015) reported similar low market off-take figures highlighted by Musemwa *et al.* (2010) in communal farmers of South Africa, particularly for the Eastern Cape Province. This has indicated that communal farmers have low economic returns for their cattle after participating in a formal marketing channel. On the contrary, Lubinga *et al.* (2018) reported that the off-take rate for communal beef farmers in the Free State province is 11.8 %, which is much higher than the national average of 6 % that was revealed by Scholtz and Bester (2010) but significantly lower as compared to their commercial beef counterparts for the province 33 %.

Nevertheless, Fakudze (2015) mentioned a positive relationship between the implementation of the NRMDP and the market off-take rate. In line with Fakudze's (2015) predictions of a positive market off-take rate associated with the custom feeding facilities on cattle marketing, (Marandure *et al.,* 2016) confirmed higher cattle marketing in the Eastern Cape. Marandure *et al.* (2016) and Gwiriri *et al.* (2019) support the above argument by indicating a higher market

off-take rate in Gxwalubomvu of 18.6% and Ncorha of 15.3%, respectively. However, these findings are against the 12.1% recorded for communal farmers (Musemwa *et al.,* 2010). The higher market off-take rate reported by Marandure *et al.* (2016) can be attributed to these areas' custom feeding programme (CFPs). Lubinga *et al.* (2018) mentioned that they used a parametric estimation technique to assess whether livestock farmers involved in formal marketing were receiving higher prices, as Fakudze (2015) reported.

According to Nyhodo *et al.* (2014), communal farmers in the Eastern Cape Province earned far less income from their livestock assets due to the low-market off-take rate. Though significant progress has been made, such as improving animal genetics and disease control, it has failed to noticeably raise the off-take rate (Nyhodo *et al.,* 2014). Mapiye *et al.* (2009) argue that market unavailability is the main reason for the low off-take rates on communal farmers in South Africa and low economic returns among communal farmers who participated in the formal market.

2.7.2 Transaction costs

Transaction costs are the main barrier smallholder farmers face in getting higher prices from participating in the formal markets in South Africa (Sotsha *et al.,* 2018; Lubinga *et al.,* 2018; Gwiriri *et al.,* 2019. Hence, Musemwa *et al.* (2007) argue that most communal cattle farmers' remote location coupled with poor road networks results in high transactional costs and reduces the price traders are prepared to pay for the cattle. Despite those communal farmers being in areas with good road linkages, the formal markets' distance determines the transaction costs (Makhura, 2001; Nkhori, 2004). In Eastern Cape, Nqeno (2008) reported that long distance to the markets is the leading cause of communal farmers getting low economic value for their cattle.

Various scholars affirm that communal farmers' lack of market information, market infrastructure, and suitable animals are the leading cause of higher transaction costs (Mapiye, 2017; Lubinga *et al.,* 2018). Hence, communal farmers are getting low prices for their animals because of high transaction costs. Lubinga *et al.* (2018), citing Onono *et al.* (2015), mentioned that communal farmers usually prefer on-farm cattle sales to avoid incurring high transaction costs and loss of carcass value caused by transporting cattle over long distances. According to Marandure *et al.* (2016), the custom feeding facility is a centralized market, and they eliminate transaction costs by allowing buyers to come to the facilities. Prominently, the CFPs provided an opportunity for communal farmers to attain higher prices for older animals and reduce

transaction costs (Gwiriri *et al.,* 2019). Hence, Ndoro *et al.* (2013) asserted that cattle in the auction pens often fetch better prices than those sold elsewhere.

2.7.3 Lack of information

Communal farmers have a lack of marketing information, grazing camps, stock theft, and disease prevalence. It is well documented that communal farmers rely on their indigenous knowledge to make livestock management decisions. Hence, farmers' information needs enable them to make crucial decisions and strengthen their negotiating capacity during transactions with buyers (Musemwa *et al.,* 2008). Information on consumer demands, market opportunities, and supply and prices are important for cattle producers to make an informed market decision (Kunene-Ngubane, 2015; Fakudze, 2015).

According to Musemwa *et al.* (2010), lack of information access reduced cattle sales. Providing enough marketing information to smallholder cattle producers helps create an atmosphere of inclusiveness that increases transparency resulting in improved market participation (Musemwa *et al.,* 2008). Mngomezulu (2010) pointed out that communal farmers remain uninformed about new production techniques and auction sale dates. Hence, they lose opportunities to sell. Smallholder farmers rely on informal information and are exposed to the risk of receiving biased information about the market (Fakudze, 2015), which will negatively affect their income. However, Nqeno (2008) claim that the most critical thing that costs communal farmers in the formal market is inadequate veterinary services.

2.7.4 The impact of poor body condition of smallholder beef cattle

A body condition score is one of the instruments used to measure the animal's body fat deposition (Nqeno, 2008). In addition, Nqeno (2008) argues that the tool does not need any infrastructure, and it monitors livestock performance. Poor cattle from smallholder farmers have gained attention (Makhura, 2001; Nqeno, 2008; Mngomezulu, 2010). Makhura (2001) noted that livestock's poor condition results in farmers getting low prices for their cattle. Some factors lead to this problem, such as ticks that reduce live weight gain (Marandure 2015, citing Marufu *et al.,* 2014) and Mahlobo (2015) indicated poor veld condition. Communal cattle producers sell cattle that are too old or lean (Marandure, 2015; Musemwa *et al.,* 2010). Lighter carcasses from indigenous cattle get low prices in the formal markets (Gwiriri *et al.,* 2019). In contrast, Lubinga *et al.* (2018) revealed that CFP participating farmers receive higher prices due to their cattle's more appealing body score and weight. However, farmers participating in

the CFP pay an R800 fee per animal sold to the facility, and R800 is subtracted from the price paid by the buyer (Lubinga *et al.,* 2018). Therefore, this indicates that communal farmers are obtaining lower prices.

While Ntombela *et al.* (2013) noted that communal farmers received higher prices for their old animals in the informal markets, they get low prices in the formal market. Hence, Nyhodo *et al.* (2014) indicated that seasons change the conditions of livestock owned by communal farmers. Still, Molefi (2015) pointed out that smallholder farmers' cattle farmers do not meet market requirements since farmers are not using breeds with good body conformation, which attracts buyers. These have contributed significantly to farmers receiving low economic returns from their cattle in the formal markets. Musemwa *et al.* (2010) also mentioned low prices being offered for smallholder cattle producers because of emaciated body conditions.

2.7.5 Carcass classification systems used in the formal market

According to Chingala *et al.* (2017), grading and classification systems are used in the beef industry to define the quality and yield of a carcass to ensure consistent meat quality and consumer satisfaction. In contrast, Soji *et al.* (2015) claim that the South African carcass classification system does not include any meat quality measure. Also, Soji *et al.* (2015) urge that the formal market is characterized by meat examination and carcass classification, which scare off the smallholder farmers for fear of income loss due to animal condemnation. However, Chingala *et al.* (2017) pointed out that grading refers to placing different values on several carcass qualities and using combinations of these features to develop a grade related to meat quality for pricing purposes. Simultaneously, carcass classification refers to sorting carcasses with similar classes based on specific standards to guide those involved in the production, trading, and consumption of carcasses (Chingala *et al.,* 2017).

According to Soji *et al.* (2015) and Chingala *et al.* (2017), beef carcasses are classified based on age, fat cover, conformation, carcass damage, and sex. The grading of a carcass in South Africa is classified into the following classes: B – old animal, C – very old animal, A – very young animal, AB – young animal (Soji *et al.,* 2015; Chingala *et al.,* 2017). With classes, A and AB received higher prices, and those animals hardly reached the formal markets in the smallholder beef sub-sector.

According to Marandure (2015), communal beef farmers in South Africa are keen to sell cattle to formal markets; however, the classification system used to value beef carcasses in these

markets is suitable for young well-muscled animals. Moreover, smallholder farmers sell old animals in poor condition (Musemwa *et al.,* 2010; Marandure, 2015); hence they receive low economic returns after participating in the formal market. Contrasting communal farmers participating in the custom feeding programme obtain higher prices (Lubinga *et al.,* 2018; Fakudze, 2015; Marandure *et al.,* 2016), which can be attributed to cattle management or preparedness of cattle in these facilities.

Soji *et al.* (2015) noted that the South African carcass classification system is oriented toward meat sellers and does not indicate the projected eating quality of the classified carcasses' meat. Also, the classification system used in the formal sector is not favourable for smallholder farmers. Carcasses from communal farmers receive poor conformation classes (Chingala *et al.,* 2017). Chingala *et al.* (2017) strongly suggested that a clear description of important carcass and meat traits is the first step towards improved smallholder farmers' economic returns in the formal market.

2.8 Grass biodiversity status in uMzimkhulu Local Municipality

The Harry Gwala District is one of the province's wealthy grass biodiversity districts, boosted by five biomes: Forest, Fynbos, Grassland, Savanna and Wetland, and contains 28 vegetation types (Ezemvelo KZN Wildlife, 2014). uMzimkhulu has an abundance of high-quality soils, high altitudes, and abundant water, making the area suitable for livestock farming; however, a significant portion of the land is highly degraded (Department of Rural Development & Land Reform, DRDLR, undated). SANBI (2013) reports that at the current rate, KwaZulu-Natal Province keeps losing its natural landscapes to cultivation, livestock farming, and urbanization and will have almost no natural habitat left outside protected areas by 2050. The grassland is at the most risk (SANBI, 2013). uMzimkhulu rangeland has been highly degraded due to substantial overgrazing practised by smallholder farmers.

According to Ezemvelo KZN Wildlife (2014), the National Department of Environmental Affairs (DEA) in the Harry Gwala District has identified 25 threatened ecosystems, including one Critically Endangered, seven Endangered and 17 Vulnerable ecosystems. The purpose of these ecosystems was to prioritize conservation areas, reduce species extinction rates, and prevent further degradation and loss of structure (Ezemvelo KZN Wildlife, 2014). Furthermore, the severe ongoing loss of grass biodiversity in the area is a significant concern, and livestock farmers in the district need to be able to reduce the loss to benefit the grass biodiversity, which will play a significant role in household food security.

The biodiversity richness comprises between 250 000 and 1 million species (Abdu-Raheem and Worth, 2013). Nonetheless, it is significant to note that most South Africa's biodiversity species have been identified as highly threatened worldwide (Abdu-Raheem and Worth, 2013, citing Wynberg, 2002; Ezemvelo KZN Wildlife, 2014). On the contrary, the Government of South Africa (2015) reported that the two national ecosystem indicators of ecosystem status in the National Biodiversity Assessment (NBA), 2011 stressed that wetland ecosystems are the most threatened ecosystems in South Africa. It is well documented that most of the district's land is outside protected areas.

2.9 Drivers of grass biodiversity loss

There is an alarming loss of biodiversity in South Africa, particularly on community-managed land. Abdu-Raheem and Worth (2013) highlighted that this worry is further exacerbated by communities' threats to their lands' biodiversity resources. In addition, they suggest that wildfires, deforestation, habitat fragmentation, encroachment, pollution, and invasion of alien species are the main drivers. However, the evidence shows that agriculture is the primary source of grass biodiversity lose. Advocacy Von Bormann (2019) argues that food production is the most significant contributor to biodiversity loss.

2.9.1 Overgrazing

According to Gwiriri *et al.* (2019) and Von Bormann (2019), in South Africa, 80% of the land is suitable for farming, and 69% is estimated to be suitable for livestock and wildlife production (DAFF, 2017). Rangelands are essential for people's livelihoods globally (Nyingi *et al.,* 2018). Overgrazing of rangelands has often been mentioned as one of the significant causes of land degradation (Lesoli, 2011). Overgrazing on erosion-prone soils has led to widespread land degradation (Von Bormann, 2019). Livestock directly affects plant species composition by grazing and trampling effect, although the impacts vary with animal density and distribution (Lesoli, 2011; Tainton, 1999). High and prolonged livestock grazing is mainly blamed for losing rangeland biodiversity (Watkinson *et al.,* 2001). Subsequently, high grazing pressure reduces the rate at which the individual plants grow (Smit, 2004).

Poor grazing management used mainly by smallholder farmers is strongly criticized for the loss of grass biodiversity. Overgrazing leads to the loss of perennial and palatable terrestrial species, which leaves the land bare or proliferated by less palatable annuals (also known as increaser

species), such as *Aristida congesta* subsequent loss of grass biodiversity (Nyingi *et al.,* 2018). Herrero *et al.* (2010) and Hoffman (2011) have reported that communally grazed rangelands are continuously overgrazed, leading to a deterioration of the rangelands. In contrast, species change, and species loss have also been observed in rangeland areas where there have never been domestic animals grazing (Lesoli, 2011).

2.9.2 Rangeland burning

Unplanned or poorly timed fires can be detrimental, affecting natural habitats and damaging ecosystems (SANBI, 2014). Fire is an essential tool for rangeland management; however, it is crucial to consider the frequency, intensity, and season of burning, per the grassland requirements and tolerance (SANBI, 2014), and this is not considered in most rural areas. Grassland species and ecosystems respond differently to varying fire regimes, especially when the effects of fire are considered in combination with the grazing regime and the incorrect application of fire, which will result in a shift in species composition (SANBI. 2014). A fire has been described as the critical disturber that limits seedlings' growth into mature and taller trees (Higgins *et al.,* 2000).

The fire appears to affect several aspects of the ecology of grasslands, including the seedling establishment and survival, and the effects of fire appear not only to be short-term (Martindale, 2007). According to Mengistu (2008), as cited by Mahlobo (2016), fire is used for various reasons, including removing moribund material. The effects on grassland that is burnt early before spring rains and then grazed heavily and continuously before it can produce substantial re-growth may include a substantial decline in plant vigour and changes in species composition (Martindale, 2007, citing Trollope, 1999). Fire suppression has adverse effects on grass biodiversity in such ecosystems. Fire, coupled with browsing, can suppress increases in woody plant encroachment (Nyingi *et al.,* 2018).

2.9.3 Alien invasive species

Invasive alien plant species are plant species that have been introduced into an area or established themselves outside their native by intentional or unintentional human action and spread in such a way that it threatens ecosystems (SANBI, 2013; Atyosi *et al.,* 2019). The grassland biome has proven susceptible to invasion by a range of alien species, many of which have been deliberately introduced (DEA, 2015). Invasive alien species are considered one of the most severe threats to the conservation of biodiversity and ecosystem services in Africa

(Nyingi *et al.,* 2018; DEA, 2015). As a result, the South African government spends over 1 billion ZAR per year on their management (Zengeya and Wilson, 2020).

By contrast, Nyingi *et al.* (2018) claim that managing and controlling invasive alien species in Africa remains a challenge. Subsequently, *Chromolaena odorata* (Siam weed) has taken over pastures and farmlands, affected plant communities and disrupt forest successions (Nyingi *et al.,* 2018, citing van der Hoeven *et al.,* 2007; Boy and Witt, 2013). For instance, Atyosi *et al.* (2019) revealed that several alien plant species are known to decrease indigenous plant species diversity. At the same time, SANBI (2013) mentions that some of these invaders out-compete fodder plants, may even kill or poison livestock and reduce the carrying capacity of rangeland. In addition, invasive species make grassland susceptible to veld burning (SANBI, 2013). However, Shackleton *et al*. (2011) argue that prickly pear (*Opuntia ficus-indica*) is an essential invasive plant in South Africa, especially among the poor rural populace. In addition, the plant has been reported to be a crucial alternative feed for livestock.

2.9.4 Climate change

Climate change is a phenomenon that is causing the earth to become warmer (Siraj *et al.,* 2013). Climate change projections have long indicated that temperature and evapotranspiration are likely to increase into the 21st century (DEA 2015; 2013) and projected that climate change severely impacting Africa as a significant driver of biodiversity loss (Nyingi *et al.,* 2018). Agriculture is vulnerable to climate change in several dimensions (Dube *et al.,* 2013). Increasing temperatures may affect the timing and quantity of precipitation and change water availability (Siraj *et al.,* 2013). For example, in Malaysia, Devendra (2012) revealed that climate change seriously affects annual and perennial plant growth due to temperature and water stress. Consequently, reduce grazing lands in affected areas (Devendra, 2012).

2.10 Policy on agriculture development

In South Africa, there has been several policy initiatives to support the agricultural sector. According to Khwidzhili and Worth (2017), policy categorises strategies, procedures, and practices that establish the South African perception of sustainable agriculture. The post 1994 land reform policy was centred on the 'White Paper on Land Policy of 1997, which linked land reform to the improvement of both fairness and effectiveness through a joint agrarian and industrial plan (Agholor and Lubisi, 2020). However, the philosophies of agriculture policy in South Africa were informed by Comprehensive Rural Development Programme (CRDP) (Khwidzhili and Worth, 2017). However, the National Livestock Development Strategy

(LDPs) that supports smallholder and emerging farmers to be profitable and competitive by creating an enabling policy environment and market development was implemented (Ngarava *et al.,* 2019). Therefore, the NRMDP was supported by the government through that policy.

2.11 Summary

This chapter reviewed the literature on household food security, the contribution of livestock towards smallholder food security, beef production in South Africa, grass biodiversity in uMzimkhulu and critical drivers of grass biodiversity loose. The perception of food security and grass biodiversity conservation was critically discussed. Livestock production in the smallholder sub-sector, its challenges and key factors that determined its role towards farmers' income, the progress of the NRMDP in South Africa, and the perception regarding its impact were also discussed. The discussion of NRMDP has led to the conclusion that the programme positively impacts smallholder farmers' income. The chapter also highlighted the risk factors contributing to smallholder farmers' low economic returns.

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CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter aims to describe the research methods used in this study. It gives an overview of the methodology that was used in the study. Also, it explained the research design, the framework of the research, and the models used for data analysis. An overview of the study area and research design, research methods, target population, sample selection, data collection methods and analysis in this chapter. The chapter ends by identifying ethical clearance issues and disseminating results.

3.2 Description of the study area

The study was conducted in St. Paul at uMzimkhulu Local Municipality, which is one of the four local municipalities of the Harry Gwala District Municipality (HGDM) that is situated in the southwestern region of KwaZulu-Natal (uMzimkhulu Local Municipality (MLM), Integrated Development Plan (IDP, 2018/2019)). The municipality covers an approximate total area of 2 436 square kilometres and is divided into 22 wards. It is mainly agricultural, with scattered rural communities and subsistence agriculture (IDP, 2018/2019). The municipality has a population of approximately 197 286, translating to a 0.34% growth rate per annum (IDP, 2018/2019; Community survey data, 2016). Between the ages of 24 and above, there seems to be a decline in population percentages, which can be due to a variety of factors, including relocation to other cities in search of better job prospects or mortality from communicable diseases (TB & HIV/AIDS) (IDP, 2018/2019).
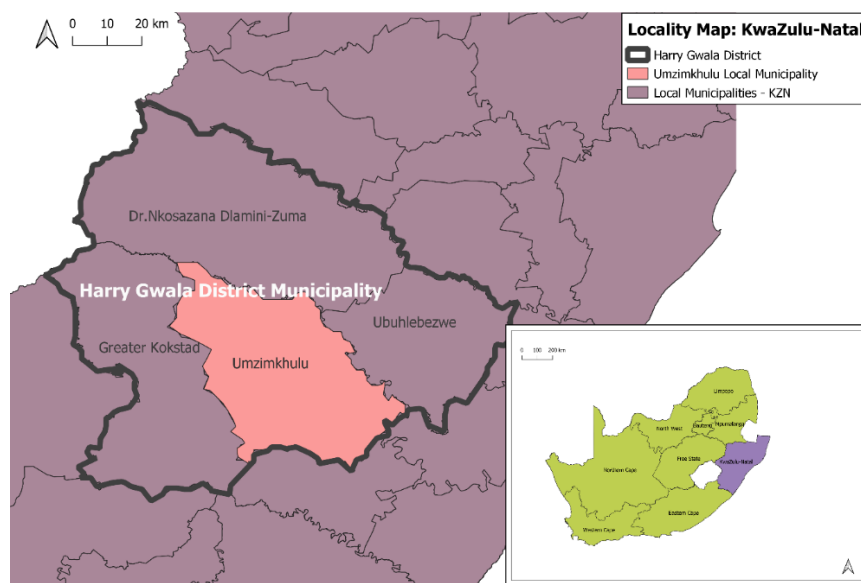
Figure 3.1: Map of South Africa with special focus on uMzimkhulu municipality of Harry Gwala district municipality within KwaZulu-Natal.

Almost 18.2% of the overall municipal area lies in degraded unimproved grassland (MLM IDP, 2018/2019). According to Harry Gwala District Municipality (HGDM) IDP (2017-2022), the district contains different vegetation types and distributions that are grouped into five biomes, which include Forest, Grassland, and Savanna vegetation. The Grassland biomes are near Threatened, with the Midlands Mistbelt Grassland being Critically Endangered and the Southern KwaZulu-Natal Moist Grassland was having an Endangered status (HGDM, IDP, 2017-2022). uMzimkhulu has a humid climate, with annual rainfall ranging from 800mm to 1 280mm. Heavy mists are a common and essential feature, providing additional moisture. The mean annual temperature for the area is 17°C (HGDM IDP, 2017-2022). However, evaporation rates in the area, averaging 1700 mm per annum, are much higher than average annual precipitation leaving the area in a negative moisture balance.

St. Paul village lies on -30°.14'46.6. "S and 29°.41'09.2" E. St. Paul village, communal grazing areas are managed under a collective land tenure system where the rangeland resources are being used by all community participants, with the mixed veld found in these areas. Tainton (1999) classified the veld of South Africa into three groups: sweet veld, sour veld, and mixed veld. According to Tainton (1999), sweet veld remains palatable and nutritious even when mature, while sour veld is palatable only for the growing season, and the mixed veld is the intermediate between sweet and sour veld. A mixed-natural pasture consists of different proportions of forage that are generally classified under the sour and sweet-natural range.

3.3 Research design

Ndobo (2013) defines research design as a procedure of collecting and analyzing data to understand the importance of a research project. Ndobo (2013), citing Kothari (2004), revealed that research design is crucial because it allows the researcher to understand various research operations. This study utilized an interpretative research design using qualitative and quantitative research methods. Mayoh and Onwuegbuzie (2016) claim that mixed methods enhance the strengths and minimize the weakness of individual methods and reduce bias and increase the validity. The mixed research method allows the researcher to collect data using several methods such as surveys, interviews, and observation, which provide in-depth information to make meaningful analysis (Ramanyimi, 2019). The method is essential in gathering descriptive information and ensuring participants provided explanatory information. For this research, a phenomenology approach was utilized to provide richness to the

investigated phenomena. Creswell (2013) argues that a phenomenological study describes the common meaning for several individuals of their lived experiences of a phenomenon and focuses on describing what all participants had in common as they experienced a concept. Therefore, this study followed a hermeneutic phenomenology methodology described by (van Manen, 1990) in exploring and explaining the in-depth lived experience of smallholder farmers in the NRMDP St. Paul Custom Feedlot Programme (CFP).

3.3.1 Brief background of phenomenological research method

Phenomenology research is an approach that seeks to describe the essence of a phenomenon by exploring it from the perspective of those who have experienced it (Neubauer *et al.,* 2019; Creswell, 2013; Lester, 1999). Koopman (2018) defined phenomenology as the science of lived experience. Phenomenological methods are particularly effective at bringing to the fore the experiences and perceptions of individuals from their perspectives. Phenomenology aims to be as accurate as possible to the phenomenon and the situation in which it appears (Moodley, 2009).

A phenomenological study describes the common meaning for several individuals of their lived experiences of a concept or a phenomenon (Creswell, 2013). Lester (1999) considers the phenomenological approach as good at surfacing deep issues and making voices heard. van Manen (1990) emphasizes that phenomenology study is vital in reducing individual experiences with a phenomenon to describe the universal essence. Hence Moustakas (1994) revealed that human experiences might be described as several phenomena based on their experience. Data is collected only from respondents who have experienced the phenomenon under study (Creswell, 2013; Moustakas, 1994; Moodley, 2009).

There are two phenomenology approaches: hermeneutic phenomenology (van Manen, 1990) and transcendental or descriptive phenomenology (Moustakas, 1994). Hermeneutic phenomenology originated from the work of Martin Heidegger (Neubauer *et al.,* 2019). Transcendental phenomenology is focused less on the researcher's interpretations and more on a description of participants' experiences (Creswell, 2013; Neubauer *et al.,* 2019). Moustakas's approach focuses on bracketing, in which investigators set aside their experiences as much as possible to take a fresh perspective on the phenomenon under examination (Neubauer *et al.,* 2019). In contrast, Neubauer *et al.* (2019) reported that Heidegger disagreed and said that "an individual cannot step out of his or her lifeworld, and humans cannot experience a phenomenon

without discussing his or her background understandings". Creswell (2013) stated that Moustakas admits that this state is seldom perfectly achieved. According to Creswell (2013) and Neubauer *et al.* (2019), the hermeneutical phenomenology method is oriented toward lived experience and interpreting life texts. Phenomenology is not only a description, but it is also an interpretive process that the researcher interprets (Neubauer *et al.,* 2019). Creswell (2013) reported that van Manen does not approach phenomenology with a set of rules or methods.

Hermeneutic phenomenology studies individuals' narratives to understand what those individuals experienced in their daily lives or lifeworld's (Neubauer *et al.,* 2019). Hermeneutic phenomenological research is concerned with interpreting real-world experiences and practices of individuals experiencing the phenomenon. The researcher intended to understand the experiences of the smallholder beef farmers who are the beneficiaries of the NRMDP regarding household food security and grass biodiversity. Therefore, hermeneutic interpretive phenomenology complemented by the interpretive phenomenological approach (IPA) is a highly appropriate research tool for understanding the participant's experiences. These approaches will provide a rigorous explication of the interpretive reality of each research participant and what is hidden. Adding an interpretive dimension to phenomenological research, enabling it to be used as the basis for practical theory, allows it to inform, support or challenge policy and action. I opted not to use descriptive phenomenology because bracketing would be challenging to achieve in this study, based on my personal experiences from the programme.

3.3.2 Interpretive Phenomenological Approach (IPA)

Heidegger, the founding father of interpretive phenomenology, challenged Husserl on the importance of description than understanding (Thani, 2018). To comprehend participants' lived experiences within the NRMDP, the investigator was applying the method of the interpretative phenomenological approach. However, Windvogel (2019) pointed out this approach enables both participants and the researcher to arrive at a co-constructed understanding of beneficiaries' experiences through the interpretation of multiple perspectives. According to Thani (2018), interpretative phenomenology explores the personal experience and is concerned with an individual's perception. According to Swart (2014), interpretative phenomenology is the process and a method for bringing out what is typically concealed in the human experience. Moodley (2009) maintains that interpretative methodology emphasizes the importance of

language as interpretative and not just descriptive. Hence, the researcher decided to use this method to analyze qualitative data.

3.4 Research methods

3.4.1 Mixed methods model

Research methodology is determined by the nature of the research question and the subject being examined (Denzin and Lincoln, 2005). As a result, mixed research methods were employed in this study to accurately portray an investigation tool to answer the research question. In a mixed research method, quantitative and qualitative modes of inquiry are incorporated (Mkhwanazi, 2019; Creswell, 2003). According to Claasen *et al.* (2015), mixed methods research designs better understand complex concepts, such as food security. According to Mkhwanazi (2019), mixed methods research attempts to authenticate the use of multiple approaches in answering research questions rather than restricting or constraining researchers' choices.

Mixed methods are incorporated to bridge their differences in addressing a research question (Mkhwanazi, 2019, citing Harwell, 2011). According to Tashakkori and Creswell (2007), cited in Claasen *et al.* (2015), using mixed methods research can further broaden insights during data collection, analysis, and research findings. Claasen *et al.* (2015) claim that mixed-methods inquiry can better investigate the whole spectrum of factors involved. This study aims to explore and understand the lived experiences from the participants' perspectives. Mkhwanazi (2019) supported the use of collaboration methods interlinked. The researcher used the qualitative research method to interpret the themes of the phenomenon under investigation. Mkhwanazi (2019), citing Johnson and Onwuegbuzie (2004), argues that both research strategies can be used in one research question and address it. According to Mkhwanazi (2019), this method is essential because it allows for the unlimited interpretation of data.

The aim is to provide richness to the research context by including a phenomenological approach. This aligns with the views of Babbie and Mouton (2002), who developed narrative descriptions of the phenomena using both methods. The study provided the ultimate lived experiences of NRMDP beneficiaries. Data was shown in the descriptive themes and numbers through which statistical results were developed to describe the phenomena.

3.4.2 Qualitative research method

According to Denzin and Lincoln (2005), qualitative research is a multifaceted research method involving an interpretative, naturalistic approach to the subject matter. However, Mkhwanazi (2019), citing Harwell (2011), defined the qualitative research method as focusing on discovering and understanding participants' experiences, perspectives, and thoughts. In agreement, Creswell (2013) argues that qualitative research is an approach of exploring and understanding phenomena in context-specific settings. Creswell (2013) indicated that qualitative research is exploratory and descriptive rather than explanatory. Hence, the descriptive nature of qualitative research allows the researcher to describe the participants' experiences (Meyer, 2000).

Qualitative research was used in this research study to explore the participants' perspectives and determine whether the programme's implementation was effective in household food security and grass biodiversity. This research aimed to better understand smallholder farmers who engaged in the programme. The study utilized in-depth face-to-face interviews, semi-structured questionnaires, and focus group discussions.

3.4.3 Quantitative research method

According to Creswell (2003), quantitative strategies involve complex experiments with many variables and treatments; this includes structural equation models that incorporate causal paths and the strength of multiple variables. Furthermore, the author highlighted that these inquiry strategies include surveys, longitudinal studies using questionnaires, and structured interviews. Quantitative research methods are typically interested in prediction and are described as deductive because calculations and tests of statistical hypotheses lead to general inferences about the characteristics of a population (Harwell cited by Mkhwanazi, 2019). This is an essential element of the research, as the population is one of the primary driving forces of food production and impact analysis.

3.5 Target population and sample selection

Neelankavil (2007) described a target population as the total number of elements chosen from a specific population. According to Ndobo (2013), a research population involves individuals or elements sharing similar characteristics. Dattalo (2008) described sample selection as a plan of action used to select an element from the population. Therefore, the subject for this study was the smallholder beef farmers (population) who are the residents at St. Paul village, situated

in Kwa-Zulu Natal province. Thus, the target population constituted all the beneficiaries of NRMDP in St. Paul village.

3.5.1 Sampling

Dattalo (2008) affirms that sampling is the plan of action used to select an aspect of a population. Maluleke (2018), citing Freedman (2004), indicated that sampling is an efficient and cost-effective way to collect data and improve data quality. Crabtree and Miller (1992) maintain that research participants are selected because they can provide detailed descriptions of their experiences and are willing to articulate their experiences. Purposive sampling was employed in this research study to select respondents. Etikan *et al.* (2016) reported that purposive sampling has a particular setting, persons, and selection is deliberately for the critical information they can provide that cannot be acquired from others. According to Tashakkori and Teddlie (2003), purposive sampling is used when participants are selected based on specific criteria. For this study, the uMzimkhulu local municipality was chosen purposefully due to the NRMDP that was implemented. Purposive sampling was used for informants working within the programme. This is in line with the views of Thani (2012), who asserted that participants are selected only if they have experienced the phenomenon under study. The sampling method in a phenomenology study is purposive (Thani, 2012). Participants were selected based on the following criteria:

- Smallholder beef farmers who reside at uMzimkhulu local municipality
- Have participated for at least two years in the programme and use this programme as a marketing channel
- Must have participated in the custom feedlot facility
- The informants must have worked within the programme for at least one year.

Koopman (2018) mentions that researchers choose purposive sampling for diverse reasons, such as representing and focusing on specific and unique issues.

3.5.2 Sample size design

The sample size in this study refers to the number of participants included in completing the study process. A sample is usually drawn from a population subset (Neelankavil, 2007). All the 77 farmers who participated under the St. Paul custom feedlot facility were purposively selected as the respondents of this study. This is in line with Mapiye (2017), who employed a census approach for his study in Limpopo. This flexible approach to the number of participants is entirely consistent with phenomenological practice, which does not require researchers to

make definitive decisions on sample sizes until the fieldwork and data analysis are underway (Dahlberg *et al.,* 2008, cited in King, 2014). In phenomenology, it is advisable not to interview too many participants (Koopman, 2018). Groenewald (2004), Creswell (2013), and Koopman (2018) recommend in-depth interviews with subjects until no new information is derived from the participants. The sample size was categorized as follows: Smallholder beef farmers (n-77), NRMDP officials (n-4), and Kwa-Zulu Natal officials from the Department of Agriculture, Land Reform and Rural Development (DALRRD) (n-2) to give their perspective on the subject. Furthermore, smallholder farmers were selected purposefully to participate in focus group discussions.

3.6 Data collection methods

Maluleke (2018) refers to data as a recorded empirical observation of the understudy cases, which can be gathered from various sources. Data collection provides the statistical importance of a research study (Pennerselvam, 2004). Techniques used in data collection include semi-structured questionnaires, surveys, observations, and focus group discussions. Therefore, as a mixed-method study, different data collection tools were used for this study. For quantitative data, surveys were used for data collection. In qualitative data collection, semi-structured questionnaires, interviews, observations, and focus group discussions were applied for data collection. In addition, secondary data was collected through NAMC sales recording regarding the St. Paul feedlot.

Phenomenological approaches are good at surfacing deep issues and making voices heard, and this is not always comfortable for funders, particularly when the research exposes taken-for-granted challenges (Lester, 1999). The data collected was intended to investigate the impact of the NRMDP on household food security and grass conservation.

Access to the respondents was required from gatekeepers. Neuman (2000), cited in Groenewald (2004), explained that a gatekeeper is someone with the formal or informal authority to control access to a site and a person from whom permission is required. Farmers were interviewed in the NRMDP facility or individually on their homestead. Farmers signed a consent form before the interview proceeded. The consent form proves that the farmer agreed to be interviewed and

reassures that none of their personal information would be used for any other purposes outside of this study. The questionnaire and interviews were conducted either in English or isiZulu languages to easily interpret the respondents' language. Five field workers were required to assist in data collection during data collection. A preliminary examination of the questionnaire was performed before the actual data collection.

3.6.1. Quantitative data

A quantitative data survey was used to collect data by administering a semi-structured questionnaire with closed-ended and open-ended questions. Also, an HFIAS scale was employed to determine household food access. All 77 respondents were dispensed with a questionnaire. Livestock sales and prices were obtained from the NAMC.

3.6.2. Qualitative data

For qualitative data collection, semi-structured interviews, field notes, and observations were used as a data collection mode to provide the textual qualitative data to the study. Data was collected during the visit to the facility and in the homestead participants. In addition, data was collected by a semi-structured questionnaire on how smallholder farmers describe their household food security status.

3.6.2.1 Questionnaire and interviews design

Face-to-face semi-structured interviews were used to collect data for this study, with a semi-structured questionnaire with closed-ended and open-ended questions. Ndobo (2013) reported that closed-ended questions have a small set of response options, whereas, in open-ended questions, the participants have multiple response options to choose from. Maluleke (2018) mentions that the questions are intended to allow the interviewees to provide more information that will add value to the outcomes of the process. Koopman (2018) argues that interviews are essential because they enable participants to discuss their interpretations of the world they live in and express how they regard situations from their perspective. At the same time, Ndobo (2013) asserted that conducting a face-to-face interview is fundamental to obtaining higher response rates.

The process commenced by introducing myself, the research topic, and reading ethical considerations to the participants. Interviews were conducted face-to-face by trained field

workers. The questionnaire consisted of five sections: the socio-demographic section, livestock and veld management section, food access and questions, lived experience regarding NRMDP, and the core of the question: How did or do you experience food security through the programme? The questionnaire related to information needed to analyze the food security status of the sample was based on questions on the HFIAS scale developed by USAID (Coates *et al.,* 2007). The HFIAS questionnaire is a standardized international measure used to indicate household food (in) security incidences.

3.6.2.2 Observational notes

Observational notes are accurate descriptions of events and conversations and the contexts in which they occur (Thani, 2018). Thani (2018) claimed that observation notes of critical aspects in the field because they assist recall of what transpired during the interview. The researcher observed participants' emotions when they shared their experiences.

3.6.2.3 Focus group discussions

Focus group discussion is advantageous for gaining an in-depth understanding of social issues, and it ensures that the researcher retains a high degree of control over the topic while granting the participants entire interaction within the discussion (Maluleke, 2018). Freitas *et al.* (1998) disagreed by highlighting that the researcher has less control over the generated data in a focus group discussion, data analysis is more challenging to be done, and it demands carefully trained interviewers. It takes effort to assemble the groups. The researcher conducted the focus discussions using an essential list of questions to guide the interviews. The researcher explained the purpose of the discussion, rules, and duration of the discussion. A sample of 77 NRMDP beneficiaries was gathered and divided into six groups to participate in the focus group discussion. The discussion explored participants' perceptions about household food security, livestock marketing, and their knowledge about grass biodiversity. For each focus group discussion, verification of information was performed. The discussion was conducted in an open space with a face mask and sanitizers applied. This is aligned with the Covid-19 regulation. The researcher facilitated the discussions.

3.7 Methods of data analysis

Mouton and Marais (1991) described data analysis as the process whereby a phenomenon is broken down into its constituent parts to be understood better. Phenomenological analysis

methods are directed towards illuminating the meanings of lived experiences of phenomena in human beings' lifeworlds (King, 2014). Sithole (2018) claim that data analysis assists in bringing order, structure, and meaning to the data collected. The researcher must describe the strategy for analyzing data (Neuman, 2009). Raw data from the questionnaires was captured on the Microsoft Excel spreadsheet and imported into the Statistical Package for Social Sciences programme version 27 (IBM SPSS 27) for analysis. At the same time, the audio recordings during interviews were performed digitally and transcribed verbatim by the researcher.

Notes from the focus group discussions were transcribed and organized into themes. The researcher reviewed all the transcripts to assess whether the data made sense. Then data was divided into more minor themes in preparation for analysis. The HFIAS determine the 30-day call of food consumed. Their descriptive statistics (frequencies, means, and standard deviations) was determined using IBM SPSS 27.

3.8 Validity and reliability

3.8.1 Validity

According to Leedy and Ormrod (2010) and Twycross and Shields (2004), validity is how the instrument measures what it is supposed to be measuring. Validity in research is seen as the extent to which the researcher provides sufficient detail to enable the reader to interpret the meaning and context of what is presented (Popey *et al.,* 1998). Ramanyimi (2019) argues that validity is the accuracy with which an instrument measures the factors under study. Trustworthiness in research can be determined by the extent to which the research provides information and the procedure the product has been accomplished (Koch, 2011). Therefore, validity is fundamental for the correctness and relevance of the questions asked to attain the desired information. Triangulation was used in this study to guarantee rich, vigorous, comprehensive, and well developed (Thani, 2018; Abdu-Raheem, 2013). Triangulation uses multiple data sources in the study to produce understanding (Thani, 2018).

Ramanyimi (2019) suggested that the research instrument to qualify the validity and reliability test must be administered and approved by the ethical clearance committee and the study supervisor. Gibbs (2002) asserted that validity is determined by the extent to which the data obtained from the participants has been consistently checked to a point where the data analysis process becomes self-correcting. Validity in this regard is measured by how the analysis reflected what was said by the participants. To ensure validity, the research instrument was

tested for content validity by giving the questionnaire to the research supervisor, conducting a pilot study, and obtaining ethical clearance from the research committee. Moreover, the researcher and the supervisor were on guard for any evidence of the data obtained that became repetitive or irrelevant relative to the research question. Speziale and Carpenter (2007) mention that bracketing is an effective way to ensure the validity of data collection and analysis in phenomenological research. The reference was conducted to previous studies related to the research topic.

3.8.2 Reliability

According to Gibbs (2002) and Babbie and Mouton (2002), reliability measures how the research findings will remain consistent across repeated investigations in different circumstances with different investigators and generalizable such findings. Thani (2018) revealed that result consistency is crucial for determining if the findings can be consistent if repeated. An external person evaluated the accuracy and whether the data supported the findings, interpretations, and conclusions. To ensure the study's dependability, the researcher provided a clear description of the research design, data collection methods, and analysis to understand my supervisors and the examiners. The phenomenological study allows us to know more about the shared experience of individuals involved in the research topic. Therefore, the reliability of this study was achieved through employing triangulation, prolonged engagement with participants, and confirmability. Windvogel (2018) maintains that confirmability ensures that the findings are based on the data rather than the researcher's biases. To align with Thani (2018), records of raw data and the use of multiple data sources were kept safe.

3.9 Ethical considerations

Harwell (2011), in a citation by Mkhwanazi (2019), mentions that researchers need to design research in a way that protects participants of a study from harm. I understand the significant nature of complying with the ethics of working with human subjects, and the University of KwaZulu Natal granted ethical clearance to, the Humanities and Social Sciences Research Ethics Committee with the reference number: HSSREC/00003324/2021. Hence, the research participants work with the Kwa-Zulu Natal Provincial DALRRD and NAMC; ethical clearance will be shared with these two institutions. The following aspects were taken into consideration to comply with the ethical requirements and communicated to the respondents through the informed consent letter:

3.9.1 Beneficence

Beneficence entails a researcher's duty to do good by respecting participants' well-being throughout the research process (Casey, 2016, cited by Thani, 2018). The researchers designed the study to be unlikely to cause any risk of harm to the participants. I considered that the research questions might trigger the emotions of smallholder farmers who lost their animals in the programme and were not being compensated. Participants were observed of any changes (emotional discomfort) and were comfortable continuing the interview. The researcher ensured participants that it was safe for them to share their experiences as master's student and was clear about the purpose of the interview.

3.9.2 Respect

To ensure that this study adheres to respecting participants throughout, the researcher makes sure that consent is primary. All information obtained was viewed as willingly given by participants. All research respondents were informed through a letter of consent regarding the study, which they were required to sign before the research commenced. The respondents were informed about the voluntary nature of the study, and they were under no obligation to participate in the study.

The respondents were informed that the information collected would be kept confidential and never shared with anyone except the researcher and the study supervisor. After data capturing, the hard copies of the questionnaire were stored safely for a period equal to five years and then destroyed. The respondents' identity was not recorded. The researcher audio-recorded with the permission of the participants. However, hard copies of the data collection tools were captured into electronic data, kept, and stored in a locked safe for five years for reference, and after that will be destroyed. Only the researcher and supervisor will remain with electronic data captured on the computer for academic purposes. No discrimination of any respondents based on gender, disabilities, and race was done in the research.

3.9.3 Justice

The National Commission for the Protection of Human Subjects of Biomedical and Behavioural Research (1978) suggests that the principle of justice entails that there should be fair procedures and outcomes in selecting research subjects. The researcher purposively selects participants and considers the inclusion and exclusion criteria to avoid undue influence from others. Honest is the crucial aspect of the study, and I was honest in data management, including capturing, analysis, and interpretation.

3.10. Dissemination of study findings

The study findings will be reported in the form of a mini dissertation. Before publication the study results, the researcher will present the feedback to the participants to determine that the interpretation is accurate to the lived experiences of NRMDP beneficiaries. The study results will be published electronically. The study will be published in journal articles locally and internationally. The researcher in conferences will do the presentation of papers. Recommendations will be made to equip NRMDP beneficiaries.

3.11 Summary

In this chapter, the researcher discussed the study's methodology with the research design outlined. The researcher discussed mixed methods and data collection tools for both qualitative and quantitative approaches, subsequently providing a context for the discussion of phenomenology methodology. The use of phenomenology and interpretative approach was supported with references. The NRMDP beneficiaries are selected on purpose, and the participants will sign a consent form, which will include guaranteed confidentiality information of participants. Investigating NRMDP is essential in exploring lived experiences of its participants and reflecting on their experiences in the programme. The researcher will adhere to ethical standards and Covid-19 regulations during the study process.

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CHAPTER 4: RESULTS AND DISCUSSIONS

4.1. Introduction

Chapter four presents and discusses the study's findings obtained from the interviews and focus group discussion conducted with the National Red Meat Development Programme (NRMDP) beneficiaries, specifically the custom feedlot facility from uMzimkhulu Local Municipality. Various officials from different institutions (government and private sector) working within the red meat sub-sector were interviewed. The themes that emerged from the data analysis are discussed and supported by verbatim quotes that are derived from the transcripts. The analysis is presented in tables and graphs to articulate the findings better. The study results are presented with an in-depth discussion of the findings.

4.1.1 Gender and marital status of household head

Figure 4.1 below portrays that rural community feedlot facilities are dominated by males at 74.0%, while females constitute 26.0%. Males headed most households. Male household members mainly undertake livestock farming in the study area since most of the men no longer seek employment opportunities and are unlikely to migrate to urban areas for work. The study by Mbanjwa (2016) also indicated that men make up the largest proportion of smallholder farmers, 63.9 %. Mapiye *et al.* (2009) also revealed that 75% of cattle production systems in communal areas of the Eastern Cape are dominated by men, highlighting the gender disparities in the livestock industry. The current study also reports gender inequalities, and that can be attributed to the reason that female counterparts will be responsible for other household activities such as looking after children and cooking.
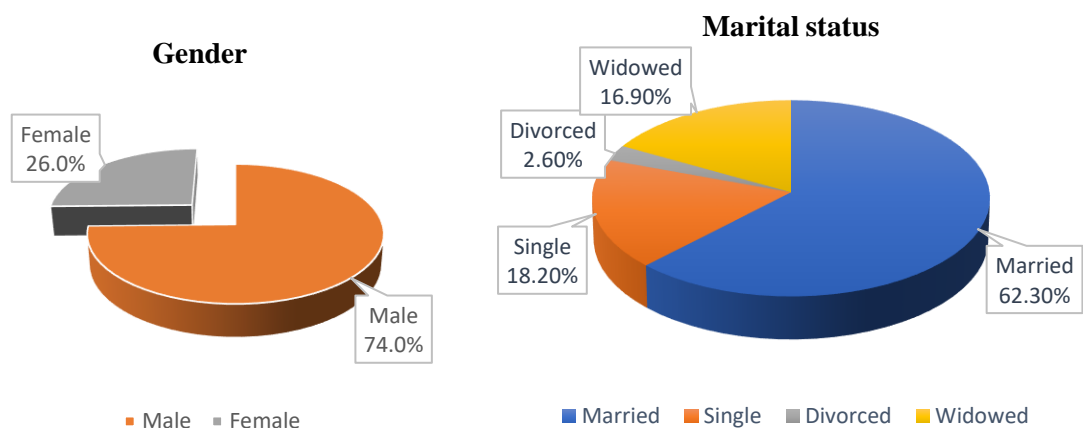
Figure 4.1: Gender and marital status of household head

Source: Survey data (2021)

The marital status of household heads was separated into four categories: single, married, widowed, and divorced. 62.30% of interviewed farmers were married, 18.20% were single, 16.90% were widowed, and 2.60% were divorced these result indicates a relatively large proportion of married household head. Married household heads are thought to have an advantage regarding labour availability for their production (Garikai, 2014).

4.1.2 Income and employment status of household head

According to Ndobo (2013), household income is the total monthly income of households from all sources. Household income has been considered the crucial determinant of household food security status (World Bank, 2018; Shelembe, 2018; Sekhampu, 2013). Hence, low-income households are susceptible to food insecurity (World Bank, 2018; Shelembe, 2018). Sekhampu (2013) and Jacobs (2009) indicated that income significantly determines household food security. In this current study, the majority, 36.40% of the farmers, reported that their primary source of income was livestock and the sale of livestock or livestock production. At 20.80% were government social grants, whilst 11.70% were skilled labour, and 7.80% were generated from the transport business. Table 4.1 shows the household head's main source of income.

Table 4.1: The household head's primary source of income

Household head source of income	Frequency	Percentage
Agricultural casual labour	6	7.80
Agriculture and sale of crops	6	7.80
Kinship/support from family, friends/remittances	4	5.20
Livestock and sale of livestock or livestock product	28	36.40
Skilled labour	9	11.70
Social grants	16	20.80
Transport	6	7.80
Other specify	2	2.60
Total	**77**	**100.00**

Source: Survey data (2021)

In alignment, Sotsha *et al.* (2017) claim that lower-income earners derive a higher income from livestock in rural areas. Chitja and Mabaya (2015) confirm that smallholder farming provides income, employment, and food for most rural areas. Despite their potential to improve smallholder income and household food security, in Kenya, smallholder farmers' average gross

income was about R 25 911.02 per year, measured in 2009 prices (FAO, 2015). According to The Alliance for a Green Revolution in Africa (AGRA, 2014) (cited in Stewart *et al.,* 2016), smallholder farmers with an average income of less than R 21.86 per day from agricultural production are not enough to meet household needs. Nevertheless, Ramanyimi's (2019) study shows that most smallholder farmers earn more than R5,000 per month from agricultural products and the income generated is translated to food security. In contrast, Myeki *et al.* (2014), Sotsha *et al.* (2017) and Sotsha and Mazibuko (2017) provided evidence that smallholder farmers who participated in the NRMDP were receiving higher income. Livestock sales are an essential component of household income (Munyai, 2012). However, seasonal income variability means that many households in South Africa find themselves permanently or temporarily unable to meet their daily food requirements (Shelembe, 2018).

Figure 4.2 displays the distribution of household heads by job status into seven categories: self-employed, employed for wage/salary, out of work and looking for work, homemaker, pension holder, out of work but not currently looking for work, and unable to work. 48.10 % of household heads were pensioners, 16.90% were unemployed but seeking employment, 10.40 % were employed for wage or income, 14.30 % were self-employed, 9.10 % were unemployed but now looking for work, and 1.30 % were homemakers.

Employement status
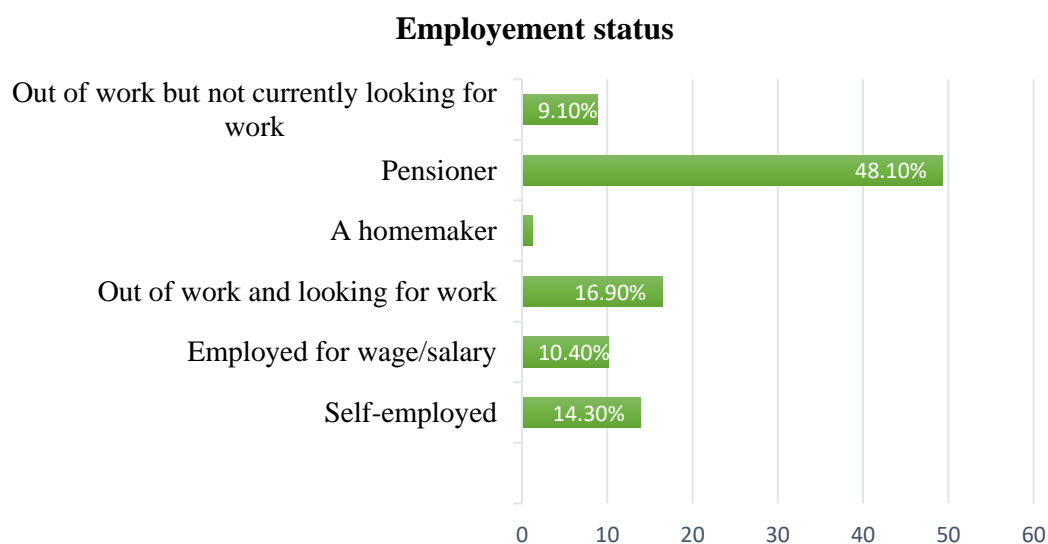
Figure 4.2: Household head employment status

Source: Survey data (2021)

The social grant was the only source of income for many homes with pension-holding heads of household (Shelembe, 2018). Unemployed farmers rely on agriculture in terms of revenue generation and food security (Ramanyimi, 2019). One respondent stated: *"We planned to sell*

our cattle in the feedlot after three months and have the income to buy food." Shelembe (2018) mentions that households with unemployed heads are more likely to be vulnerable to food insecurity. Households who cannot meet their daily food requirements are also susceptible to illnesses and micronutrient deficiencies (Shelembe, 2018).

4.1.3 Household head educational level

In Ethiopia, Shumiye (2007) points out that the educational attainment of the head of the household has positive effects on household food security. The Land Bank (2011) states that educational level enables farmers to manage their farming operations effectively. Therefore, education has positive implications for participating in the custom feedlot facility to increase the chances of earning a higher income and being in a food-secure household. The household head's education level affects cattle production and marketing (Marandure, 2015). Consequently, the study respondents were requested to mention their educational level. Education levels were categorised into four cohorts: no formal education, primary education, secondary education, and tertiary education. Figure 4.3 from the St. Paul feedlot facility project reveals that a small proportion of smallholder farmers, 6.50 %, attended up to the tertiary level, while 9.10 % had never attended school, 36.40 % attended up to the primary level, and 48.10 % attended up to the secondary level.
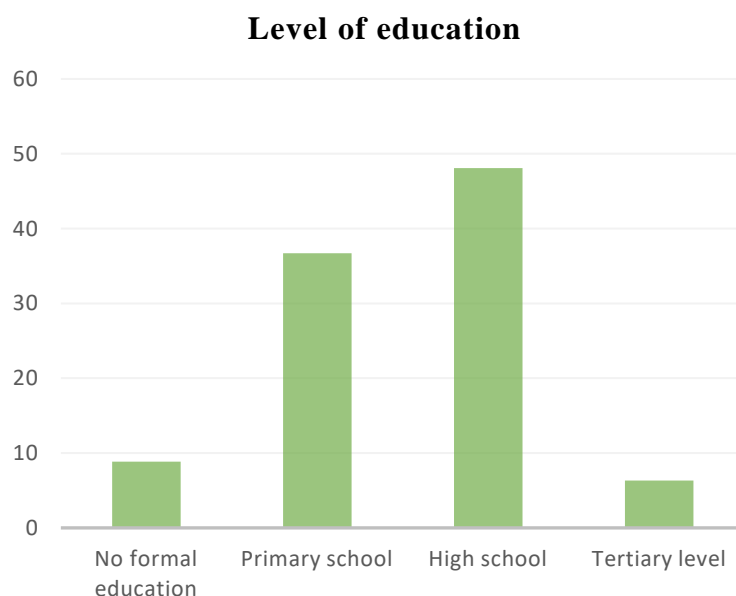
Figure 4.3: Level of education of household head

Source: Survey data (2021)

St. Paul the study findings are consistent with Mahlobo (2016), who reported a low level of education among smallholder farmers at uMvoti, KwaZulu Natal and align with Shelembe (2018), who concluded that the majority of household heads had a secondary level of education (60 %). A study by Grwambi *et al.* (2006) revealed low levels of education among smallholder cattle producers in South Africa. The educational level of farmers is of utmost importance in red meat production due to market demands (food safety, price changes, cattle production, and market requirements of the South African red meat sub-sector). In addition, education is essential for smallholder farmers in selecting appropriate livestock production strategies that will improve their income. The level of education contributes to food security and poverty reduction because it improves livelihood strategies and outcomes (Sakyi, 2012). Food insecurity is prevalent where the household head has a low level of education (Ramanyimi, 2019; Shelembe, 2018; Jacobs, 2009).

4.1.4 Household size

Feleke *et al.* (2005) indicated that household size is measured by the number of members within a household. In 2018, the World Bank mentioned that the larger the size of the household, the higher the incidence of poverty. Olayemi (2012) asserted that household size and food security are negatively correlated because as household size increases, food security decreases. Pressure for food within the household increases due to its large size (Musemwa *et al.,* 2007).
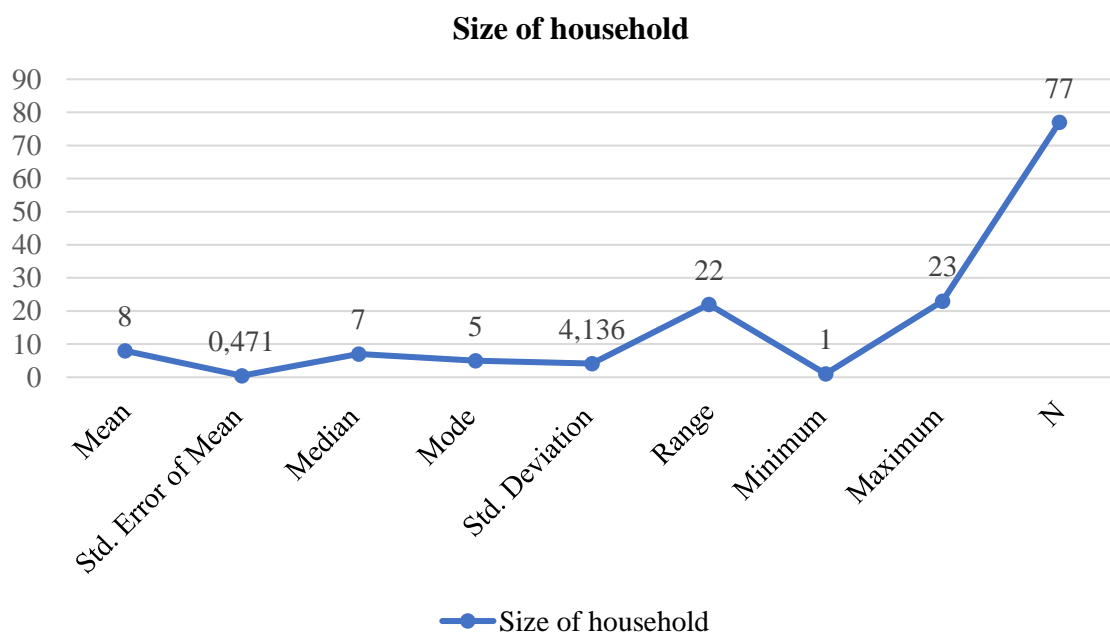
Figure 4.3: Size of household

Figure 4.3 above results show that smallholder farmers in the St. Paul feedlot programme had large household sizes with a range of 22 members with a mean of eight household sizes. Similar findings to the study were reported by Garikai (2014), who at Umbumbulu, whose household size ranged from one to 25, with a mean of eight members. On the contrary, large household sizes ensure an adequate supply of family labour for vegetable production activities and enable household members to earn additional income from non-farm activities (Martey *et al.,* 2012; cited by Garikai, 2014).

4.1.5 Age of household head

Descriptive analyses revealed that most of the farmers were adults with a mean age of 56 years, given that 32 % were between the age of 61 and 70 years while 25 % were between 51 and 60 years. The maximum age of the participant was 77 years old. Youth participation was very low, with the study revealing only 6 % (age 20-30) years. Figure 4.4 below shows the age group of participants.

Age group of participants

Adults (20-30) 6%
Adults (31-40) 10%
Adults (41-50) 13%
Adults (51-60) 25%
Adults (61-70) 32%
Adults (71-80)…

■ Adults (20-30) ■ Adults (31-40) ■ Adults (41-50)
■ Adults (51-60) ■ Adults (61-70) ■ Adults (71-80)
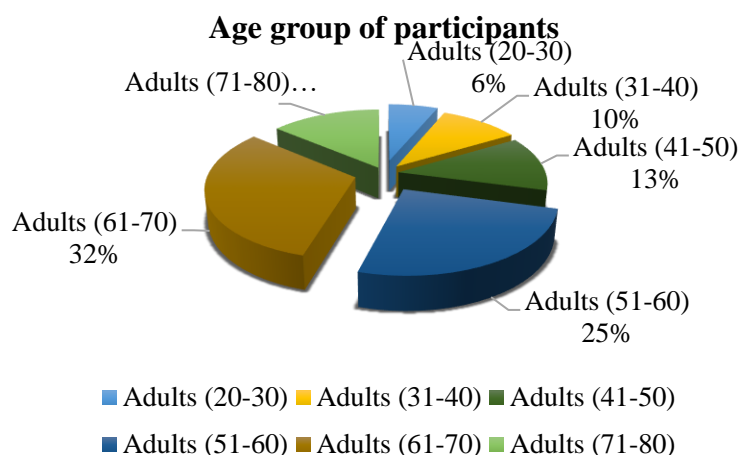
Figure 4.4: Age group of participants

The youngest farmer was 22 years old in the study area, which can be attributed to cattle ownership. Mbanjwa (2016) affirms that the dominance of older people in rural areas arises from cattle ownership in a household. Youth tend to move to the cities for better job opportunities. Previous studies by Garikai (2014) reported that the maximum age was 78 years at Umbumbulu. Mapiye (2017) reported that over 64% of farmers were between 46 and 65 years.

4.2 Overview of themes

The following section presents themes and subthemes formed after interviews with research participants. The researcher employed an interpretive phenomenological approach (IPA) to derive themes from the main objective, " Investigating the National Red Meat Development Programme's role in household food security and grass biodiversity at uMzimkhulu Local Municipality, KwaZulu Natal". Three main themes were derived from interviews as follows:

a) smallholder farmers' lived experiences as a beneficiary of the NRMDP in the St. Paul feedlot, b) participants reported a variety of challenges related to NRMDP, and

c) policy implementation to enhance household food security and grass biodiversity simultaneously (see Table 4.2). Every theme and subtheme presented in the study was briefly explained and supported by quotes from the participants. Then verbatim quotes were interpreted with the aid of IPA. Furthermore, the derived themes and subthemes were discussed in detail with supporting literature.

The following three themes were developed from the data collected:

Theme 1: Smallholder farmers' lived experiences as a beneficiary of the NRMDP in St. Paul feedlot.

Theme 2: Participants reported a variety of challenges related to NRMDP.

Theme 3: Policy implementation to enhance household food security and grass biodiversity Simultaneously.

Table 4.2: Themes, exploring respondents lived experiences under the NRMDP

Main themes	Subthemes
Theme 1: Smallholder farmers' lived experiences as beneficiaries of the NRMDP in the St. Paul feedlot.	New opportunity for better income.
	Smallholders' farmers' business venture
	Bureaucratic challenges
Theme 2: Participants reported various challenges related to NRMDP or St. Paul feedlot.	Marketing of livestock at St. Paul CFP.
	The sin of tenders in development.
	Destroyer of veld in communal areas
Theme 3: Policy implementation to enhance household food security and grass biodiversity simultaneously	NRMDP coordination and communication challenges.
	Policy gaps or alignment.
	NRMDP's role in household food security and grass biodiversity.

Source: Survey data (2021)

Theme 1: Smallholder farmers' lived experiences as a beneficiary of the NRMDP in the St. Paul feedlot

The prominent theme of smallholder farmers' lived experiences as a beneficiary of the NRMDP in the St. Paul feedlot refers to the lived experiences as being offered an opportunity to participate in the formal or systematized marketing of livestock. The main theme realizes the intentions of smallholder farmers in the programme and being able to obtain improved income and make a living out of their livestock. It emphasizes what farmers have gained or learned in the programme. This central theme also refers to opportunities for improved income for smallholder farmers to enhance their household food security and seek business opportunities within the red meat sub-sector that will enable them to improve the local economy and support their families. The theme consists of three subthemes i) new opportunity for better income, ii) smallholder farmers' business venture, and iii) bureaucratic challenges. (See Table 4.3).

i) New opportunity for better income: The subtheme new opportunity for better income can be characterised as the ability to create income by sending your cattle to be sold in the feedlot after they have spent 120 days in the facility, which farmers consider to be a short period to prepare their cattle for market. Smallholder farmers were attracted by the NRMDP's time and advantages, such as assistance with feeding expenditures, workshops, and training. Kunene-Ngubane (2015) asserts that food insecurity and low-income levels are key problems that must be addressed to improve the well-being of the majority. Consequently, nearly half of the population of South Africa is considered chronically poor at the upper-bound national poverty line of ZAR 992 per person per month (World Bank, 2018). However, the Sustainable Development Goals (SDGs) 2 aim to end hunger and all forms of malnutrition by 2030 and double the agricultural productivity and incomes of smallholder food producers (Stats SA, 2019). Therefore, the Integrated Sustainable Rural Development Strategy (ISRDS, 2004; in Musemwa *et al.,* 2010) identifies livestock farming as an agricultural sector with the potential to improve household food security and improve livelihoods in communal areas of South Africa. Moreover, the evidence in the following verbatim quotes below proves the importance of livestock towards income for smallholder farmers:

"On my side, my experience there was great because I received good money since I have a good breed and some of the peers need to be taught about feedlot requirements since their cattle take a longer time to be ready to be marketed."

"After putting my cattle into the feedlot, being honest, everything was smooth; it was perfect at that time, and I was positive that after three months (120 days), I would receive my first better income from the cattle sent to the feedlot. However, there were abrupt and cruel changes in the middle when there were feed shortages."

"I have three cattle that I sent to the feedlot to be fed and marketed, but one died there, one sold at a lower price whilst I have to take back one very thin home. Everything that happened there left a bitter taste in me, and it is still painful what I experienced there, and I did not even get compensation, and I do not believe that cattle died there. I feel like it was stolen or sold, not knowing."

Keeping livestock is a substantial risk reduction strategy for vulnerable communities. According to Nqeno (2008), Mngomezulu (2010), and Mapiye (2017), livestock is the source of income for smallholder farmers. Hence, Mahlobo (2016) and Munyai (2012) revealed that smallholder farmers relied on livestock for emergency cash to purchase food and meet health expenses. Lubinga *et al.* (2018) reported that farmers who sold their cattle through the Custom Feedlot Programme (CFP) facilities receive higher prices than non-CFP facilities participants. Molefi (2015) maintains that most farmers (47%) ranked beef cattle as their primary source of income. Many respondents reported cattle as their bank account on legs. Eastern Cape's Mouth Frere Myeki *et al.* (2014) emphasised that the NRMDP had a favourable impact on women's empowerment; thus, their profit was more significant. Participants who were mainly involved in this NRMDP programme were income-earning opportunities. Even though some farmers were not as fortunate to receive income.

ii) Smallholder farmers' business venture: Respondents stated that participating in the feedlot programme had taught them the new business opportunity, and this initiative has instilled the idea of making a living out of their livestock. However, participation in the programme might be extremely difficult due to the impact of several factors on livestock marketing. In the majority of cases, they claimed that they are content with the prices they obtain when their animals are sold, despite the fact that livestock marketing can be facilitated after a lengthy period of time. The participants had the following sentiments to share concerning the CFP business:

"The St. Paul feedlot is a nice initiative for us; our government have done massive work by building a feedlot for us because that was an eye-opener for us to realise that we can live and send children to school due to livestock. However, some of us who participated in the programme have noticed that this is a business, and there is no smooth road in business. Most of us are under livestock association; we discuss this, and that aid in opening our eyes and minds."

"Firstly, to participate successfully in this business, you need big frame cattle such as Beef master, Brangus and Simental. I am pleading with my fellow farmers to change their breed (bull) because they do not provide them with better income; Secondly, people need to be trained about feedlot operations and the red meat classification system used in South Africa to succeed in the business. I have already changed my bull to produce quality animals for the business I embark on."

"My experience there is being taught about livestock business since we are being exposed to a new dimension of this business because we are used in our traditional informal marketing whilst the feedlot money is transferred to your bank account instead given in cash. As a result, that will help me in future regarding my business since I will be able to provide proof (bank statement during credit requirements) that I am in the livestock business."

According to Munyai (2012), the livestock sector in developing countries contributes more than 33% to the agricultural gross domestic product. In addition, cattle are an inflation-free form of banking for resource-poor people and can be sold to meet household expenses (Musemwa *et al.*, 2008). In Southern Africa, livestock sales are an essential component of household income, contributing over 25% of the total income and crucial for food security (Musemwa *et al.*, 2008; Mahlobo, 2016). Several studies have reported livestock as an insurance and investment value for smallholder farmers. As a result, Musemwa *et al.* (2010) mentioned that smallholder farmers sell more cattle as transport becomes more available. These findings are in line with Gwiriri *et al.* (2019) and Marandure (2015), who highlighted that transaction costs were low for farmers who participated in the programme, and this initiative has encouraged farmers to sell their cattle. Ndoro *et al.* (2013) claim that selling their cattle through the auction pens often fetches better prices than those sold elsewhere. Mapiye (2017) noted that household size determines productivity and enterprise income in communal areas. In contrast, households with large sizes negatively impacted farm income and the business if most of the members did not participate (Mathonzi, 2000).

i) **Bureaucratic challenges:** The subtheme seeks to highlight the ill-treatment the participants were subjected to during their time in the programme. Participants revealed that the treatment they received in the programme was emotional and still hurt and abusive, and some of them still hurt whenever they think about it. In most cases, they will arrive at the project site to find their animals starving, and it went to extant that their cattle die due to hunger and there was no compensation and whilst others claim that their livestock was sold without being part of price negotiation. It was clear that these farmers had experienced severe trauma, and some were not willing to continue participating in the programme.

"It was emotional abuse for me to see my cattle staying for longer days without being fed because there was no feed in the facility. Furthermore, seeing my cattle starving to death was emotionally devastating, and it was my first-time seeing cattle eating their dung or stones; as a result, I cannot imagine cattle that are locked up not being fed, and I was so helpless."

"I have not found peace due to my cattle that died in the facility due to starvation, and I was embarrassed when I had to go there and took my cattle that was very thin, and that can die anytime; as a result, I had to offload the cattle far from home because I was ashamed, disappointed and humiliated and I was going to be a laughingstock in the community."

"Feedlot was providing us an opportunity of earning better income from our cattle and security for our cattle simultaneously; however, now I am so hurt because my ox that was not sold in the feedlot was stolen but in the feedlot are safe."

Even though previous studies by Nyhobo *et al.* (2014) and Gwiriri *et al.* (2019) reported constraints of feed shortages in these facilities. Cattle continue to die in CFPs, and farmers are not compensated, resulting in these local farmers disengaging from the CFPs, and the main reason is supplies shortages such as feed and treatment (Gwiriri *et al.,* 2019). The situation can is directly attributed to bureaucratic challenges that field workers and farmers were facing in these CFPs. This is a dire situation to ignore, given that smallholder farmers largely depend on livestock for income. Thus, it negatively affects the expansion of the farmer's income and the growth of the farming businesses. Cattle production has been praised as the primary source of reducing food insecurity and increasing smallholder farmers' income in South Africa (Nqeno, 2008; Montshwe, 2006; Mahlobo, 2015; Lubinga *et al.,* 2018). In support, Nyhobo *et al.* (2014) highlighted that livestock marketing represents a primary unexploited source of income for many of the country's poor households that own these animals. Therefore, the death of cattle (due to feeding shortages) in the CFP implies that the affected household is exposed or highly vulnerable than ever to the effects of food insecurity. Nyhobo *et al.* (2014) recommended that

feed purchases are the most extensive input for the programme, and it utmost importance to take a close look at the ways of finding the least cost ration. Some are reluctant to continue sending their cattle to the programme, whilst the majority expressed their enthusiasm about their continuity in the NRMDP.

Theme 2: Participants reported a variety of challenges related to NRMDP or St. Paul feedlot

The principal theme refers to key factors mentioned by participants that hinder the programme in realising its objective of improving the lives of its beneficiaries. There are specific challenges that need to be addressed immediately. This theme highlights marketing challenges, issues with the tender into agricultural projects, and the impact of veld fires in communal rangeland consequently into livestock production. This theme can reveal a lack of awareness regarding veld burning in rural communities as there is an appropriate use of fire by many community dwellers in the grazing camps. Also, it seeks to address the issues of uncontrolled veld burning.

i) Marketing of livestock at St. Paul CFP: Livestock marketing by smallholder farmers into the formal market has been hindered by various aspects such as lack of information, infrastructure, and transaction costs. Lack of marketable livestock numbers and poor condition of livestock from smallholder farmers is one of the critical constraints (Mngomezulu, 2010). Studies have revealed that in the CFPs, farmers tend to send older animals. A discussion with farmers regarding the marketing of their cattle was one of the most important topics during the focus group. The following quotations illuminated the experience of farmers.

"Our cattle were not sold or marketed on the stipulated time of three months, and that was a frustrating experience."
"I could not sell animals because my cattle died due to starvation, and I believe if it were sold with the first three months of its stay in the facility, I would have earned income."
"If my cattle were sold through auctions, I would have earned a better income because my cattle were big."
"It was clear that our cattle were not properly fed and that negatively affected my income because my cattle received low income. The most unfortunate thing there was our livestock subjected to hunger that resulted not to be able to sell and coronavirus also negatively affected us because of low demand for beef during the lockdown period."
During a discussion with the participants, it was clear there is a vast gap in understanding of the marketing norms and standards of the South African red meat sub-sector. In South Africa,

smallholder cattle farmers are keen to sell beef to formal markets, but the classification system used to value beef carcasses favours young well-muscled animals (Marandure, 2015). Grading and classification systems are used in the beef industry to describe the quality and yield of a carcass (Chingala *et al.,* 2017; Strydom *et al.,* 2015). However, the lack of reliable marketing information amongst smallholder farmers is severe (Montshwe, 2006). Smallholder farmers mainly keep indigenous cattle and nondescript crosses with exotic breeds (Nqeno, 2008; Strydom, 2008). Indigenous cattle are slow maturing and ideally suited to marketed natural pasture (Strydom *et al.,* 2015).

Older and lighter carcasses from indigenous cattle fetch low prices in formal markets (Chingala *et al.,* 2017). Contrary to the experience of Gwiriri *et al.* (2019) and Ntombela *et al.* (2013), CFPs provided an opportunity for communal farmers to attain higher prices for older animals. In support, studies by (Marandure 2015; Fakudze, 2015; Ntombela *et al.,* 2013; Lubinga *et al.,* 2018) reported a higher off-take rate and higher prices for the CFP participants. Despite the improvement of smallholder farmers' income and market off-take rate, the food security extent has not been researched.

ii) Sin of tenders in development: This subtheme relates to acquiring the St. Paul feedlot supplies. The purchasing of products and services for the NRMDP is of the utmost importance to the NRMDP beneficiaries' ability to generate income and, consequently, food security. The acquisition of products would directly or indirectly affect the local environment in the study area. Finding a better procurement system and having a fair exit could lead to food security for households. This is clear from the following quotes. St. Paul:

"If I knew that the government would use the tender system there, I would not have sent my cattle there because tenders are not good since those guys only care for their profit. The person who got a feeding tender for St. Paul feedlot failed and hurt us a lot because our cattle were starving subsequently; we have no choice but to take cattle back home."
"It is a great sin for the government to stop feeding our cattle without notifying us, and the tender people did not treat us well. There is a lack of honesty and integrity because we sent our cattle in good conditions, yet when we get to the facility, we find out animals dying because tender people did not deliver."
"I sent two cattle to the feedlot with the hope I will earn income so that I can be able to do my household needs; unfortunately, one cattle died there, and the other came back very thin, all

due to tenders that were used in the programme and that expose me to food insecurity since I am not working."

"During programme mobilisation and awareness, we were not informed that the majority of the procurement there was going to be done via tenders, and it is clear to me now that government departments are failing because of tenders."

A tender is a process where an organisation is invited to supply goods and services and awards the contract to the best offer according to predetermined criteria without negotiation (Woods, 2008). At the same time, Ngobeni (2011) found that the goods and services bought by a national government in South Africa represent large public money. The national government must put in place measures to manage how these goods and services are acquired and used. However, proper and successful government procurement rests upon certain core principles of behaviour: value for money, open and effective competition; ethics and fair dealing; accountability and reporting; and equity.

During interviews with key informants, it was discovered that the programme used the tender system for the procurement of feed due to the likelihood that feed would cost more than R500,000. According to National Treasury practise note no.8 of 2007/8, all national departments are required to solicit competitive bids for all procurement. However, the feed issues in St. Paul began when the new administration took office in the middle of 2019. The new administration quickly halted all transactions between the DALRRD and the National Agricultural Marketing Council (NAMC), the program's implementing agent. Therefore, no feed was purchased, and farmers' cattle with minimal resources perished.

Consequently, they were exposed to greater food insecurity. According to Ngobeni (2011), the national government is confronted with major difficulties in managing the bidding process, and these difficulties are related to the implementation and adoption of the code of best practices. St. Paul's verbatim quotes suggest that numerous research participants' lived experiences were unhappy with the procurement of feed in the programme due to the tender system. However, the evidence from the respondents indicates that they experienced these issues when the new administration took over.

iii) Destruction of veld in communal areas: This subtheme refers to an experience smallholder farmers and critical informants share as the destruction of veld in communal areas. This is evident in the quotes below:

"If grass biodiversity is not conserved, that means livestock is not going to help us, and we do not have means or resources of feeding animals; therefore, it means we need to conserve grass."

"When I look at the grass, I see a cheaper source of feed, which will increase my profit from livestock; however, uncontrolled burning of veld by community members is destroying everything. People often burn our veld in winter, which exposes our livestock to starvation; as a result, our cattle production is negatively affected."

"There is a new upsetting habit of fire frequencies on our grazing land that is destroying the condition of our veld since increasers species are replacing the decreased species. Veld burning has been our main obstacle as smallholder farmers, and it is continuing at an alarming rate, and it seems like no one is determined to take action."

According to Mapiye (2017, citing Harding *et al.,* 2007), a lack of feeding resources has been reported as a severe constraint to cattle productivity among the smallholder producers. There are shortages of feed (Sotsha *et al.,* 2017: Mahlobo, 2016; Nqeno, 2008). Then cattle are exposed to starvation that is exacerbated by uncontrolled veld burning in communal areas. According to Tainton (1999), veld burning in South Africa has been used for agricultural and conservation areas objectives. Therefore, fire is regarded as a central component in the management of veld (Tainton, 1999; SANBI, 2014; Mahlobo, 2016).

However, incorrect application of fire can result in a shift in species composition, a decline in basal cover, an increase in soil erosion, and bush encroachment by invasive alien or indigenous woody species (SANBI, 2014). Hence, dry grasslands should not be burnt frequently (SANBI, 2014). Tainton (1999) argues that it is a standard practice amongst farmers to burn veld annually because this practice is recently burned veld is more nutritious than unburned veld. SANBI (2014) maintains that burning too frequently can damage the veld, leading to poor species composition and negatively impacting animal production.

For livestock to perform at just an optimal level, the nutrition must be adequate and high quality to satisfy the nutritional requirements. Therefore, it is important that the carelessness of veld burning practices used by communities be stopped because grasses of poor nutritional value and quality often replace quality grass species. Contrary to this presumption, Nyingi *et al.* (2018) state that vegetation types such as the grasslands, savanna, and fynbos are dependent on fire for their optimal ecological function. Hence, fire suppression in these vegetation types has significant negative consequences for biodiversity (Nyingi *et al.,* 2018).

Awareness campaigns are crucial for smallholder subsector farming to understand the planned use of fire in their grazing area and act when there is fire. Therefore, veld fire control teams must be established in each farming community to safeguard their grass resource from being consumed by unwanted destructive fires.

Theme 3: Exploring the experiences of officials involved in the NRMDP regarding policy implementation to enhance household food security and grass biodiversity simultaneously

This core theme refers to how the National and provincial officials worked closely within the NRMDP to experience policy implementation regarding food security and grass biodiversity. Discussion with the participants indicated that the programme plays an essential role in household food security and grass biodiversity in rural areas. However, the programme is impeded by policy gaps and needs to be aligned with the needs of smallholder farmers. Participants reported that a lack of coordination and a lengthier turnaround time are two of the most significant obstacles to the project. Sub-themes include i) NRMDP coordination and communication challenges, ii) policy gap or alignment, and iii) NRMDP role in household food security and grass biodiversity.

i) NRMDP coordination and communication challenges: This sub-theme refers to management experiences by the NRMDP team members about coordination, communication, and implementation that may result in the programme's inability to achieve its goals or objectives. This can be observed in some of the quotes below.

"The main challenge was coordinating or communicating with the national office regarding resource distribution and receiving those resources as a turnaround was too long."
"The challenge is the issue of implementing the programme in a coordinated manner where the government can be there to play a critical role in creating an enabling infrastructure which will allow the programme to be sustainable whereby all the stakeholders from the national to local government and private sector can be coordinated to support the programme."
"The turnaround was extremely long, and things on the ground might have changed for the worse by the time you receive feedback. Also, farmers are not fully participating in the programme as many farmers are not clear about the project goals or what it seeks to achieve."
"Communication breakdown is frustrating for farmers and implementors due to easy task that can be concluded within a week it took about five months due to poor communication."

There is a need for a coordinated approach to addressing the pillars of food security in South Africa (Nkwana, 2015). Furthermore, a lack of engagement with relevant stakeholders resulted in a limited understanding of the diverse problems (Pereira and Drimie, 2016); thus, a programme might fail its objective. South Africa still faces many developmental challenges, but that can be improved by making commitments, resourcing those commitments, going beyond networking and dialogues, and holding each other accountable for coordinated responses (Nkwana, 2015). In order to correctly solve the program's obstacles, it is necessary to have a coordinated strategy for addressing communication concerns. There is a straightforward way for the NRMDP to fulfil its goals, coordination must be enhanced, responsibility must be shared with stakeholders, and individual stakeholders must assume responsibility for their actions.

ii) Policy gaps or alignment: Participants in the study emphasised the necessity for government departments working in the agriculture sector to unify their policies. Some participants stated that agriculture is an industry that cannot afford delays; hence, its policies should be adaptable to stimulate smallholder farmers' services amid shocks. Thus, agriculture is concerned with providing survival necessities to a population with limited resources. The DALRRD was the primary funder for the programme in strictly providing financial support for feed, veterinary needs, training, and staff. The following is the evidence from the participants regards to policy gaps or alignment:

"For any policy to be successful, it must pass at least four stresses: political, funding, bureaucratic and socio-cultural stress. Political stress is often experienced when there are new ministers, some are not good in inherent policy, and good policy will suffer, and the NRMDP is suffering due to this type of stress. While funding stress has been one of the main hinders of the programme due to insufficient funding, long processes in the fund to be released; hence funds can be made available in the last two months of the financial year. The funding did not allow the programme to be sustainable due to a shorter period of funding the programme and funding sometimes is stopped abruptly. Bureaucratic stress is when there is good policy, but it suffers due to implementors who do not see eye to eye, or there is poor coordination, and it leads to stunted growth and socio-cultural stress; however, this one is not an issue for the programme because the NRMDP it was tail made to the social needs of smallholder farmers."

"There is a policy gap that needs alignment for the funding of the NRMDP or any agricultural project, and it needs to be aligned especially for the needs of the targeted projects. There are

a lot of red tapes within the government system that makes things be done at a slow rate because when you are a farmer or implementing agent working in agriculture, there is no switch for on or off things. After all, if you require feed or water today, it must be delivered now, not tomorrow, and anything needed must be attended to now. There is no chance of waiting for a tender that will be completed after six months. Hence, these red tapes in our system are killing the state."

"The programme is operating under policies that are having huge gaps because Service Level Agreement (SLA) that were meant to be signed is not yet signed, and it is almost a year now, and the programme is not adequately funded when it is operational. NRMDP is suffering because of the gap in policy because the government should have created a policy that would enable all the stakeholders to be under one roof as that policy will integrate government departments, municipalities and SOEs to allow farmers to access information easier; however, there is no such policy."

The purpose of identifying policy coherence or policy gaps is to determine the need to ensure that an effective policy is designed for the programme. Therefore, to enhance the contribution of the NRMDP to reducing food insecurity among the poor, it is crucial to understand the reasons for the policy gaps. Identifying the reasons for poor policy coherence will enable policymakers and planners to address food insecurity and grass biodiversity at uMzimkhulu in the context of the programme, which provides a complete package to farmers that would encourage them to sell their animals. The Food and Nutrition Security (FNS) policy emerged in 2013, and it seeks to pave the way toward a secure food country in which the right to food is realised for all (Moyo, 2016). According to Hendriks (2014), the agricultural policy on the Agriculture White Paper Discussion Document aimed to create an environment in which opportunities for higher incomes and employment for smallholder farmers would be created alongside a thriving commercial farming sector.

In support of this policy, NAMC, in 2013, embarked on the cattle custom feeding programme, where smallholder farmers' cattle are fed and marked through this initiative. Lubinga *et al.* (2018) reported that smallholder farmers selling their cattle through the programme were getting a higher income, while their counterparts selling elsewhere got a lower income. However, this initiative has suffered due to a lack of policy coherence.

According to Thow *et al.* (2017), citing Organization for Economic Cooperation and Development (OECD, 2016), policy coherence is the systematic promotion of mutually

reinforcing policies across government departments to create synergies toward achieving agreed objectives and to avoid or minimize negative spillovers in other policy areas. As noted, Delport (2019) argues that there is a lack of necessary coordination and implementation mechanisms to align policy responses across government departments effectively. Pereira and Drimie (2016) state that inadequate consultation in drafting the policy has undermined its ability to provide real policy direction. In support, Drimie (2016) affirms that government structures often create inconsistent policies due to their separate political mandates. There are profound institutional barriers to successfully translating policy into implementable programmes (Altman *et al.,* 2009). Existing agricultural and food policies have failed to provide the required mechanisms to underpin accurate policy alignment for the agricultural system and good governance (Delport, 2019). In South Africa, the policies favour large commercial agriculture, and little policy is available to support the smallholder agriculture sector (Thamaga-Chitja and Morojele, 2014). Therefore, the policy has a significant role in explaining the gap in food insecurity and grass biodiversity loss in the study area.

iii) NRMDP role in household food security and grass biodiversity: The subtheme role of the NRMDP in food security and grass biodiversity can be defined as the ability to generate an income by selling cattle through the programme and using that income to purchase food. Whilst grass biodiversity is the ability to put animals into the CFPs to reduce grass pressure in communal grazing lands. This is evidenced in the following quotes below:

"The NRMDP is contributing to household food security where the programme is operational and that it comes in the form of livestock marketing which is the income after selling and through consumption of quality meat the CFPs produce. It plays a significant role in grass biodiversity by reducing uneconomically livestock (old and sick cattle) in the veld."
"NRMDP is responding to food security because it is one of the programmes that ensure that farmers do not leave their areas and look for markets and promote improvement in the local economy. Hence, the NRMDP addresses food security because it has generated over 3 million cattle sales in the area since implementation."
"The programme has a strong potential to improve household food security because it has been able to drive the local economy through creating jobs in a particular area."
"uMzimkhulu is dominated by sour veld due to uncontrolled burning of veld; therefore, the programme has intervened by conducting training on veld management and conducting auctions for older cattle and excessive bulls."

"NAMC can create market access for farmers in rural areas, through auction and teach farmers about animal husbandry to assist in producing quality grade of meat that is required by the market and convert their livestock into income to buy family needs."

The overexploitation of natural resources is a direct result of population growth, and without proper interventions, it leads to a decline in biodiversity and increases the vulnerability of rural communities to poverty (Nyingi *et al.,* 2018). Impoverished and food-insecure populations reside in countries with the most significant biodiversity resources (United Nations Division for Sustainable Development, 1992 (cited in Abdu-Raheem and Worth, 2013). The longer cattle stay on the natural pasture, the greater the pressure exerted on vegetation (Marandure, 2015); hence there is a grass biodiversity loss. There is a need for sound policy to address grass biodiversity and household food security problems in rural areas. Marandure (2015) suggested that well-managed veld with good soil fertility and high levels of biodiversity positively affect cattle body conditions by providing higher nutrient quality.

However, livestock farming has great potential to alleviate household food insecurity and poverty in communal areas of South Africa ISRDS, 2004 (cited in Musemwa *et al.,* 2008). Rural households use cattle for milk, meat, and income generation (Munyai, 2012; Nqeno, 2008).

Previous studies by Ntombela *et al.* (2013), Myeki *et al.* (2014), and Lubinga *et al.* (2018) reported that smallholder farmers in the custom feedlot were earning higher profits at Mount Frere, Eastern Cape, and KwaZulu Natal, respectively. Therefore, the programme has a positive role in household food security and is vital to increasing smallholder farmers' participation as it is beneficial to grass biodiversity in the area. Overgrazing is reduced in communal grazing land due to the implementation of the community custom feedlot because the programme facilitates the marketing of uneconomical livestock.

4.3 Impact of the National Red Meat Development Programme (NRMDP) on household food security

According to FAO (1996), food security is the situation when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy lifestyle at the individual, household, national, regional and global levels. South Africa is deemed a secure food country at the national level as it produces sufficient food due to its strategic plans to import other staple food. Despite that,

millions of South Africans are food insecure at the household level. According to Mkhatshane (2019), citing Radimer *et al.* (1990), a household is considered food-secure when its members do not live-in hunger or fear starvation. For a household to achieve food security, it requires adequate resources to obtain appropriate foods for a nutritious diet that households can utilize (Mkhatshane, 2019). In addition, food security relates to people securing access to the food they need for a healthy and active life (Ndobo, 2013).

At the same time, smallholder farmers have been reported to own the majority of cattle in South Africa, and (Ngarava *et al.,* 2019) mention that Livestock Development Programmes (LDPs) have been implemented in the endeavour to mainstream smallholder rural poor livestock keepers to participate in formal market economies. Despite that, food insecurity is persistent among smallholder farmers. Kataneksza *et al.* (2012) pointed out that Kwa-Zulu Natal has 5.7 million poor people, which means that 61% of the population lives in poverty.

Therefore, the study sought to ascertain the extent to which the St. Paul feedlot contributes to food security for the programme's beneficiaries. To investigate the household food security status of the beneficiaries, the study employed Household Food Insecurity Access Scale (HFIAS) tool to measure household food access. The HFIAS is used to monitor whether households have become vulnerable to food access in the past 30 days, and (Sekhampu, 2017) the questionnaire consists of a set of questions about concerns and availability and accessibility of food. The HFAIS score was calculated for each household based on the nine 'frequency-of-occurrence' questions. According to Coates *et al.* (2007), household food insecurity score ranges from 0 to 27, with a high score indicating greater vulnerability to food insecurity. In the study, the HFAIS mean score was 8, with a median score of 9, a minimum score of 0, and a maximum of 23. The standard deviation of 6.2 implied a high variation between the individual scores ranging from 0 to 23.

According to the study findings, 19.5% of the surveyed households in the St. Paul custom feedlot were classified as food secure compared to 80.5% as food insecure (see figure 4.5 below). Altman *et al.* (2009) revealed that a large proportion of South African households were food insecure. The study corroborates with Stats SA (2009), Mukwedaya (2018), and Nyakurimwa (2011), who observed that KwaZulu Natal has a high prevalence of food-insecure households. At the same time, 73 % of households in South Africa are food insecure (Hendriks, 2005). According to Shelembe (2018), 72 % of households consume much less recommended daily intake of calories. Although the NRMDP can expand the economic participation of smallholder farmers in the area. Food insecurity is prevalent amongst St. Paul custom feedlot project beneficiaries,

and that can be attributed to constraints in the programme such as cattle death within the facility, more extended period to sell animals, unappropriated cattle used for a feedlot, lack of feed in the facility, and closure of the programme. The facility was not operational for almost 15 months during the study period. Some respondents indicated that some farmers had to take their cattle back home and use other marketing channels. Figure 4.5 presents the food security status of St. Paul feedlot beneficiaries.

4.4 Categorize of food (in)security

FAO (2006) mentions that the availability and accessibility of food considers a secure food household in one's home. Ndobo (2013) records that households are food secure when they have access to the amount of safe food needed by all household members. Hence, Coates *et al.* (2007) indicated that secure food households do not have to worry about food access because they rarely experience anxiety about not having enough food. However, food insecurity can be described as not having access to highly nutritious food required to maintain a healthy body and life (Ramanyimi, 2019). On the other hand, food-insecure households are worried about not having sufficient food to eat or not having money to buy food when it runs out (Ndobo, 2013, citing Burns, 2004). Food insecure households were categorised into three food-insecure households: mild food insecure, moderately food insecure, and severely food insecure. Coates *et al.* (2007) indicated that mild food insecure individuals were anxious about not having sufficient food in the past 30 days. Coates *et al.* (2007) observe that moderate food insecure households consume inadequate diets and eat less preferred food. Subsequently, reducing the quality of food intake, limiting the numbers and portions of meals eaten daily (Abdu-Raheen and Worth, 2011). However, severe food-insecure households are vulnerable to food shortages. There is a high incidence or occurrence of going to bed without food.

Household food security status results are presented in figure 4.6 on the HFIAS classification measure of food insecurity; about 19.50% of the sampled households were classified as food secure, 29.90% were mildly food insecure, 40.30% were moderately food insecure, and 10.40% were severely food insecure.
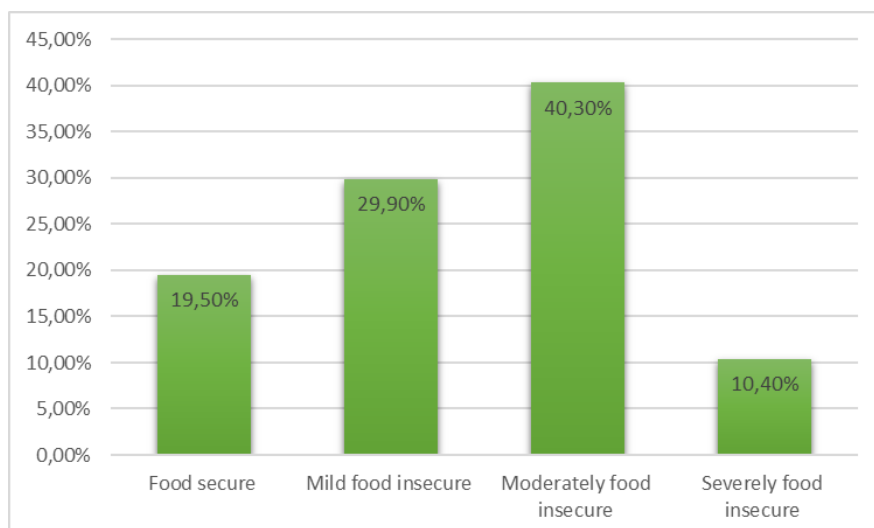
Figure 4.5: Percentage distribution of household food security status

Source: Survey data (2021)

The study shows that many households are food insecure at 80.50%. The COVID-19 pandemic has further exacerbated the plight of food insecurity for smallholder farmers at St. Paul. Livestock auctions were stopped, and beef demand was extremely low due to closed hotels, restaurants, and entertainment facilities. Movement restriction posed by the government as a regulation of limiting the spread of the virus affected the marketing of livestock and subsequently increased food-insecure households. According to Shisana *et al*. (2013), reporting the SANHANES 2012 survey, 28.3% of the South African population were at risk of hunger, and 26% experienced hunger in 2012. Households in the poorest quintile recorded the highest level of severe and moderate food insecurity in all years (World Bank, 2018). The most significant proportion of participants who experienced hunger was in urban informal 32.4% and rural formal 37.0% areas (Shisana *et al.*, 2013).

4.4.1 Household food security and demographic variables

4.4.1.1 Gender of household head by food security status

The relationship between gender and household food security is presented in figure 4.6. The study findings reveal that gender plays an essential role in enhancing household food security because food security varies substantially between male-headed households and female-headed households.
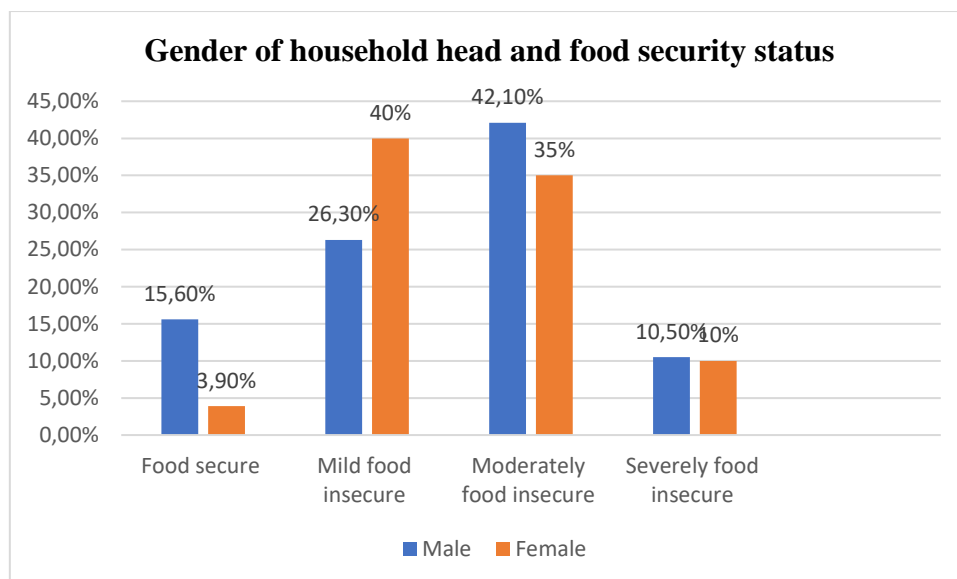
Figure 4.6: Gender of household and food security status

Source: Survey data (2021)

Male-headed households 15.60% were more food secure than their female-headed household counterparts 3.90%. Mild food insecurity was prevalent in female-headed households at 40% and male-headed households at 26.30%. Male-headed households were more moderately food insecure at 42.10% and female-headed households at 35%, and severe food insecurity was not much different as the male-headed household was at 10.50% and the female-headed household at 10.10%, respectively. Olagunju *et al.* (2012) found that households headed by a female were more food insecure than those headed by a male. The study findings concluded that female-headed household were food insecure than their male counterparts.

4.4.1.2 Marital Status of household head

The figure 4.7 below presents the marital status of the household head and food security status.
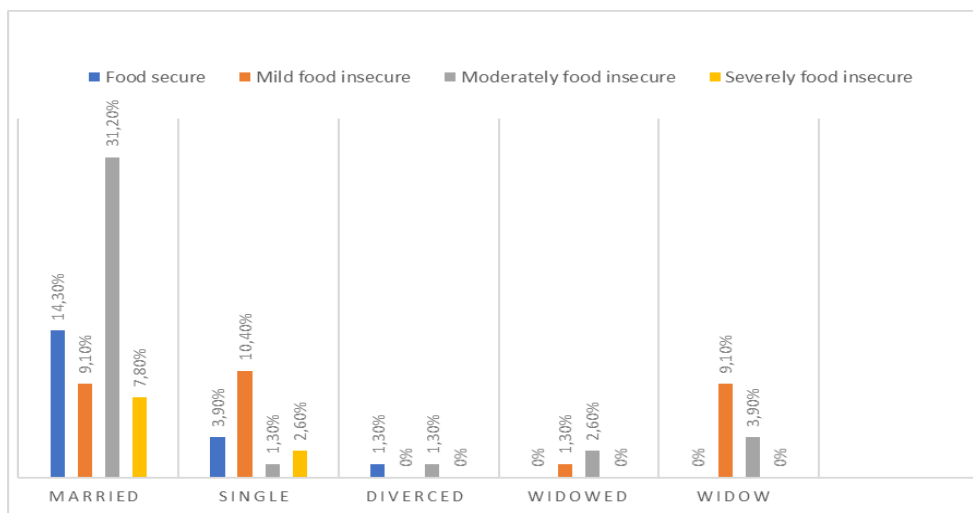
Figure 4.7: Marital status of household head and food security level

Source: Survey data (2021)

In households with married couples, 14.30% are more food secure, 9.10% are mild food insecure, the majority, 31.20% are moderate food insecure, and 7.80% are severely food insecure. Meanwhile, single people at 3.90% were food secure, 10.40% were mild food secure, 1.30% were moderate food insecure, and 2.60% were severe food insecure. The study results in figure 4.7 reveal that married household heads are more food insecure than unmarried heads. Several studies have reported that married household heads are likely to be food secure. The difference in the percentages is that people who are not married are most likely to be single parents with fewer support structures from other family members.

4.4.1.3 Educational attainment

Table 4.4 represents that households with a post-matric qualification are more food secure than households with low education levels. Therefore, education plays a significant role in determining the food security status of households. The study results revealed that household head with tertiary education were food secure than household headed by people with no education or primary education. Shelembe (2018) and Mkhatshane (2019) concurs that education has several positive benefits that improve all elements of food security. Food insecurity is frequent mainly in households headed by people with lower levels of education and no formal schooling (Ndobo, 2013). Households with low education are more at risk with food security (Shelembe, 2018, citing Fiedler *et al.,* 2012).

Table 4.4: Education attainment of the household head and food security status

Percentage of food insecurity and education level of household head								
Education	**Food insecurity status**							
	Food Secure		Mild food insecure		Moderately food insecure		Severe food insecure	
	N	%	N	%	N	%	N	%
No formal education	1	6.70%	2	8.70%	3	9.70%	1	12.50%
Primary school	5	33.30%	8	34.80%	12	38.70%	3	37.50%
High school	5	33.30%	12	52.20%	16	51.60%	4	50.0%

Tertiary level	4	26.70%	1	4.30%	0	0	0	0

Source: Survey data (2021)

4.4.1.4 Employment Status

Table 4.5 presents the study results using the HFIAS categorisation measure on the employment status of a household. Households headed by pensioners are more food secure 66.70% than those headed by people who are out of work and looking for work 6.70%. Households headed by out of work and looking for work people are experiencing higher incidences of food insecurity with mildly, moderately, and severely at 21.70%, 19.40%, and 12.50%, respectively, compared to those headed by employed people at 13.30%, 7.90%, and 12.50%. These findings correspond with those of Ndobo (2013), who reported higher incidents of food insecurity in a household headed by unemployed people. Unemployment contributes to household food insecurity (FAO, 2012).

Table 4.5: Employment status and food security status

Percentage of food insecurity and employment status of household head								
Employment status	**Food insecure status**							
	Food secure		Mild food insecure		Moderately food insecure		Severe food insecure	
	N	%	N	%	N	%	N	%
Self employed	2	13.30%	3	13.30%	5	16.10%	1	12.50%
Employed for wage/ salary	1	6.70%	3	13.30%	3	9.70%	1	12.50%
Out of work & looking for work	1	6.70%	5	21.70%	6	19.40%	1	12.50%
A homemaker	0	0%	0	0%	1	3.20%	0	0%
Pensioner	10	66.70%	9	39.10%	14	45.20%	4	50.0%
Out of work but not currently looking for work	1	6.70%	3	13.30%	2	6.50%	1	12.50%

Source: Survey data (2021)

4.5 Factors that influence household food security status of NRMDP beneficiaries

Smallholder farmers reported factors that play a crucial role in determining their food security status. Respondents indicated factors that influence the appropriate food security: lack of selling available cattle, cattle dying in the custom feedlot facility, low income from cattle sales, nutrition, and poor-quality breed. These factors' influence was measured utilizing severe, moderate, and low influence rating. Households revealed factors they perceived to be important when participating in the programme.

Table 4.6 presents factors that influence food security. The results highlight that 67.50% of smallholder farmers' food security status, the lack of selling their cattle into the programme severely affected the majority. With 15.60% having experienced the moderate impact of not selling their cattle on their household food security, only 16.90% were least (low) affected. Those who experienced a serious impact on their household's food security linked it to the abrupt cessation of funding for the programme and the starvation of their cattle. This hinders their selling opportunity since their cattle were not in good condition. The study also reveals that smallholder farmers were severely affected by their cattle's death in the custom feedlot at 55.80%, and there will be no income to purchase food for their household. About 15.60% of respondents were moderately affected by the loss of their livestock to a feedlot, while 32.50% were minimally affected.

Table 4.6: Factors that influence food security

Factors that influence food security		
Lack of selling available cattle	**Frequency**	**Percentage (%)**
Severe	52	67.50
Moderate	12	15.60
Low	13	16.90
Cattle died in the custom feedlot facility		
Severe	43	55.80
Moderate	12	15.60
Low	25	32.50
Low income from cattle sales		
Severe	57	74.0
Moderate	11	14.30
Low	9	11.70

Poor quality breed		
Severe	29	37.70
Moderate	29	37.70
Low	19	24.70
Total	**77**	**100.00**

Source: Survey data (2021)

Those respondents were not entirely dependent on livestock for their livelihood. Gwiriri *et al.* (2019) noted that the income of smallholder farmers was affected by the death of cattle in the custom feedlot at Lahlangubo, Eastern Cape. In addition, some farmers were reluctant to send their cattle to the programme again after their cattle died in the feedlot. Nyhobo *et al.* (2014) suggested that the programme use alternative feed to lower its costs. Hence, feed is the most significant expense for the programme, thus reducing the feed shortage incidents in the facility.

The majority of livestock farmers agreed that low income from cattle sales was severe at 74.0% limiting their household being food security. While 14.30% and 11.70% reported that they were moderate and low affected by low income, respectively. This indicates that less income was inadequate to meet their household expenses. This is in line with Gwiriri *et al.* (2019), who indicated that farmers were complaining in the Eastern Cape for lower prices for their big cattle. However, this is contrary to the results of Lubinga *et al.* (2018) and Myeki *et al.* 2014 who reported higher income and profits for the programme participants.

Others had to sell during the Covid-19 pandemic when beef demand was low, and the majority of respondents stated that they sold their cattle without price awareness, resulting in a loss of revenue. Nqeno's (2008) study concurs that cattle production by smallholder farmers can enhance household food security. Therefore, a household will lack the money to buy staple foods; thus, the majority of the respondents are food insecure at 80.5%. The poor-quality breed harms household income and food security. The study finds that low-quality breeds adversely impacted 37.70 % in their ability to purchase adequate food. This is due to the classification system employed in South Africa, which is unfavourable to smallholder cattle farmers (Chingala *et al.,* 2017). According to Nqeno (2008) and Mangomezulu (2010), most smallholder livestock producers keep nondescript breeds.

4.5.1 The NRMDP's role in smallholder farmers' income

The NRMDP has been acknowledged by several researchers for its positive role in facilitating smallholder farmers' market participating and creating an enabling platform for income-generating. Studies by Lubinga *et al.* (2018), Ntombela *et al.* (2013), Myeki *et al.* (2014), and Sotsha and Mazibuko (2017) all confirm that the programme has a positive role on farmers' income. Kirsten *et al.* (2007) argue that farming is the most important source of income for rural households in South Africa. Livestock production is recognised by scholars as an essential asset for farmers in reducing food insecurity and income generation. Cattle from St. Paul custom feedlot were sold in batches based on their readiness for market. cattle were sold to the near abattoir. Table 4.7 below presents first batch of cattle prices and factors that determined prices. These sale records were obtained from the facility administrator. There were two batches that were sent to the abattoir and a total of 29 cattle were sold and generated an income of R 151 229.56 in total. The sales records below revealed that cattle from smallholder farmers were graded as B2. However, there were informal sales, but their prices were not available and the liveweight of these cattle were not on record before being sold. These grades indicates that these cattle are old and the was perception that these animals were going to obtain better prices if sold informal.

Table 4.7: St. Paul feedlot slaughtered cattle price list

TAG NO.	GRADE	COLD CARCAS WEIGHT	PRICE PER KILO	CARCAS PRICE	7% DEDUCTED	NET PAYOUT
BATCH NO 1. SLAUGHTERED CATTLE PRICE LIST & 7% DEDUCTED FROM THE CARCAS PRICE						
108	B2	182,94	37,00	R 6 768,78	R 473,81	**R 6 294,96**
15	B2	227,56	37,00	R 8 419,72	R 589,38	**R 7 830,33**
16	B2	243,86	37,00	R 9 022,82	R 631,59	**R 8 391,22**
17	B2	245,41	37,00	R 9 080,17	R 635,61	**R 8 444,55**
27	C2	177,12	36,00	R 6 376,32	R 446,34	**R 5 929,97**
93	B2	220,97	37,00	R 8 175,89	R 572,31	**R 7 603,57**
107	B2	204,67	37,00	R 7 572,79	R 530,09	**R 7 042,69**
148	B2	208,74	37,00	R 7 723,38	R 540,63	**R 7 182,74**
20	B2	228,92	37,00	R 8 470,04	R 592,90	**R 7 877,13**
-	B2	201,76	37,00	R 7 465,12	R 522,55	**R 6 942,56**
-	B2	228,14	37,00	R 8 441,18	R 590,88	**R 7 850,29**
TOTAL				**R 87 516,21**	**R 6 126,09**	**R 81 390,01**
BATCH No.2 SLAUGHTERING RESULTS						
74	B1	204,20	37,00	R 7 555,40	R 528,78	**R 7 026,62**

104	B0	174,79	26,00	R 4 544,52	R 318,11	**R 4 226,41**
69	B1	186,63	37,00	R 6 905,31	R 483,37	**R 6 421,93**
29	B2	201,57	38,00	R 7 659,99	R 536,17	**R 7 123,81**
73	B2	223,68	38,00	R 8 499,84	R 594,98	**R 7 904,85**
206	B2	233,19	38,00	R 8 861,22	R 620,28	**R 8 240,93**
203	B2	192,84	38,00	R 7 327,92	R 512,95	**R 6 814,96**
80	B2	219,61	38,00	R 8 345,18	R 584,16	**R 7 761,01**
111	AB2	194,97	39,00	R 7 603,83	R 532,26	**R 7 071,56**
109	AB2	199,82	39,00	R 7 792,98	R 545,50	**R 7 247,47**
TOTAL				**R 75 096,19**	**R 5 256,56**	**R 69 839,55**

Source: NAMC 2021

Myeki *et al.* 2014 reported higher profits for farmers participating in the programme and higher income than nonparticipants (Lubinga *et al.,* 2018). However, smallholder farmers find themselves at a significant disadvantage because they have little or no information about market conditions, how it works, and why prices fluctuate. Key informants' discussion advocacy that the NRMDP plays a positive role in smallholder farmers' income. Also, the income of farmers who participated in the programme has been improved due to a lack of transaction costs, and their cattle are marketed at a better body condition or weight. Regardless of bureaucratic restrictions, the NRMDP significantly impacts the rural economy through employment creation and cattle sales opportunities for locals on auction days.

Therefore, it plays a vital role in household food security; however, challenges it experienced in the past two years have undermined the work done. However, key informants argue that farmers would have obtained better income by keeping suitable cattle for the abattoir. The majority of the cattle were graded as B2 and C2 because they were older cattle. About 51.90% of farmers could not sell their cattle due to various reasons. Almost 26.0% of farmers marketed their cattle via abattoir, 16.90% by auction, and 3.90% were using both auction and abattoir. Therefore, the results indicated that most farmers were not able to generate income and were exposed to food insecurity. However, those whose cattle were sold indicated that they hardly experienced food insecurity when the programme was operating without any challenge.

Therefore, there is a need to address this programme's coordination with a national government to reduce household food insecurity.

4.6 Household food insecurity coping strategies

According to Abdu-Raheem and Worth (2011), food insecurity in households remains a concern in South Africa. Coping strategies vary from one household to another and over time according to choices, objectives, opportunities, and constraints (Mkhatshane. 2019). Coping strategies are all the purposefully selected acts that households in a poor socio-economic situation use to limit their expense or earn income to enable them to pay for their necessities (Mkhatshane, 2019, citing Snel and Staring, 2001). Abdu-Raheen and Worth (2011) observe that households rely on less expensive foods, and locally available vegetables, limiting portion size of meals, households borrowing food, and reducing the number of meals eaten in a day. Figure 4.8 below portrays household coping strategies when there is a shortage of food in the homestead. Household heads were asked to mention their comping strategy.
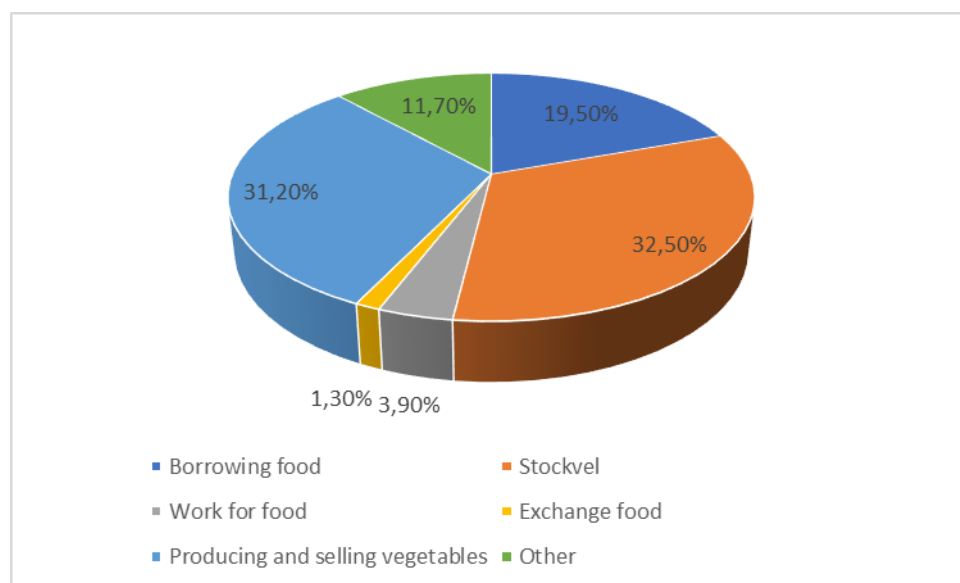
Figure 4.8: Farmers coping strategies during food insecurity

Source: Survey data (2021)

Most 32.50% of the households who benefited in the St. Paul feedlot are attested to employing stokvel as a coping strategy when there is a shortage of food in their household. Households implement various coping strategies, and about 31.20% opted for producing and selling surplus vegetables, 19.50% borrowed food, 3.90% worked for food, and 1.30% exchanged food. The study reveals that incident of household food insecurity is prevalent in this rural area as

respondents attest to employing various coping strategies figure 4.8. According to Maluleke (2018), households that tend to use various coping strategies to fight against food shortages may be considered food insecure. Coping strategies indicate a household's vulnerability because poor households are likely to use more coping strategies (Mkhatshane, 2019). Maluleka (2019) points out that these coping strategies cannot sustain a household for an extended period.

4.7 Summary

The study investigated the impact of the National Red Meat Development Programme in improving household food security in uMzimkhulu Local Municipality. Intensifying food insecurity in rural areas has resulted in assessing the impact of the programme towards household food security. The programme has been operational in KwaZulu Natal over ten years despite, that it has encountered are numerous constraints that impeding it to fulfil its objectives. The study examined St. Paul custom feedlot has not been able to improve the food security status of their beneficiaries as the majority were food insecure. Key things that are hindering the programme is the shortage of feed, treatments, and operational funds. In most cases cattle were not sold while some were starved to death. The National the Department of Agriculture, Land Reform and Rural Development (DALRRD) which is the main funding of the programme is to be blamed for the poor outcomes of the NRMDP, because the signing of the SLA has not been done. Hence, the abovementioned challenges were experienced by the programme. Red tapes and coordination of the programme are the main issues in the programme. Thus, smallholder farmers miss opportunities of generating income.

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CHAPTER 5

Exploring of Smallholder Farmers' Perception towards Grass Biodiversity in uMzimkhulu Local Municipality, KwaZulu-Natal Province

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ABSTRACT

Smallholder livestock farmers have an important role to play in grass biodiversity conservation in rural areas. This paper aimed towards assessing smallholder farmers perception on grass biodiversity of the National Red Meat Development Programme beneficiaries in St. Paul village under St. Paul custom feedlot located in uMzimkhulu Local Municipality, KwaZulu-Natal Province. The study results reveal that smallholder are aware of grass biodiversity loss in grazing land in the area. A total of 77 smallholder livestock were purposively selected from the programme. This study found that overgrazing, veld burning, climate change, bush encroachment, lack of rainfall and alien species invasion have significantly contributed to grass biodiversity lose in the area.

The study proposes the formation of veld burning committee to coordinate burning of veld. Installing camps or fences in the area will control grazing of livestock, therefore, reduce overgrazing as rotational grazing will need to be implemented. Furthermore, farmers need to be trained on veld management that training need to include veld condition assessment, timing of burning, and grazing principles.

Keywords: Smallholder livestock, perception, grass biodiversity, conservation, NRMDP, Veld burning.

5.1 Introduction and background of the study

Food-insecure and indigent populations reside in countries with the most significant biodiversity resources (Abdu-Raheem and Worth, 2013). South Africa ranks as the third most

biologically diverse country globally and contains three of the world's 34 biodiversity hotspots (Government of South Africa, 2015), although it only represents 2% of the world's land surface. Simultaneously, approximately 13.8 million South Africans are impoverished, 25.2% of the population lives in extreme poverty (Stats SA, 2017). Hence, Chappell (2009) and Abdu-Raheem (2013) suggested that the challenges of biodiversity loss and food insecurity are global in scope and cannot be viewed independently.

Impoverished rural areas directly use natural resources as a source of food, building material and energy, respectively (Shackleton, 2004). In addition, agriculture is the largest land-use type in South Africa, with significant consequences of biodiversity loss (Von Bormann, 2019). Over 80 % of the land in South Africa is suitable for livestock production (Von Bormann, 2019); however, most of the land is degraded, particularly in Kwa-Zulu Natal. The grassland biome has long been considered one of the most threatened in South Africa. Many people rely on grassland ecosystems to some degree for their daily living from direct benefits of the productivity of livestock (South African National Biodiversity Institute's (SANBI), 2014).

It is important to note that South Africa's government has embarked on reducing biodiversity loss and food insecurity. The government has implemented and increased budget spending on various programmes both oriented towards food insecurity and biodiversity loss (Dube *et al.,* 2013; Sekhampu, 2017). South Africa is committed to international agreements on Sustainable Development Goals (SDG), with SDG 2 aiming to end hunger and all forms of malnutrition. The SDG 17 has a crucial target of ensuring the conservation and sustainable use of terrestrial ecosystems (Stats SA, 2019). Abdu-Raheem and Worth (2013) state that biodiversity conservation, particularly on communal and rural farmlands, is still of great concern in South Africa.

Abdu-Raheem (2013) applauded smallholder farmers as critical stakeholders and role players in achieving biodiversity conservation, particularly in developing countries. Therefore, this paper considers involving livestock smallholder farmers in determining their perception of grass biodiversity. Smallholder farmers need to conserve grass biodiversity. The study seeks to understand smallholder farmers' perception of grass biodiversity particularly of the National Red Meat Development Programme (NRMDP) beneficiaries in uMzimkhulu Local Municipality. No study was conducted to assess the NRMDP beneficiaries' grass biodiversity perception. The specific objective of the study is to explore smallholder livestock farmers'

perceptions of grass biodiversity conservation in livestock management. The paper reveals the drivers of grass biodiversity loss perceived by smallholder farmers.

5.2 Materials and methods

5.2.1 Study area

The study was conducted in the St. Paul community in uMzimkhulu local municipality of the Harry Gwala District Municipality in KwaZulu Natal of South Africa. St. Paul village is situated at -30o.14'46.6. "S and 29o. 41'09.2" E. The municipality has a population of approximately 197 286, translating to a 0.34% growth rate per annum. uMzimkhulu has a humid climate, with annual rainfall ranging from 800mm to 1 280mm. Heavy mists are a common and essential feature, providing additional moisture. The mean annual temperature for the area is 17°C. St Paul village, communal grazing areas are managed under a collective land tenure system where the rangeland resources are being used by all community participants, with the mixed veld found in these areas.

5.3 Sampling method and sample size

St. Paul feedlot was purposively selected as the beneficiary of the NAMC cattle custom feeding program. A purposive sampling technique was employed to interview 77 smallholder livestock farmers who were active in the St. Paul custom feedlot programme in uMzimkhulu. The 77 farmers were experiencing challenges of grass biodiversity loss and livestock management.

5.4 Data collection and analysis

The study employed a mixed methodology approach which combined the collection and analysis of qualitative and quantitative data. The Statistical Package for Social Sciences (IBM SPSS version 27) was used in this analysis to generate descriptive statistics. Data collected from survey questionnaire were coded and descriptive statistics in the form of frequencies was generated. The frequency results were also used to support the presented qualitative data while information from focus group discussions, and observations was analyzed and interpreted through thematic analysis.

5.5 Results and discussion

5.5.1 Biodiversity is indispensable for the production of goods such as food and fuel

The study assessed respondents' perceptions of the importance of biodiversity in food production. The indispensable of biodiversity to the production of goods was measured using the rating of agree, disagree, neutral, strongly agree, and strongly disagree. Study findings portray that the majority, 59.0%, of respondents agree that biodiversity is crucial for producing goods, while 5.20% disagree, 2.60% respondents were neutral, and 32.50% strongly agree. The results show that the respondents valued biodiversity as an important component of life for their livelihoods. Respondents further highlighted that they depend on natural resources.

This reason can be attributed to the fact majority of the respondents depend on veld for livestock grazing and woods for cooking. This concurred with Shackleton (2004), who reports that many impoverished South Africans in rural areas directly use natural resources such as fuel wood, wild fruits, food, and building material. Nyingi *et al.* (2018) confirm that a large proportion of livelihoods in Africa depend on natural resources, including agriculture, fisheries, and forestry. Also, key informants substantiated that these smallholder farmers are aware of biodiversity necessity in food production.

5.6 South Africa will get poorer economically due to biodiversity loss

The study asked questions on the impact of biodiversity loss on South Africa's economy. The results revealed that 42.90% strongly agree that South Africa will be economically poor due to biodiversity loss, followed by those who disagree and neutral at 5.20% and 3.90% strongly disagree, respectively. Other respondents indicated that their livelihoods depend on biodiversity since they live on medicine and sell woods from the forestry. According to the Government of South Africa (2015), an emerging wildlife industry, game ranching, including hunting, is estimated to generate R7.7 billion a year and create 100 000 jobs. Hence, South Africa will be economically poor if there is a loss in its biodiversity. The government of South Africa (2015) emphasized that South Africa's biodiversity assets need sound management to enhance their contribution to the economy. Therefore, the results reveal that sound management towards biodiversity conservation is crucial in positively contributing to smallholders' quality of life.

5.7 Farmer's perception on drivers of biodiversity loss

5.7.1 Livestock is one of the drivers of deforestation

The government of South Africa (2015) indicated that Kwa-Zulu Natal is experiencing high rates of loss and degradation of natural habitat. However, Li *et al.* (2012) note that the causes of rangeland degradation are complex. Therefore, for the current study, all farmers were asked

whether livestock is one of the main drivers of habitat destruction. About 40.30% of the respondents agreed that livestock is of the leading causes of rangeland deforestation, while 16.90% strongly disagreed. Meanwhile, 11.70% strongly agreed. Illegally harvesting of forestry by people for firewood has been reported by farmers as one of the main reasons for deforestation. The result in Table 4.7 shows that most smallholder farmers perceived that grazing livestock appropriately could play a positive role in biodiversity conservation. Results for biodiversity loss were consistent with Mapiye (2017), who indicated that most respondents reported biodiversity loss in a study conducted in Limpopo. Farmers indicated that some of the preferred species were no longer available on their rangeland; thus, they agreed that there was biodiversity loss. Addressing these drivers being biased to food security could pose a risk to biodiversity; hence, addressing them simultaneously will need a well-integrated and coordinated approach.

Sound management of livestock grazing is crucial for biodiversity conservation; thus, when respondents were asked whether grazing livestock appropriately can play a positive role in biodiversity conservation in the study area, the majority, 63.60 % agreed that it could have a positive impact on biodiversity conservation, 3.90% disagreed, with 28.60% strongly agreed and 1.30% strongly disagreed respectively. This result affirms what was argued by Sisay and Baars (2002), who asserted that properly managed rangelands have higher biomass production and more acceptable species. Tongway, 2003 (cited in Munyai 2012) contended that heavy or inappropriate grazing has resulted in changes in the resource state in certain rangelands. However, chi-square results of grazing livestock appropriate and women and men show no significant difference (p = 0.404) between their perceptions. This can be attributed to the fact that women and men in the study area use the same grazing management practices.

The study further asked farmers whether they agree or disagree that grass must be fully recovered before being re-grazed. The majority of respondents, 57.10%, agreed, while at 6.50%, 2.60%, and 33.80%, farmers disagreed, strongly disagreed, and strongly agreed, respectively. Salomon (2011) affirms that at Okhombe, KwaZulu Natal pastoralists allowed grazing as soon as grassland recovered from defoliation. However, smallholder farmers indicated that to practice some of these rangeland managements are not feasible due to the lack of fences on grazing camps. Chi-square results show no significant difference (p = 0.714) between allowing livestock to re-graze when the grass has fully recovered and the gender of the respondents. This implies that smallholder farmers have equal chances of protecting grass species in the rangeland.

The study findings agree with Palmer *et al.* (2013), who argue that high and prolonged livestock grazing is the main reason for rangeland degradation and loss of biodiversity. In support Government of South Africa (2015) point out that overgrazing is the significant driver of loss and degradation of natural habitat. De Wit *et al.* (2015) and Nyingi *et al.* (2018) mentioned that overgrazing affects the loss of palatable species and bush encroachment. Trampling causes a change in species composition; thus, certain species are more resistant while others are vulnerable to trampling (Lesoli, 2011). On the contrary, trampling and grazing by livestock can stimulate the growth and diversity of vegetation, improve soil structure, and prevent bush encroachment Salomon, 2011 (cited in Hesse and MacGregor, 2006). According to Lesoli (2011), uncontrolled grazing results in poor basal cover, change in species composition and low biomass production.

Table 5.1: Drivers of biodiversity loss

Variable description	Level of agreement %				
	Strongly agree	**Agree**	**Neutral**	**Strongly disagree**	**Disagree**
Farmer's perception of drivers of biodiversity loss					
Livestock is one of the drivers of deforestation	11.70	40.30	5.20	16.90	16.90
Grazing livestock appropriately can play a positive role in biodiversity conservation	28.60	63.60	2.60	1.30	3.90
Grass must be fully recovered before it is re-grazed	33.80	57.10	2.60	0	6.50

Source: Survey data (2021)

A chi-square test of livestock as one of the drivers of deforestation and gender shows no significant difference (p = 0.491) between women and men's perceptions of deforestation drivers. This suggests that men and women in the study area perceived livestock as the primary driver of deforestation. This result can be attributed to the fact that both men and women grew the vegetables mainly for sale, hence no significant difference across gender.

5.8 Smallholder farmers adjustments in their farming practices because of the changes in grass biodiversity

Farmers' agricultural adjustment is a management method used to minimise the loss of grass biodiversity in communal areas. Grazing management is the utilisation of a specific pasture area by grazing animals to achieve specified objectives (Munyai, 2012; Gwelo, 2012). Samuels *et al.* (2007) studied adaptive grazing management practices applied by smallholder farmers in Namaqualand to respond to drought and strategies to reduce pressure on the rangelands. Several researchers revealed that smallholder farmers are kraaling their cattle at night.

5.8.1 Veld burning

Respondents were asked to indicate which management practices they adjusted to their farming. The majority, 64.90% of the farmers, indicated that they stop veld burning on their grazing land. However, 9.10% of farmers disagreed, 22.10% of farmers strongly agreed, and 2.60% strongly disagreed. Despite that, farmers were concerned about uncontrolled burning in the study area. Farmers report that the community often burns veld during the winter season. Hence, their grazing land is dominated by unpalatable species. The Chi-square test shows that there is a significant difference ($p = 0.061$) between men and females toward veld burning. This implies that men are involved in stopping veld burning and are responsible for rangeland management.

Imprudent veld burning practices often lead to the replacement of the labile grass species by often grasses of poor nutritional value and quality. Therefore, the use of fire must be informed by a technical approach, and farmers must be part of the system. Hence, farmers must safeguard their grass resources from being consumed by unwanted destructive fires with or without fences. The veld of the study area is categorized as sour veld, and farmers must be informed about their area. The St. Paul community must understand the planned use of fire for their grazing area and act when there is fire. Munyai (2012) notes that declining pasture production and the loss of sustainable grazing systems threaten the productivity of grazing livestock and the sustainability of natural resources.

5.8.2 Cull unproductive livestock

Almost 62.30% of farmers agreed that they cull unproductive livestock, 14.30% disagreed, 6.50% were neutral, and 16.90% strongly agreed. This can be attributed to the marketing infrastructure (sales yard) and auctions that are often conducted by NAMC under the NRMDP. Studies by Marandure (2015), Sotsha *et al.* (2017), and Fakudze (2016) reported higher market off-rate in areas where the NRMDP is operational. In line with Fakudze's (2015) predictions of

a positive market off-take rate associated with the custom feeding facilities on the marketing of cattle, (Marandure *et al.,* 2016), confirmed higher marketing of cattle in the Eastern Cape. The study by Marandure *et al.* (2016) and Gwiriri *et al.* (2019) supports the above argument by indicating a higher market off-take rate in Gxwalubomvu of 18.6% Ncorha 15.3%, respectively. Culling of unproductive livestock can be done through selling or slaughtering for consumption.

5.8.3 Stop overgrazing

Various researchers have reported overgrazing as one of the significant grass biodiversity losses. According to Lesoli (2011), citing Trollope *et al.* (1990), overgrazing is excessive defoliation of the grass sward by animals to the detriment of the condition of the rangeland. Despite that, this study shows that 50.60% agreed that they stop overgrazing, at 29.90% disagreed, 1.30% were neutral, 10.40 % strongly agreed, and 7.80% strongly disagreed. The lack of fenced camps and the lack of fenced camps were the main reasons why some farmers could not stop overgrazing. Munyai (2012) blames overgrazing as a common problem leading to the rapid degradation of natural resources. Farmers highlighted that it is necessary to stop overgrazing because it impedes livestock performance and natural resources. Also, overgrazing further affects their price when they market their livestock.

5.8.4 Implementing rotational grazing

Approximately 53.20% of the farmers agreed that they implemented rotational grazing; while 22.10% of the respondents disagreed, 5.20% were neutral, 11.70% strongly agreed, and 7.80% strongly disagreed that they implemented rotational grazing. On the contrary, Moyo *et al.* (2013) reported that smallholder farmers did not perform rangeland management practices. Smallholder farmers indicated that implementing rotational grazing poses a risk of livestock theft since there are no fences, and their livestock might not be used in the new camp. Vetter, 2005 (cited in Salomon 2011) reports that rotational grazing forms part of a set of interventions to promote presumed rangeland equilibrium by managing carrying capacity, stocking rates, and monitoring range conditions.

5.8.5 Do veld condition assessment

Table 4.9 reveals that 55.80 % agreed with their role in completing veld condition assessment, 15.60 % disagreed, 6.50 % were indifferent, 14.30 % strongly agreed, and 7.80 % strongly disagreed. Overall results show that farmers were assessing the condition of their rangeland;

however, those who might be doing it are the ones who are kraaling their cattle at night. Farmers indicated that they are using indigenous knowledge in determining veld quality. The respondents in the current study state that they can differentiate decreaser, increasers, and alien invasive species. O'Connor *et al.* (2010) pointed out that the veld condition would be a suitable indicator if it reflected biodiversity and resource conditions. Hence, farmers stressed the importance of doing veld condition assessment to simultaneously safeguard their natural resources and fulfill their food production and biodiversity needs.

5.8.6 Removal of alien invasive species

Study descriptive results shows that 48.10% of respondents agreed to remove alien invasive species, 23.40% disagreed, 7.80% were neutral, 15.60% strongly agreed, and 5.20% strongly disagreed. This indicates that the majority of farmers recognise and comprehend the economic impact of invading alien species. According to Nyingi *et al.* (2018), invasive alien species affect biodiversity and nature's contributions to food production. Also, some invasive alien species plants can facilitate wildfires. However, farmers in the study area have not developed any strategy for mitigating the impact of alien species on their rangeland. Farmers indicated a need to regulate the removal of alien invasive species.

5.8.7 Maintain grazing capacity

Munyai (2012), quoting Rowe-Rowe (1999), defined the grazing capacity of the veld as the area of land required to maintain a single animal unit without causing deterioration in either the vegetation or soil condition. Thus, decrease in basal cover or a change in species composition. Grazing capacity varies from farm to farm and even from place to place on one farm (Munyai, 2012). The results in Table show that a high percentage of participants at 36,40% agreed that they maintain grazing capacity. While 22.10% were neutral and disagreed, 11.70% strongly agreed, and 7.80% strongly disagreed. Respondents further highlighted that maintaining grazing capacity was one of the main challenges since they are using communal grazing land and practicing that is not feasible due to the lack of fences and uncontrolled grazing. The study agrees with Nqeno (2008) and Lesoli (2011), which reported that the lack of fencing in communal rangeland in the Eastern Cape is a huge constrain. Munyai (2012) points out that farmers have no idea of the village's natural pasture's carrying capacity.

Table 5.2: Farmer's (%) adjustments in their farming practices

Variable description	Level of agreement %

	Strongly agree	Agree	Neutral	Strongly disagree	Disagree
Smallholder farmers adjustments in their farming practices because of the changes in grass biodiversity					
Stop veld burning	22,10	64,90	1,30	2,60	9,10
Cull unproductive livestock	16,90	62,30	6,50	0	14,30
Stop overgrazing	10,40	50,60	1,30	7,80	29,90
Implemented rotational grazing	11,70	53,20	5,20	7,80	22,10
Do veld assessment prior grazing	14,30	55,80	6,50	7,80	15,60
Remove alien invasive species	15,60	48,10	7,80	5,20	23,40
Maintain grazing capacity	11,70	36,40	22,10	5,20	22,10

Source: Survey data (2021)

5.9 Farmers' perceptions on the importance of conserving grass biodiversity in a community grazing land

In the present study table 5.3 shows, a higher proportion of 55.80% of the farmers at St. Paul agreed it is essential to conserve grass biodiversity in communal grazing land, and 32.50% strongly agreed. At St. Paul, 3.90% disagreed that it is to conserve grass biodiversity, and 1.30 % strongly disagreed with its importance. At the same time, 6.50% were undecided about the importance of grass biodiversity conservation. Farmers at St. Paul explained that conserving grass biodiversity is important because the grass is their primary source of feed for their livestock. Also, acceptable species are being replaced at an alarming rate by unpalatable species and are concerned that future generations will not be able to farm in the area, benefiting the biodiversity.

Table 5.3: Importance of conserving grass biodiversity

Variable description	Level of agreement	Frequency	Percentage
Importance of conserving grass biodiversity in a community grazing land	Agreed	43	55.80
	Disagreed	3	3.90
	Neutral	5	6.50
	Strongly agreed	25	32.50
	Strongly disagreed	1	1.30

Source: Survey data (2021)

Livestock production plays an essential role in smallholder farmers' economic and food security status at St. Paul. Beef cattle production contributes significantly to household food security (Molefi, 2015). Montshwe (2006) also stated that livestock provides essential functions in the life of rural households and is one of the agricultural sub-sectors with a significant potential for economic growth and development. At St. Paul, farmers opted to use crop residuals in winter to ease grazing pressure on the veld. Also, conserving grass biodiversity is significant to these farmers since grass is their cheapest livestock nutrition that supports their livelihood.

5.10 Perception of farmers on the factors perceived as the drivers of grass biodiversity loss on communal rangeland

5.10.1 Poor grazing management

Study results in Table 5.4 portray smallholder farmers' perceptions about factors they perceived as drivers of grass biodiversity loss. About 62.20% agreed, and 22.10% strongly agreed that poor grazing management in St. Paul is one of the critical drivers of grass biodiversity loss. Meanwhile, 10.40% of respondents disagreed, and 2.60% strongly disagreed. Also, 2.60% of respondents were neutral. The majority of farmers perceived poor grazing management to be a threat to grass biodiversity due to high soil erosion, large bare patches, overgrazing, and decreaser species being replaced by increaser species.

Lesoli (2011) suggested that rangeland scientists have a perception that communal rangelands are degraded because of improper grazing management. Magandana (2016) asserted that poor grazing management is severe during dry seasons, putting pressure on grass. Munyai (2012), citing Duvel and Afful (1997), observed that overstocking had been the primary cause of the degradation of natural resources in the communal farming areas of South Africa, and it remained unresolved. High-intensity grazing systems had a substantially greater negative impact on biodiversity integrity than either conventional or continuous systems (O'Connor *et al.*, 2010). Magandana (2016) noted that well-managed rangeland is identified by the dominance of palatable than the less palatable species. Thus, Molefi (2015) suggested that a proper management programme is needed to promote communal farming and livelihood diversification by leveraging the contribution of land-based resources to household income.

5.10.2 Low rainfall

Study results in table 5.4 portray that most respondents at 61.0% agree that low precipitation is one of the main drivers of grass biodiversity loss. While 7.80% does not regard low rainfall as the driver of biodiversity change, 28.60% of farmers strongly agreed, and 2.60% strongly disagreed. However, the study concluded that low precipitation plays a key role in grass biodiversity loss in the study area. In addition, respondents report that the recent drought affected grass biodiversity negatively. The study affirms Mapiye's (2017) results, who reported a large proportion of 80% of the farmers stressed that the leading cause of the rangeland condition challenge was caused by poor availability and distribution of rainfall in Limpopo province.

Lesoli (2011) noted that at low rainfall, relatively more water is lost through evaporation, leaving less water available to plants, and so the rain use efficiency is reduced. Farmers at St. Paul feedlot reveal that grazing becomes scarce because of low rainfall; thus, livestock death rates increase due to feeding shortage. Farmers point out that higher incidents of low rainfall occur mainly in winter. O'Connor *et al.* (2010) assert that plant diversity increases with increasing rainfall. Therefore, precipitation is one of the vital components in maintaining biodiversity.

5.10.3 Fire

Judicious burning is considered vital for maintaining the composition and vigour of the veld and necessary to boost animal production (Munyai, 2012). Therefore, the first spring fire is necessary to clear the low-quality material that has been collected throughout the winter (Salomon, 2011). A higher proportion, 50.60% of farmers observed that veld fires are destroying natural resources, at 42.90% they strongly agreed. Meanwhile, the minority, 3.90% disagreed, 1.30% strongly disagreed, and 1.30% were neutral. Farmers revealed that rangelands are significantly burnt frequently without a valid reason. Also, when fires erupt, few farmers will try to stop them or only safeguard the area grazed by their livestock. During the focus group discussion, farmers mention that they create fire belts around grazing camps to protect the rangeland. Key informants' discussion affirmed the problem of veld burning at St. Paul. According to O'Connor *et al.* (2010) and Magandana (2016), citing Barac (2003), lack of managed veld fires for a prolonged time contributes to bush encroachment.

5.10.4 Bush encroachment

According to Munyai (2012), bush encroachment is the process by which a grass-dominant vegetation type becomes dominated by woody species. Bush encroachment is a serious problem throughout sub-Saharan Africa as it leads to large areas of grazing lands being either lost or reduced in capacity (Munyai, 2012). The survey descriptive results in table 4.11 indicated that a higher proportion of the respondents, at 49.40% agree that bush encroachment is the problem in the study area. Only a few respondents at 20.80% disagreed, 16.90% were neutral, 10.40% strongly agreed, and 2.60% strongly disagreed.

Table 5.4: Drivers of biodiversity loss

Variable description	Level of agreement %				
	Strongly agree	**Agree**	**Neutral**	**Strongly disagree**	**Disagree**
Factors perceived as the drivers of biodiversity loss					
Poor grazing management	22.10	62.20	2.60	2.60	10.40
Low rainfall	28.60	61.0	0	2.60	7.80
Veld burning	42.90	50.60	1.30	1.30	3.90
Bush encroachment	10.40	49.40	16.90	2.60	20.80

Source: Survey data (2021)

The problem of bush encroachment in the area can be attributed to the uncontrolled burning of rangeland. Community members initiate veld burning without a proper reason, and they burn all year round. This implies that rules are not implemented for veld management. Therefore, this influences the utilisation of rangelands by community members. Mapiye (2017), quoting SAPIA News (2013), states that bush encroachments reduce herbaceous species, cause biodiversity loss, and, more importantly, reduce rangeland grazing capacity. Therefore, smallholder farmers must undertake strategic measures to control bush encroachment. Bush encroachment is financially significant in communal areas.

5.11 Perception of smallholder farmers on livestock and rangeland management strategies to improve grass biodiversity

Farmer's perception of rangeland management strategies is presented in table 5.5. Grazing management practices aim to achieve an equitable distribution of livestock use among areas

and plant communities within a pasture (Lesoli, 2011). Approximately 15.60% of smallholder farmers perceived that applying veld burning is one of the best management strategies for improving grass biodiversity. However, most of the respondents at 33.80% and 40.30% disagreed and strongly disagreed with the idea of using fire as a management strategy for veld. This can be attributed to the uncontrolled burning of rangeland at uMzimkhulu, and most of the palatable species have been largely replaced by unpalatable grass species. In contrast, Nyingi *et al.* (2018) asserted that fire is an essential disturbance for maintaining biodiversity.

According to Munyai (2012), rest grazing strategy is essential to maintain veld condition. Thus, Munyai (2012), citing Billet (2002), highlighted rest grazing as essential to ensure optimal palatability. Most at 37.70% of participants of the current study perceived that rest grazing is an important management strategy for the conservation of grass biodiversity. While 24.70%, 15.60%, 14.30, and 7.80% disagree, they were neutral, strongly agree, and strongly disagreed, respectively. Farmers suggested that it is important to rest other camps since some species were at risk of extinction and the nutrient value of their grazing land has decreased rapidly.

Table 5.5: Rangeland management practices to improve grass biodiversity

Variable description	Level of agreement %				
	Strongly agree	Agree	Neutral	Strongly disagree	Disagree
Rangeland management practices to improve grass biodiversity					
Apply veld burning (fire)	5.20	15.60	5.20	40.30	33.80
Rest grazing	14.30	37.70	15.60	7.80	24.70
Implement stocking rate	19.50	44.20	14.30	1.30	20.80
Destroy alien invasive species	26.0	39.0	14.30	3.90	16.90

Source: Survey data (2021)

Communal rangelands can seldom withstand the grazing pressure they are experiencing, and they are degraded to the extent that some of the species will not be able to regrow. However, smallholder farmers in the St. Paul area indicated that implementing a stocking rate is one of the crucial management strategies that need to be implemented to conserve grass biodiversity. About 44.20% of the respondents agree there is a need to implement a stocking rate on grazing camps. However, the lack of divided camps is the main constraint in achieving that objective. Over 21.20% were against the implementation of the stocking rate. This can be attributed to a

lack of knowledge about rangeland quality. Most farmers state that they cannot distinguish high-quality veld (available increasers and decreaser species).

According to Munyai (2012), stocking rate is crucial in rangeland management because if there are high stocking rates, most of the areas become degraded, thus resulting in a reduced availability of feed and subsequent depressed animal performance. Because stocking rates influence the availability of grass species. Lesoli (2011) suggested an alternative management strategy of increasing or decreasing the stocking rate based on the current condition of the rangeland and the season of the year. Destocking is advised where livestock numbers exceed the recommended carrying capacity (Salomon, 2011; Moyo *et al.,* 2013).

The survey results reveal that about 39.0% of respondents indicated it is of utmost importance to destroy alien invasive species on their grazing land. Farmers revealed that alien invasive species lower their rangeland quality, and these species are competing with native species for nutrients. However, 16.90% of respondents disagreed that they eliminate invasive species. In addition, 14.30 % were impartial, while 26 % strongly agreed that they eliminate alien invasive species. At 3.90% strongly disagreed that they destroy alien invasive species. Management and control of invasive alien species remain a challenge in Africa (Nyingi *et al.,* 2018). During focus group discussion, farmers pointed out that facing grazing camps and reintroducing rangeland rangers will improve grass biodiversity. In Okhombe, Salomon (2011) stated that rangeland was improved by appointing herders to maintain, protect the fences, control veld fires, and implement the grazing system. Households were to pay a minimum fee for the herders.

5.12 Smallholder farmers' perception of implementing a strict programme that will restore grass biodiversity in the grazing land

Most of the management strategies implemented in grazing land aim to improve grazing biodiversity and livestock performance. However, no grazing management is implemented in most communal areas, which poses a massive risk to grass biodiversity loss. Lesoli (2011) observed an openness in grazing land in Eastern Cape. Based on Table 5.6, farmers' results on perception of implementing a strict programme. 53.20% of respondents indicated a desire to execute a tight grazing programme, according to the study results. However, 1.30% disagreed, 41.60% strongly agreed, and 3.90% disagreed. This indicates that smallholder farmers are aware that there is an occurrence of grass biodiversity loss in their rangelands. Therefore, St. Paul feedlot beneficiaries perceived that grass biodiversity loss in rangeland is caused by

overgrazing and uncontrolled veld burning. This concurs with Gwelo (2012), who revealed that smallholder farmers from Kwezana, 83% and 100% at Dikidikana in the Eastern Cape, agreed that there was evidence of rangeland degradation.

Table 5.6: Perception of implementing a strict programme to restore grass biodiversity

Variable description	Level of agreement	Frequency	Percentage
Perception of farmers on the importance of implementing a strict programme that will restore grass biodiversity	Agreed	41	53.20
	Disagreed	1	1.30
	Neutral	0	0
	Strongly agreed	32	41.60
	Strongly disagreed	3	3.90

Source: Survey data (2021)

Hence, smallholder farmers at St. Paul feedlot agreed that there is a need to implement a strict grazing programme. Lack of grazing rules will adversely affect rangeland utilisation, condition, and livestock production (Moyo *et al.,* 2013). Lesoli (2011) mentioned that there is a perception amongst the rangeland scientists that communal rangelands are degraded because of improper grazing management.

A strict grazing programme needs to be developed to be conducive to livestock performance and forage production. Hence, a strict grazing programme to be implemented will have to reduce incidents of overgrazing, exceeding carrying capacity, and veld burning. The community must be well consulted before implementing the new grazing management practices. However, respondents mention that the lack of fencing in grazing camps is the main constraint to implementing such a management technique. Nqeno (2008) reported a lack of fences as one of the challenges smallholder beef farmers face in the Eastern Cape. Lesoli (2011) highlighted that some methods used for rangeland restoration consist of biological and mechanical approaches, and the management of rangeland ecosystems must be based on ecological theory. In addition, a larger number of farmers highlighted the current grazing management strategies implemented; the future generation will not be able to farm in this area (benefiting from grass biodiversity).

Table 5.7: Cross-tabulation - perception to implement a strict programme to restore grass biodiversity and gender

Variable description	Level of agreement	Gender of the household head		Total
		Male	Female	
Perception on importance to implement a strict programme that will restore grass biodiversity	Agreed	33 (42.90%)	8(10.40%)	41 (53.20%)
	Disagreed	(0%)	1 (1.30%)	1 (1.30%)
	Strongly agreed	23 (29.90%)	9(11.70%)	32 (41.60%)
	Strongly disagreed	1 (1.30%)	2 (2.60%)	3 (3.90%)
	Total	**57**	**20**	**N = 77**
Chi-square		**Value** 6.401	**P value** 0.094	

Source: Survey data (2021)

Chi-square test results in Table 5.7 above, show a significant difference (p = 0.094) between males and females concerning the importance of implementing a strict programme that will restore grass biodiversity. This can indicate that man has more knowledge about grass species since they are more involved daily with livestock and rangeland management.

5.13 Farmers' perception about informed loss of biodiversity

Figure 5.1 present results of farmers about their perceptions regarding being informed about the loss of biodiversity in their community. The most significant, 31.20% of farmers perceived that they were not well informed about the loss of biodiversity, while the minority of 14.30% feel like they were informed very well. Most of the farmers highlighted that they could notice a loss of biodiversity in their community even though they are not informed because some natural resources are not available. Others blame the government for not conducting awareness campaigns about biodiversity losses and how to prevent them. However, some farmers have hailed the NRMDP for teaching about rangeland management and reducing grazing pressure by marketing older cattle.
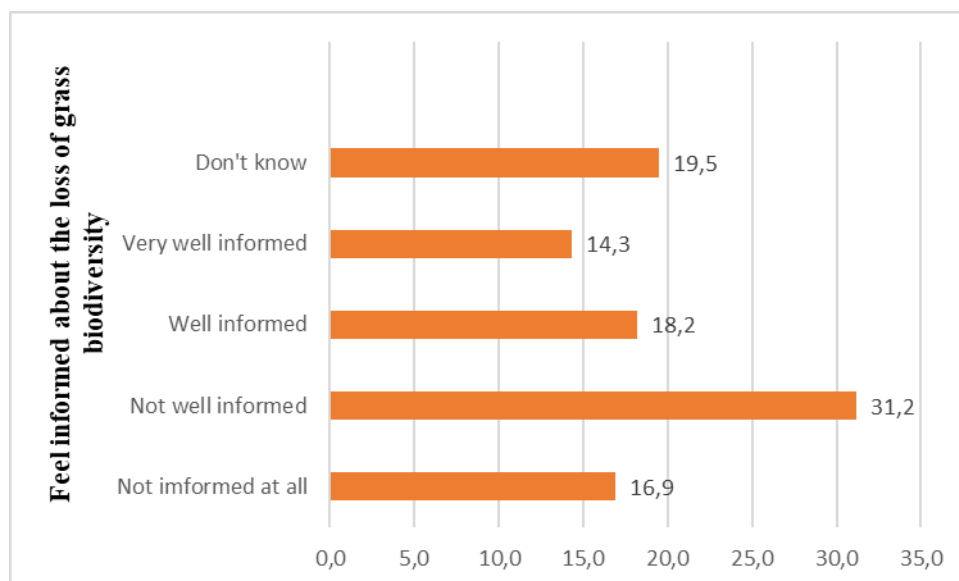
Figure 5.1: Farmer's perception about informed of biodiversity loss
Source: Survey data (2021)

During a discussion with key informants, which was one of the program's training objectives for farmers, it was revealed that the programme was responding to grass biodiversity concerns by selling "uneconomical cattle" at a better price; these are older cattle. Several studies have reported a lack of information and education as the main constrain for smallholder farmers in South Africa. Thus, there is a sense of urgency for farmers to equip themselves with the knowledge and management tactics to prevent loss of biodiversity in their community and get the best out of their natural resources. Farmers must obtain better knowledge or information about their natural resources to influence their perceptions and attitude regarding biodiversity. Having farmers with the right perception and attitude will efficiently enhance the use of natural resources to meet the goal of securing food security. Farmers have been deemed as the most critical stakeholder for biodiversity management and food security.

5.13 Factors that threaten grass biodiversity

The figure 5.2 below portrays study findings regarding farmers' perception of factors that threaten grass biodiversity. Farmers had a different opinion regarding the most devastating threat to grass biodiversity.

Figure 5.2: Factors that threaten biodiversity

Source: Survey data (2021)

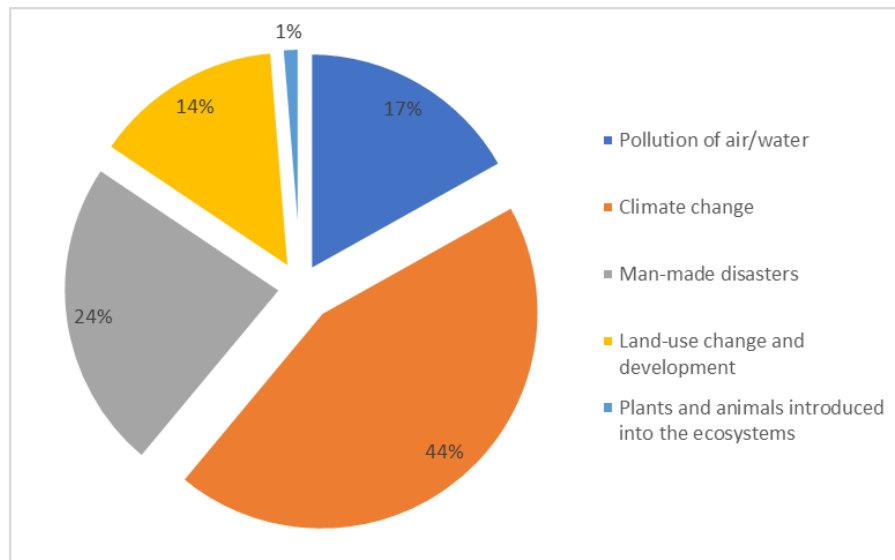The majority, 44% of farmers, pointed out that climate change is a major threat, 24% reported man-made disasters, 17% blame pollution of air or water, 14% land-use change and development, and 1% plants and animals introduced into the ecosystems. Chi-square results show a significant difference ($p = 0.001$) between gender and factors that threaten grass biodiversity. Farmers perceived climate change as the main threat to biodiversity in the study area. Lesoli (2011) indicated that the effects of climate change on rangelands could be on vegetation biodiversity, land degradation, and altered grazing systems. Participants report that soil and vegetation tend to dry up quickly due to climate change effects. Nyingi *et al.* (2018) anticipated that climate change is a significant driver of biodiversity loss and extinction. Hence, Nyingi *et al.* (2018) suggested that climate change is expected to have direct, and in most cases negative impacts on Africa's ability to produce food.

5.9 Conclusion and recommendations

South Africa grass biodiversity have been found to be endangered. Therefore, the study objective was to explore smallholder farmers perception towards grass biodiversity in uMzimkhulu local municipality and management practices applied in rural areas before cattle were sent to the custom feedlot. The study found out many farmers were aware that grass biodiversity was endangered in their grazing lands. Farmers identify critical causes of grass biodiversity lose such as overgrazing, veld burning more especially in winter, climate change. Some farmers were not taking any measures in reducing grass biodiversity. As a results

farmer's practice continues grazing, alien species were not removed. The lack of capacity building and grazing awareness exacerbated grass biodiversity lose. Moreover, the study found that the majority of the farmers were culling unproductive such as older, Oxs, Bulls and unreproductive cattle because of the NRMDP being vibrant in uMzimkhulu.

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CHAPTER 6: CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The study discovered that the livestock production play an important role to the livelihoods of smallholder farmers in St. Paul village under uMzimkhulu local municipality. Farmers were dependent livestock sales for generating income and being food secure. The majority of the farmers were male-headed with many over the age of 60 years, suggesting that the ownership of cattle still dominated by males and decision making was done by males in these household. Majority of the respondents were having primary and secondary education while the minority have obtained tertiary education. **In terms of objective 1 and 2 which were aimed at investigating the household food security status of the National Red Meat Development Programme (NRMDP) of beneficiaries and perception towards grass biodiversity in rural areas of uMzimkhulu.** The study results revealed smallholder farmers in St. Paul custom feedlot has experience dire situation in the programme. Most of the farmers were not able to sell their cattle, some cattle were sold with lower prices and cattle were starved since there were shortage of feed. Nonetheless, some have applauded the government by introducing this initiative. The study has indicated that farmers were introduced to a new business adventure and method of making better income from their cattle. However, bureaucratic challenges, policy red tapes, insufficient budget, and lack of government integration of all stakeholders hindered the programme. Though, the programme has a huge potential in improving household food security in uMzimkhulu the study results reported that majority of the households were food insecure. Severe food insecurity amongst the beneficiaries of the programme can be attributed to the challenges experienced with the facility such as animal deaths. Therefore, the programme did not have a positive impact towards food security in St. Paul.

The study results found that grass biodiversity loss was a great concern in uMzimkhulu and farmers are aware of its implication to livestock production and food security. Climate change, overgrazing, veld burning, lack of rainfall, and soil erosion was one of the critical aspects of grass biodiversity loss. Farmer awareness and capacity building was a crucial aspect in managing of veld in rural areas.

In terms of the objective 3 which aimed at exploring policy implementation in relation to the NRMDP. The study results revealed that for any policy to be effective it need to be proper consultation before it implementation. Also, the is a huge policy gap within government

departments. Policy implemented need to for agricultural sustainable must limit risk to farmers. Furthermore, the study revealed that the was no policy implemented for insurance for disaster within the programme. Local government played little or no role towards the programme because there is no policy implemented for them to take full responsibility.

6.2 Policy recommendations

- It is recommended that intensification of appropriate policies to successfully address the problems on the ground, not just policies that are good on paper but fail to address issues on the ground because of the red tapes that hinder it. There is a need for proactive policy support to fund the programme sustainably. The system must be flexible to address emergency circumstances, for instead, there are pandemics.

- The NRMDP is an income-generating programme for smallholder farmers; therefore, it is recommended that farmers be equipped with entrepreneurial skills to successfully benefit from the programme and give them a comparative advantage to make their business sustainable.

- We need all the stakeholders (national, provincial, local government and private sector) to be coordinated in a good manner under one umbrella, and they indicate what they can offer towards the programme to make sure that NRMDP is funded sustainable so that it can revamp and sustain itself in future.

- Funds need to be made available as soon as possible because the delays are killing the programme and the tender system needs to be reassessed. Moreover, introduce farmers and youth to new opportunities within farming, such as modern technology like artificial insemination, and export markets and register them to a cooperative.

- The NRMDP implemented by NAMC is one of the critical programmes to assist smallholder farmers in market access and ensure income access to procure food. However, this programme has not reached its potential to address food insecurity and grass biodiversity in rural areas. According to Abdu-Raheem and Worth (2013), South Africa is combatting unsustainable exploitation and degradation of its biodiversity species by enhancing food security at the household level. South Africa's policy faces challenges in finding solutions to food insecurity; policies need to enhance food security without compromising environmental and social welfare outcomes (Delport, 2019). Marandure (2015) predicted that increasing the cattle market offtake will be beneficial in taking away pressure from most smallholder areas' fast deteriorating

natural pastures. Thus, the NRMDP emerges as a potentially influential tool to achieve this.

- However, for the NRMDP to achieve its goals, it is clear that there is a need for policy alignment. The policy needs to address the problems encountered at the ground level by smallholder farmers. Policy redesigning of the programme is crucial, and it needs to give more attention to household food security and grass biodiversity in rural areas. There is a need for a proper consultation to reduce the lack of buy-in from other government departments and the private sector. To ensure that household food insecurity and grass biodiversity are eliminated, it is vital to seek an unbiased policy to address these problems. Therefore, policy approaches have to invest in the rural economy and prioritize the use of natural resources efficiently.

6.3 Implications for further research

- The study investigated the impact of the NRMDP on household food security and grass biodiversity conservation only to the beneficiaries of the programme at uMzimkhulu local municipality and lived experiences of smallholders; therefore, there is still a need to include nonparticipants of the programme to identify household food security status at uMzimkhulu.

- More research is required to develop policies that will assess the sustainability of funding agricultural projects.

- Due to limited time and resources, small sample size has been used; therefore, future research may broaden the sample size.

APPENDICES

APPENDIX A: Letter from National Agricultural Marketing Council (NAMC)

(Gatekeepers Letter)

The Registrar

University of KwaZulu Natal

RE: PERMISION FOR MR SIBONGISENI PEACOCK TO USE SECONDARY DATA OF THE PROGRAMME: NATIONAL RED MEAT DEVELOPMENT PROGRAMME, ST PAUL CUSTOM FEEDING FACILITY IN MZIMKHULU, KWAZULU NATAL PROVINCE.

This letter serves as a confirmation that Mr. Sibongiseni Peacock, student number: 220112567, a registered student with the College of Agriculture, Engineering & Science at the University of KwaZulu Natal, has been granted permission by the National Agricultural Marketing Council (NAMC) to use the St Paul Custom feeding Facility secondary data to conduct research on "Investigating the role of the National Red Meat Development Programme in improving the household food security and grass biodiversity in communal areas of uMzimkhulu Local Municipality, KwaZulu Natal".

We trust that you find the above in order.

Yours Sincerely

19-11-2021

Dr Simphiwe Ngqangweni   **Date**
Chief Executive Officer
National Agricultural Marketing Council

Council Members: Mr. A. Petersen (Chairperson), Ms. T. Ntshangase (Deputy Chairperson), Prof. A. Jooste, Mr. S.J. Mhlaba, Ms. F. Mkile, Ms. N. Mokose, Ms. S. Naidoo, Mr. G. Schutte and Dr. S.T. Xaba.

APPENDIX B: Letter from Ward 6 Councillor of uMzimkhulu Local Municipality
(Gatekeepers Letter)

P. O. Box 608, Lourdes Mission, uMzimkhulu, 3297, KwaZulu Natal Province,

Reference: Re-Approval to conduct a research project

Contact Person: Bongiwe Sibeni

Contact No.: 079 893 6980

Date: 02 November 2021

Sibongiseni Peacock (220112567)

University of KwaZulu Natal,

College of Agriculture, Engineering & Science

Pietermaritzburg

02 November 2021

Approval to conduct a research project at St Paul

Dear Mr S. Peacock,

I Bongiwe Sibeni, Councillor at ward 6 of uMzimkhulu Local Municipality, am pleased to give **Sibongiseni Peacock**, a masters student from the University of KwaZulu Natal, permission to conduct his research project at St. Paul Farmer Production Support Unity (St. Paul feedlot). The student has demonstrated that the study will not impose any risk or harm to study participants.

Smallholder farmers of red meat who wishes to volunteer to participate in the study are allowed to respond to the questionnaires provided by the student.

For further information, please do not hesitate to contact me at 079 893 36980.

Yours faithfully

Mrs B.Sibeni (Ward 6 Cllr.)

APPENDIX C: Ethical Clearance Approval Letter

UNIVERSITY OF ™
KWAZULU-NATAL

INYUVESI
YAKWAZULU-NATALI

28 January 2022

Sibongiseni Peacock (220112567)
School Of Agri Earth & Env Sc
Pietermaritzburg Campus

Dear S Peacock,

Protocol reference number: HSSREC/00003324/2021
Project title: Investigating the role of the National Red Meat Development Programme in improving household food security and grass biodiversity in communal areas of uMzimkhulu Local Municipality, Kwa-Zulu Natal
Degree: Masters

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 09 September 2021 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted FULL APPROVAL.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

This approval is valid until 28 January 2023.
To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

All research conducted during the COVID-19 period must adhere to the national and UKZN guidelines.

HSSREC is registered with the South African National Research Ethics Council (REC-040414-040).

Yours sincerely,

_____
Professor Dipane Hlalele (Chair)

/dd

INSPIRING GREATNESS

APPENDIX D: Department of Agriculture, Land Reform and Rural Development (KZN Province) (Gatekeepers Letter)

agriculture, land reform
& rural development
Department:
Agriculture, Land Reform and Rural Development
REPUBLIC OF SOUTH AFRICA

KWAZULU-NATAL PROVINCIAL SHARED SERVICES CENTER
Port Shepstone District Office, 41 Nelson Mandela Drive, Port Shepstone, 4240
Tel: 039 – 682 2295; Fax: 039 – 682 0509

Mr. S. Peacock

College of Agriculture, Engineering & Science

Dear Mr S. Peacock

RE: REQUEST TO CONDUCT RESEARCH STUDY: INVESTIGATING THE ROLE OF THE NATIONAL RED MEAT DEVELOPMENT PROGRAMME IN IMPROVING HOUSEHOLD FOOD SECURITY AND GRASS BIODIVERSITY IN COMMUNAL AREAS OF UMZIMKHULU LOCAL MUNICIPALITY, KWAZULU-NATAL

I have read and understand the information submitted in your letter dated 07 May 2021. I hereby give consent to conduct your proposed investigation at **St Paul Custom Feedlot located in Umzimkhulu Local Municipality** as a case study for the purposes of this research project with the **University of KwaZulu – Natal.**

Approval is hereby granted to contact **Beneficiaries** of the project as well as **Project Officers** within **Harry Gwala District Office** for data collection / interviews.

For further assistance, please contact Ms N. Radebe on 039 – 682 2295.

Mr. N.C. Mndaweni
Chief Director: KZN PSSC
Date: 27/05/2021

APPENDIX E: St. Paul Farmer Production Unit Approval Letter (Gatekeepers Letter)

ST. PAUL FARMER PRODUCTION UNIT

P. O. Box 527
Umzimkhulu
3297
20/05/2021

ISIVUMELWANO SOKWENZA UPHANDO

Umzimkhulu Farmers Association phantsi kwabafuyi benkomo abadayisi okanye abaxhamuli bophuhliso lwenyamaebomvu (National Red Meat Development Programme) siyamvumela simnika amagunya umfundi weMasitazi weUniversity of KwaZulu-Natal ukululeka nokuthuthukisa abafuyi ngemibono namakhono. Igama ngu Sibongiseni Peacok, Student No. 220112567.

For more information, please contact Mr. Mthembu.

Ozithobileyo

Mnu Mthembu (Chairperson – 0792215354)

APPENDIX F: Study Consent Form

UNIVERSITY OF
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INYUVESI
YAKWAZULU-NATALI

Questionnaire

Introduction

Smallholder Beef Assessment Questionnaire

I Sibongiseni Peacock, a full-time student at the University of KwaZulu Natal registered for Master's in Agriculture (Food Security). I would like to invite you to participate in this research project which is about Investigating the Impact of the National Red Meat Development Programme (NRMDP) on household food security and grass biodiversity at uMzimkhulu Local Municipality. I kindly request you to complete the following questionnaire regarding your participation in the NRMDP. If you decide to take part in this interview, please note the following:

- All the identifying information that you provide will remain confidential
- Your participation is completely voluntary.
- You have the right to withdraw from the interview at any point without any penalty.
- You are free not to answer any questions that make you uncomfortable.
- For further information about the study, please contact my supervisor Mr. Denver Naidoo at Naidook12@ukzn.ac.za or co-supervisor Prof. Sikhalazo Dube at s.dube@cgiar.org and HSSREC Research Office UKZN at hssrec@ukzn.ac.za or at +27 31 260 3587/4557/8350

Participation agreement

I _____ (full name and surname) hereby confirm my understanding of the questionnaire and I understand that I will not be exposed to any risks during the study and that I may withdraw from participating at any point.

Signature of the participant: _____ Date: _____

APPENDIX G: Questionnaire

Investigating the role of the National Red Meat Development Programme in improving household food security and grass biodiversity in communal areas of uMzimkhulu Local Municipality, Kwa-Zulu Natal Province

Questionnaire number................   Name of respondent................................

Village name...................…….   Municipality Name................................

Sex of respondent……………....   Ward number……………………….

Date............/.............../................   GPS co-ordinates………………..………

A HOUSEHOLD DEMOGRAPHIC INFORMATION

A1. Head of household

1. Who is the head of the household?	0= Male			1= Female	

2. Marital status	0=Married	1= Single	2=Divorced	3=Widowed

3.What is the age of the household head					

4.What is the size of your household?

Adults   M ☐   Children. M ☐   F ☐   Total

F ☐

5. Highest level of education	0=No formal education	1= Primary school	2=High school	3=Tertiary level

6. Employment status?	0= Self-employed	1= Employed for wage/salary	2= Out of work and looking for work	3= A homemaker
	4= Pensioner	5= A student	6= Out of work but not currently looking for work	7= Unable to work

7. What is your monthly income?	

8. What is the household's main source of income? Please select all that apply

☐0=Agricultural casual labour

☐1=Agriculture and sale of crops

☐2=Kinship/support from family friends/remittances

☐3=Livestock and sale of livestock or livestock product

☐4=Skilled labour

☐5=Social grants

☐6=Transport

☐7=Other specify_____

9. Does your household collect any type of social grant?
☐0= No
☐1= Yes

10. What type of grants does your household receive?
☐0= Old Age Grant
☐1= Child Support Grant
☐2= Disability Grant
☐3= Care Dependency Grant
☐4= Grant in Aid

11. No. of people receiving Social Grant in your household?	0= Household head	1= Child grant	2= Foster care grant	3=Old age pension

12. What is the major source of the household livelihood?

Please select all that apply☐
0=Salary☐
1=Casual/daily labour☐
2=Farming activity☐
3=Small business☐
4=Renting income☐
5=Pension, provident fund, etc.☐
6=Remittances☐
7=Handicraft☐
8=Other -☐

13. Other grants from the Government	

14. What additional sources of income does your household have?	

15. What farming activities does your household engage in?	0= Producing vegetables	1=Livestock	2= Both

SECTION B: TO DETERMINE THE HOUSEHOLD FOOD SECURITY STATUS OF COMMUNAL FARMERS SINCE THE IMPLEMENTATION OF THE NATIONAL RED MEAT DEVELOPMENT PROGRAMME QUESTIONNAIRE HOUSEHOLD FOOD INSECURITY ACCESS SCALE QUESTIONNAIRE

For each of the following questions, consider what has happened in the past 30 days. Please answer whether this happened never, rarely (once or twice), sometimes (3-10 times), or often (more than 10 times) in the past 30 days?

Question	Response choices	Code
1. Did you worry that you would not have enough food?	0 = Never 1 = Rarely (once or twice in the past 30 days) 2 = Sometimes (three to ten times in the past 30 days) 3 = Often (more than 10 times in the past 30 days)	
2. Were you not able to eat the kinds of foods you preferred because of a lack of resources (money)?	0 = Never 1 = Rarely (once or twice in the past 30 days) 2 = Sometimes (three to ten times in the past 30 days) 3 = Often (more than 10 times in the past 30 days)	
3. Did you cut the size of meals during the past 30 days because there was not enough food in the house?	0 = Never 1 = Rarely (once or twice in the past 30 days) 2 = Sometimes (three to ten times in the past 30 days) 3 = Often (more than 10 times in the past 30 days)	
4. Did you eat food that you preferred not to eat because of a lack of resources to obtain other types of food?	0 = Never 1 = Rarely (once or twice in the past 30 days) 2 = Sometimes (three to ten times in the past 30 days) 3 = Often (more than 10 times in the past 30 days)	
5. Did you eat a smaller meal than you felt you needed because there was not enough food?	0 = Never 1 = Rarely (once or twice in the past 30 days) 2 = Sometimes (three to ten times in the past 30 days) 3 = Often (more than 10 times in the past 30 days)	
6. Did you eat fewer meals in a day because there was not enough food?	0 = Never 1 = Rarely (once or twice in the past 30 days) 2 = Sometimes (three to ten times in the past 30 days) 3 = Often (more than 10 times in the past 30 days)	
7. Was there ever no food at all in where you live because there were no resources to get more?	0 = Never 1 = Rarely (once or twice in the past 30 days) 2 = Sometimes (three to ten times in the past 30 days) 3 = Often (more than 10 times in the past 30 days)	
8. Did you go to sleep at night hungry because there was not enough food?	0 = Never 1 = Rarely (once or twice in the past 30 days) 2 = Sometimes (three to ten times in the past 30 days) 3 = Often (more than 10 times in the past 30 days)	
9. Did you go a whole day without eating anything because there was not enough food?	0 = Never 1 = Rarely (once or twice in the past 30 days) 2 = Sometimes (three to ten times in the past 30 days) 3= Often (more than 10 times in the past 30 days)	

10. Indicate the months your household is likely to run out of food

0=Jan	1=Feb	2=Mar	3=Apr	4=May	5=Jun	6=Jul	7=Aug	8=Sep	9=Oct	10=Nov	11=Dec

11. How many cattle have you sold through the NRMDP in this feedlot?

0=One cattle	1=Two cattle	2=Three cattle	3=Four cattle	4=Five cattle

5=Six cattle	6=Seven cattle	7=Eight cattle	8= More	

12. How much money do you get from cattle sales per annum in the programme?

13. How are the following factors affecting your household food security status?	0=Severe	1=Moderate	2=Low
13.1 Not being able to sell animals in the programme (No animals available)			
13.2 Lack of selling while animals available			
13.3 Cattle died in the custom feedlot facility			
13.4 Stock theft			
13.5 Low income from sales			
13.6 Poor quality breed			

14. What coping strategies have you implemented to meet household food security if your livestock is not sold?

0= Borrowing of food	1= Stokvel	2= Work for food	3= Exchange food	4= Producing and selling vegetables	5= other

SECTION C: TO EXPLORE COMMUNAL LIVESTOCK FARMERS PERCEPTIONS OF BIODIVERSITY CONSERVATION IN LIVESTOCK MANAGEMENT

1. What is your livestock composition? (Rank them in order of importance from 1-6 where 1 is most important and 6 is least important).							
Livestock species	Goats	Sheep	Cattle	Poultry	Pigs	Others (specify)	
Number of livestock							
Rank							
1.1 What is the composition of the cattle you have?							
Calves (<7 months)		Heifers		Steers	Cows	Oxen	Bulls

2. Which breeds do you keep?

Breed	0=Brahman	1= Nguni	3=Non-descript	4=Afrikaner	5=Other
Number					
					Total:

3. **Why do you keep cattle? (Tick one or more) (Rank them in order of importance from 1-6 where 1 is most important and 6 is least important).**

Use	Rank	Use	Rank
0=Meat		1=Sales	
2=Draught power		3=Status	
4=Milk		5=Dowry/Lobolo	
6=Skin		7=Ceremonies	
8=Manure		9=Other	

4. **How did you acquire your cattle?**

0= Inherited	1= Given	2= Bought	3= Others(specify)

----

5. **What feeding system do you use?**

0= Herding	1= Paddock	2=Yard	3=Free grazing	4= Other (specify)

6. **What sources of feed do you use for your cattle? (Tick 1 or more)**

0=Veld	1=Pasture	3 2= Conserved feed	3=Crop residues	5=Commercial feed	6= Other (specify)

7. **What are the important areas used for livestock grazing? You may select multiple responses**

0= Communal grazing	1= Pasture grazing	2= Private enclosures (feedlot)	3= Roadside grazing

8. **Size of the grazing land**_____

8.1 Land ownership

0=Private	1= Communal	2= State-owned

9. **Do you give your cattle's any supplement feeding?** 1= Yes☐ 2= No☐

	1=Agree	2=Disagree	3=Neutral	4=Strongly agree	5=Strongly disagree
10. Biodiversity is indispensable for the production of goods such as food, fuel, and medicines					
11. Our wellbeing and quality of life is based upon nature and biodiversity as it provides pleasure and recreation					
12. It is a moral obligation – because we have a responsibility as stewards of nature					
13. South Africa will get poorer economically as a consequence of the loss of biodiversity					
14. Livestock is one of the main drivers for deforestation for grazing or fodder and feed production					
15. Grazing livestock appropriately can play a positive role in biodiversity conservation?					
16. Grass must be fully recovered before it is re-grazed					
17. Do you think that the decline and possible extinction of					
animal species, flora, and fauna, will have an impact on you personally?					
18. I made the following adjustments in my farming practices because of the changes in grass biodiversity?					
18.1 Stop veld burning					
18.2 Cull unproductive animals					
18.3 Stop overgrazing					

18.4 Implemented rotational grazing					
18.5 Do veld assessment prior grazing					
18.6 Remove alien invasive species					
18.7 Restore soil					
18.8 Maintain grazing capacity					
	1=Agree	2=Disagree	3=Neutral	4=Strongly agree	5=Strongly disagree
19. High livestock densities cause land degradation in terms of declining range productivity, soil degradation and woody invasion of grasslands					
20. Do you think it is important to conserve grass biodiversity in a community grazing land?					
21. Extensive livestock grazing system is more favorable than intensive systems					
22. What is your experience and perception of grass biodiversity?					
22.1 Used to conserve					
22.2 Never used					
22.3 Used but stopped					
22.4 Sometimes					

23. What are the factors you perceive as the drivers of biodiversity loss?					
23.1 Poor grazing management					
23.2 Low rainfall					
23.3 Fire					
23.4 Bush encroachment					
23.5 Poor soil condition					
23.6 Other					

24. What are the veld management strategy that can be implemented to improve biodiversity conditions in the veld	1=Agree	2=Disagree	3=Neutral	4=Strongly agree	5=Strongly disagree
24.1 Apply veld burning (Fire)					
24.2 Overgrazing					
24.3 Continues grazing					
24.4 Rest grazing					
24.5 Implement stocking rate					
24.6 Destroy alien invasive species					
25. Do you think it is important to implement a strict programme that will restore grass biodiversity in the grazing land?					
26. Do you think with the current grazing management strategies implemented; the future generation will be able to farm in this area (benefiting in grass biodiversity)?					
27. What is your perception about biodiversity conservation regarding feedlot?					
27.1 It improves grass biodiversity (Reduces grazing pressure)					
27.2 Negatively affect it					
27.3 Reduces overstocking					
27.4 Pollute land					
27.5 Promote alien invasive species					
28. Deforestation and habitat encroachment can affect the emergence, occurrence of infectious diseases					

29. How informed do you feel about the loss of biodiversity?

0=Not informed at all	1=Not well informed	2=Well informed	3=Very well informed	4= Don't Know

30. What threatens biodiversity the most?

0=Pollution of air/ water	1=Climate change	I2=intensification of agriculture, deforestation	3=Man-made disasters
4=Land-use change and development	5=Plants and animals introduced into the ecosystems	6=Other	7=Don't know

Thank you very much for your time!

APPENDIX H: Focused Group Discussion Guide

FOCUS GROUP DISCUSSION OUTLINE

Participants: NRMDP beneficiaries (divided into two groups)

Th study aims to investigate the impact of the NRMDP on household food security and grass biodiversity sustainability at uMzimkhulu. The discussion will contribute to discovering the impact that the programme has made to increase household's access to nutritious food and sustainability of biodiversity and how the beneficiaries have experienced food security in that context. The study results from these engagements will be used for study purposes.

Key questions:

• What are your experiences as a St Paul custom feedlot beneficiary?

• Please describe how did you experience your lived experience (challenges, and opportunities) as a beneficiary of NRMDP? These affected food security and biodiversity conservation

• What impacts do you think biodiversity conservation may have on food security?

• To what extent does your involvement with this programme affected your household food security?

• In your understanding, what is biodiversity?

• How has this experience instilled confidence in you (farmer) that future threats to household food security and biodiversity sustainability could be successfully addressed?

• Please describe how you manage your livestock in terms of grazing

• Will you continue participating into the programme?

APPENDIX I: Key Informants Interview

INTERVIEW GUIDE FOR KEY INFORMANTS:
TO IDENTIFY POLICY COHERENCE IMPLEMENTED FOR STAKEHOLDERS INVOLVED IN THE PROGRAMME TO IMPROVE FOOD SECURITY AND BIODIVERSITY SUSTAINABILITY.

- Please share with me your experiences as an official of the NRMDP
- What are the challenges that you experience in the programme?
- What are the causes of the challenges you experienced, and how did you overcome them?
- What is food security and grass biodiversity in your understanding?
- Do you think the programme can improve household food security and biodiversity conservation?
- Do you think the NRMDP adhere to policy regarding food security and biodiversity conservation?
- How can the land demand for food production and biodiversity conservation be met simultaneously in the policy framework or context?
- Please give examples of good practices in the protection of environmental rights on biodiversity and conservation.
- Please provide good practices in the adoption of biodiversity-related legislation, policies and programmes.
- What are the gaps in policy implementation of the programme to achieve your goals?
- What actions are needed to be done by the national and provincial government to achieve what is stated above?
- Why do you think it is important to protect biodiversity through sound policy implementation?
- What can be done to protect biodiversity?
- What suggestions or recommendations would you offer to improve the programme in terms of food security and biodiversity conservation?