Exploring grazing management practices for sustainable cattle farming in the North West Province of South Africa

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DECLARATION

I hereby declare that the assignment submitted herewith to the North-West University in partial fulfilment of the requirements for the Master of Business Administration (MBA) degree is my own original work. It has been text-edited in accordance with professional communication standards and has not been previously submitted to any other institution for evaluation purposes.

Frans Nicolaas Janse van Rensburg

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LIST OF ABBREVIATIONS

ADG	Average Daily Growth
CSG	Controlled Selective Grazing
FCE	Feed Conversion Efficiency
FGS	Flexible Grazing System
HDG	High Density Grazing
HPG	High Performance Grazing
HUG	High Utilisation Grazing
ICP	Inter Calving Period
LSU	Large Stock Unit
NSG	Non-selective Grazing
RG	Rotational Grazing
SDG	Short Duration Grazing
SDG’s	Sustainable Development Goals
UHDG	Ultra High Intensity Grazing

ABSTRACT

This study explored how different grazing management practices can affect the sustainability of cattle farming in the North West Province of South Africa. The main objective of the study was to explore grazing management practices that support sustainable cattle farming in the North West Province of South Africa. The research examined how farmers apply and evaluate different grazing management practices. It further explored how these practices relate to ecological condition, operational decisions, and long-term farm viability. The study addressed the challenge of ongoing veld degradation, climate variability, and profitability pressures that continue to threaten sustainable cattle production in the region.

A qualitative, exploratory design was used, using semi-structured face-to-face interviews with cattle farmers across the province. Using Braun and Clarke's reflexive thematic analysis approach, the study found that although farmers value ecologically responsible grazing management practices, several barriers to adoption exist. These barriers include high initial infrastructure costs, limited knowledge and uncertainty about outcomes, which restrict the adoption of high-intensity rotational grazing management practices. Stocking rate decisions, veld condition, and rainfall remain central drivers of management choices, while farmers who apply more sustainable grazing management practices report better veld recovery, greater resilience, and improved long-term productivity, sustainability, and profitability of their cattle operations.

From a management perspective, the findings suggest that farmers require practical, context-appropriate support to transition towards more sustainable grazing frameworks. This includes accessible training, demonstration sites, financial guidance, and collaborative knowledge sharing between practitioners who have successfully implemented such grazing management practices.

The study concludes that sustainable grazing management is both achievable and beneficial. The successful implementation of sustainable grazing management practices depends on farmers' knowledge, practical exposure, and long-term commitment.

Key terms

Sustainable, Cattle Farming, Grazing Management Practices, Sustainability, Costs, Profit, Interviews, Barriers, North-West Province

CHAPTER 1

INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 Introduction and background

Livestock production is the predominant consumer of land resources globally and is intricately linked to landscape management, biodiversity, soil conservation, and the comprehensive functioning of ecosystems. South Africa is similar; cattle are raised on around 70% of agricultural land, representing nearly 80% of land resources (Fynn *et al.*, 2017). Livestock production in South Africa significantly contributes to food security and clothing, while also providing other social and economic benefits to the nation (Palmer & Scholtz, 2013).

The worldwide demand for animal products, particularly meat, is rising, propelled by the growth of the global human population, increased wealth in developing nations, and a corresponding change in the consumption of cattle products. The South African middle-class population has significantly expanded over the past decade, resulting in a corresponding increase in demand for cattle commodities (Palmer & Scholtz, 2013). Consequently, preserving the biodiversity of flora and fauna species together with rising demand for beef cattle products has emerged as a global priority (Boakes *et al.*, 2024:5750).

The environmental consequences of increased livestock quantities are land degradation, water depletion and pollution, and threats to biodiversity, particularly when production systems are poorly managed (Palmer & Scholtz, 2013). The changing environmental, social, and economic landscape necessitates greater innovation among cattle farmers (Oduniyi *et al.*, 2020).

To ensure the long-term sustainability and uphold food security, beef producers need to implement management strategies and practices to improve profitability while also mitigating the impact of fluctuating prices and rising production costs (Bilotto *et al.*, 2024:668). The beef producer has no control over price and expenses, but they can manage and implement practices that will be profitable and sustainable. Another factor in long-term sustainability is ecological sustainability, which includes rangeland health and biodiversity (Fynn & Jackson, 2022:136-147).

The intended purpose of this study was to explore different grazing management practices for sustainable cattle farming in the North-West province of South Africa. The study also examines profitability, risk, and the ecological consequences of different grazing management practices as indicators of long-term sustainability in cattle farming.

1.2 Problem statement

Pasture-based cattle farming systems in South Africa are vulnerable to climate-related events, low production yields, revenue variability, and inadequate adaptation capability, impacting the long-term sustainability and profitability of cattle farmers (Oduniyi *et al.*, 2020). The problem faced by cattle farmers in South Africa is the changing environmental, social, and economic landscape, requiring greater innovation among cattle farmers (Oduniyi *et al.*, 2020).

In South Africa, two key objectives of grazing management by cattle farmers are long-term economic and ecological sustainability. Economic sustainability of cattle farming is assessed by profitability, and the revenue from cattle production is influenced by both the quantity of animals sold and their body weight, which also has an impact on carcass quality and grading (price per kilogramme) (Fynn *et al.*, 2017:90). Ecological sustainability, on the other hand, includes rangeland health and biodiversity. An optimal rangeland condition can be achieved by optimising stocking rates and grazing management practices to ensure a high coverage of preferred grasses for maximum grazing capacity and soil conservation. At the same time, biodiversity enables enhanced structural heterogeneity across the ranch via fire, grazing, and the interaction between these components (Fynn & Jackson, 2022).

Regardless of the effectiveness of cattle management in optimising grass composition, cover, and productivity on a ranch, if operational costs surpass revenue, the ranch becomes economically unsustainable and the management strategy unworkable (Fynn *et al.*, 2017:89). Sustainable farm management must evaluate the effects of grazing practices on veld condition and biodiversity (ecological sustainability), as well as cattle output and overhead expenses (economic sustainability) (Fynn & Jackson, 2022).

Furthermore, each financial year is becoming increasingly difficult for cattle farmers in the North-West province to maintain their level of profitability on farms (Undersander *et al.*, 2002). For farmers to stay profitable and viable on their farms, farmers tend to misuse their grazing land through unsustainable grazing management practices(Fynn & Jackson, 2022). Poor grazing management practices negatively affect the surrounding ecosystem and, over time, undermine the farmer's ability to sustain productive operations on the land. Therefore, this study aimed to explore possible grazing management practices for sustainable cattle farming in the North-West province of South Africa.

1.3 Research aim and objectives

The main aim of this research was to explore grazing management practices for sustainable cattle farming in the North-West province of South Africa. Farmers in the North West Province adopt multiple grazing management approaches, each differing in intensity, rotation, and ecological impact. Although the financial benefits of innovative grazing management practices are widely known for their benefits to farmers, the majority of farmers in the North West Province of South Africa still employ traditional management practices.

This research employed qualitative interviews as a tool to collect data from farmers who have successfully implemented certain grazing management practices in order to ensure long-term sustainability for their farms. The benefits, barriers, the various reasons for choosing a grazing management practice, and how farmers overcame the implementation challenges of modern grazing management practices were explored, aiming to assist other farmers who would like to move to more sustainable practices.

1.3.1.1 Primary research objective

The primary objective of this study was to explore grazing management practices for sustainable cattle farming in the North West Province of South Africa.

1.3.1.2 Secondary research objectives

To effectively address the primary objective of the study, the following secondary objectives have been formulated:

- To establish the characteristics of cattle farming in the North West Province of South Africa.
- To explore if the current grazing management practices used in the North West Province of South Africa ensure sustainability
- To discuss why cattle farmers utilising traditional grazing management practices are resistant to adopting modern and more sustainable grazing management practices.
- To develop a practical guideline or tool for the implementation of a sustainable grazing management practice for cattle farmers in the North West Province of South Africa.

1.4 Primary and secondary research questions for the study

The primary research question for this study was: How will the exploration for sustainable grazing management practices aid or assist with the sustainability of cattle farmers in the North West Province of South Africa?

In order to effectively explore the main research question for this study, the following secondary research questions were stated:

A. What are the characteristics of cattle farming in the North West Province of South Africa?
B. Do the current grazing management practices followed by farmers in the North West Province of South Africa ensure sustainability?
C. Why are some cattle farmers in the North West Province of South Africa still using traditional grazing practices as opposed to adopting modern, more sustainable grazing management practices?
D. Are there any existing practical guidelines or tools that have been developed for the implementation of sustainable grazing management practices in the North West Province of South Africa?

1.5 Scope of the study

The target area of importance for this study is the North West Province of South Africa. The North West Province, also known as Bokone Bophirima Province, is recognised as a food basket of South Africa. As illustrated in Figure 1, the province is located in the western region of South Africa. It shares boundaries with Limpopo to the north, Gauteng to the east, the Free State to the east and south, the Northern Cape to the south, and Botswana to the west and north. Altitude varies between 1000 and 2000 meters above sea level. The province encompasses a total land area of approximately 116,320 km², representing 9.5% of South Africa‘s overall area (Municipalities, 2025).

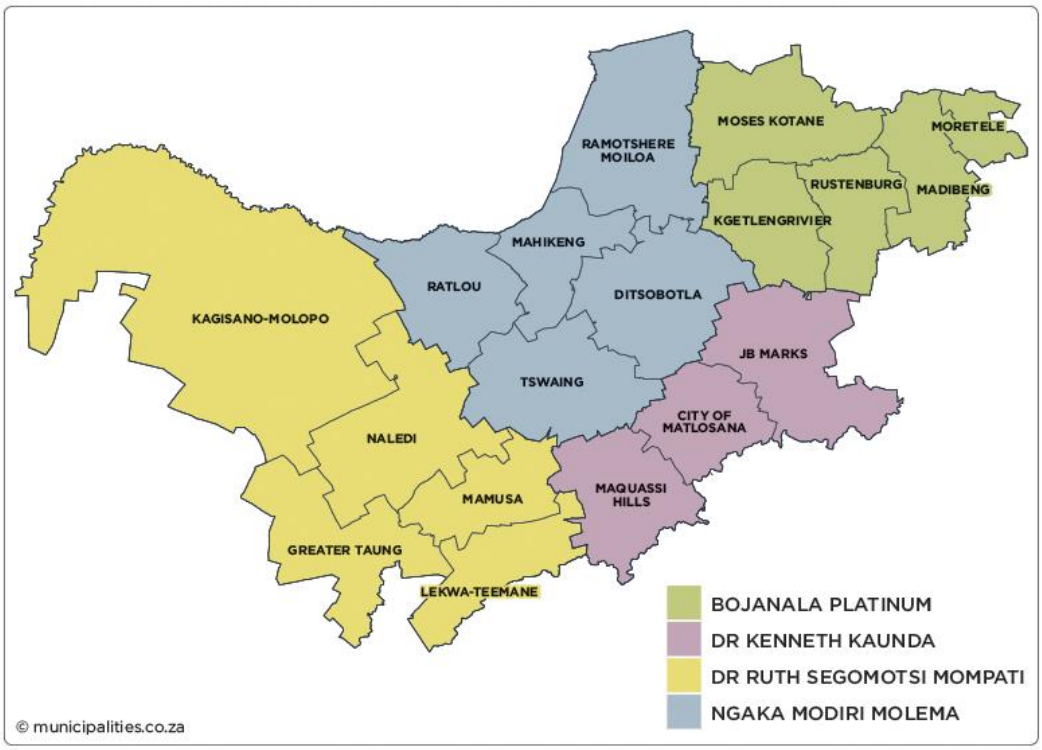

Figure 1: North West Province of South Africa (Municipalities, 2025).

The province is predominantly rural, with agriculture as the primary occupation, however, it is only the fifth largest contributor to the GDP. The North West Province possesses the highest proportion of grazing land, which accounts for the concentration of cattle herds and a significant number of pasture-based livestock farmers relative to other regions, therefore justifying its selection as the research area. Furthermore, the North West Province is recognised for cattle producers with the largest herds in the nation (Oduniyi *et al.*, 2020:4).

Different farmers were involved in the study, with data collected on-site and in person about their grazing management practices. Sustainable grazing management practices can be adopted by any existing cattle farmer. Techniques employed by one farmer may present a viable alternative for another that has not been considered before. Practical guidelines or tools for implementing sustainable grazing management practices could also be proposed.

1.6 Importance and significance of the study

Theoretically, this study will be valuable to cattle farmers by expanding the knowledge of sustainable grazing management practices in order to ensure the profitability of their cattle operations in the North West Province of South Africa. Applying the study's findings will enhance

understanding of sustainable grazing management practices and offer valuable insights into the factors influencing and promoting their adoption. The study will have a positive impact on cattle farmers, cattle buyers, and researchers in the field of practice.

By focusing on grazing management practices for sustainable cattle farming in the North-West Province, this study seeks to fill the gaps to connect ecological theory, economic considerations and practical farmer experience. The empirical work in later chapters aims to explore which grazing systems farmers in the province are using, how they perceive the benefits and constraints of different approaches, why some remain committed to traditional practices despite mounting pressures, and how they understand the relationship between rangeland condition, profitability, and risk. The study aims to enhance the academic conversation on sustainable grazing management, thereby ensuring the long-term viability of cattle farmers and the natural resources they rely upon.

1.7 Delimitations of the study

Although the grazing management practice could be followed in any province of South Africa, this study is limited to the North West Province. The research is also limited to the participants who are involved in the study and who are currently implementing grazing management practices. The limitation is due to the cost and time constraints involved in travelling and acquiring the data. The researcher believes that the study‘s results could be generalised to the rest of the country. The reason is that although the physical circumstances of a farming entity vary in different parts of South Africa, the nature of the business, in this case, sustainable cattle farming, stays the same.

1.8 Assumptions

- If a farmer implements a sustainable grazing management practice, it is assumed that the farmer’s profit margins per hectare will increase, as the literature suggests.
- Another assumption is that climate change and global warming have an adverse effect on ecology and biodiversity of nature, resulting in the management of natural resources being even more important.

1.9 Definitions of key topics

- **Beef producer or cattle farmer:** A cattle farmer is a person involved in the breeding, raising, and management of cattle for the production of meat, milk, or breeding stock (Oduniyi *et al.*, 2020).

- **Carrying capacity:** The number of animals that can be supported by the available forage (Zietsman, 2014:285).
- **Grazing management practices:** Grazing management includes the systematic regulation of livestock grazing to preserve healthy pastures, maximise fodder utilisation, and promote sustainable land use. It encompasses rotational grazing, stocking densities, and recovery intervals (Fynn *et al.*, 2017:87-98).
- **Inter-calving period:** Period (days) between two consecutive calving dates (Zietsman, 2014:286).
- **Overgrazing:** Repeated grazing of plants before recovery of root energy reserves (Zietsman, 2014:286).
- **Over-resting:** Prolonged lack of defoliation of plants or non-disturbance of plants and soil (Zietsman, 2014:286).
- **Profitability in cattle farming:** Profitability denotes the financial feasibility of cattle farming enterprises, measuring profits from animal sales against input expenses such as feed, labour, and veterinary services. This is significantly influenced by variations in global commodities markets and local input expenses (Jobirov *et al.*, 2022:391).
- **Relative Intake:** An animal's intake relative to its size (Zietsman, 2014:287).
- **Stocking rate:** The number of animals on the land (Zietsman, 2014:287).
- **Stock density:** The number of animals grazing on one hectare at any given time (Zietsman, 2014:287).
- **Sustainability:** Sustainability in cattle farming describes the ability of livestock systems to sustain productivity and profitability while conserving the ecological balance, ensuring resource availability for future generations (Cheteni & Umejesi, 2022:75-85).
- **Sustainable cattle farming:** Sustainable cattle farming describes livestock production techniques that fulfil present food requirements while preserving the environment, biodiversity, animal welfare, and agricultural economies for future generations. It encompasses responsible resource utilisation, socio-economic sustainability, and ecological equilibrium (Oduniyi *et al.*, 2020:2582).
- **Veld management:** To maintain or improve veld condition in any veld type, it is important to use optimal grazing practices and prevent overgrazing. During overgrazing, various undesired plant species can invade. This is nature‘s attempt to protect the topsoil from erosion. These plants are often extremely distasteful and are usually complex and expensive to control. Prevention is better than control (Snyman, 2012:2).

1.10 Chapter layout

- **Chapter 1: Introduction and background to the study**

The first chapter describes the study‘s background, outlining its topic of study and anticipated outcomes. It provides the reader with contextual information regarding the study, including an overview of its aims, objectives, rationale, research questions, problem statement, and definitions of key topics.

- **Chapter 2: Literature review**

The second chapter is the literature review. Theories and literature that already exist on key topics related to the study are discussed. Challenges that farmers face are described regarding the sustainability and profitability of cattle farming operations. This chapter explains how certain grazing management practices could increase the sustainability and profitability of cattle farming, contributing to food security in order to feed the growing population. The theoretical benefits and barriers are also explained.

- **Chapter 3: Research Methodology**

The third chapter describes the study’s research design, population, sample, and how the data were obtained. This chapter will also cover the ethical aspects of the study and how the data were analysed.

- **Chapter 4: Research Results**

The fourth chapter aims to evaluate the data obtained from the interview sessions conducted with participants in the study. The acquired data is reviewed and analysed in detail to deliver the findings.

- **Chapter 5: Conclusions and recommendations**

The last chapter provides answers to the research questions based on the findings presented.

Additionally, recommendations around the study and future research are made.

1.11 Chapter summary

Chapter 1 provided the background context to this study by outlining the ecological and economic significance of sustainable cattle farming in the South African context, with a focus on the North West Province. The chapter indicated how increasing demand for animal products, rising

production costs, and environmental pressures intensify the need for improved grazing management practices. The problem statement emphasised that cattle farmers in the province face declining pasture conditions, climate variability, and profitability challenges, which are often worsened by the continued use of traditional grazing methods.

The research aims and objectives were clearly established, focusing on exploring grazing management practices that can support ecological integrity, economic viability, and long-term sustainability of cattle farmers. The importance and benefits of the study were also outlined, emphasising its contribution to expanding knowledge and guiding farmers toward practices that enhance profitability, reduce risk, and ensure the sustainable use of natural resources. Lastly, a chapter outline was presented as a guide for the study's structure.

Participants' perceptions in the North West Province will be explored regarding grazing management practices to complete a qualitative study to provide modern grazing management strategies or practices for maintaining an ecological and financially viable cattle farming operation. Having outlined the study's background, problem statement, objectives, and significance, the next chapter provides a comprehensive review of literature that underpins and contextualises this exploration.

CHAPTER 2

LITERATURE REVIEW

The previous chapter introduced the study by outlining its context, rationale, objectives, and guiding research questions. This chapter engages with relevant literature to establish the conceptual and theoretical foundation for understanding sustainable grazing management practices.

2.1 Introduction

Mankind is key to maintaining harmony between livestock and grassland. Since the domestication of cattle, humans have determined the desirable and unwanted traits in breeding and management (Zietsman, 2014:21). The decisions made in this regard are compromised by numerous elements inherent to the psychology of humans (Farmar-Bowers & Lane, 2009)

It is asserted that individuals are motivated by perception rather than by actuality (Comoé & Siegrist, 2015). In many cases, our perceptions are influenced by presumption, self-importance, trends, pride, and ignorance (Meijer *et al.*, 2015). These perception-driven decisions significantly shape the production goals and management strategies adopted by cattlemen, influencing the way herds are bred, fed, and sustained (Biesheuvel *et al.*, 2021).

The predominant goal of cattlemen relates to production per animal, which includes calving rate, weaning weight, carcass grade, carcass weight, etc. (Smith, 2006:151). This is accomplished by prioritising performance based on absolute metrics of growth rate, milk production, and feedlot efficiency, followed by creating an artificial environment that enables animals to realise their genetic potential (Gillespie & Flanders, 2010:246) This environment is created by selective grazing at low stocking rates, burning dead grass, providing energy feed, and often utilising crop surpluses (Zietsman, 2014:21).

Certain modern studs offer enhanced nutrition through irrigated pasture and the early weaning of calves onto calf feed to facilitate reconception. In nearly all herds, comprehensive chemical management of ticks and internal parasites is implemented (Gillespie & Flanders, 2010:334). The aforementioned scenario is likely to result in discord among humans, cattle, and the environment (Letsoalo *et al.*, 2025). The veld (environment) will degrade, cattle will require an enhanced habitat for optimal production, and humans will face diminished returns on investment (Kirkman,

2025). Sustainable cattle farming requires a careful balance between ecological integrity, economic viability and social responsibility (Snyman, 2012:133).

The initial and fundamental step in attaining harmony among humans, cattle, and the environment is establishing a suitable objective (Zietsman, 2014:50). To achieve broad applicability, the goal must be concise and integrate economic and ecological concerns. Aiming for maximum sustainable profit per hectare aligns with these criteria (Zietsman, 2014:104). This clear and straightforward objective facilitates management and breeding decisions. It directs the attention and efforts of cattle ranchers towards a central focus. Without this goal, all issues relating to management and breeding become a matter of option. Efforts and time should be dedicated to achieving this objective rather than defining it (Zietsman, 2014:105).

2.1 Characteristics of cattle farming

2.1.1 Cattle production systems in South Africa

Livestock is raised throughout South Africa, with variations in quantity, breeds, and species influenced by grazing conditions, environmental factors, and production systems (commercial, small-scale, or communal). Intensive production systems, such as feedlots, poultry, and pig farming, are common due to their efficient land use and vertical integration, typically situated near urban markets and feed suppliers (Palmer & Scholtz, 2013).

Cattle production systems in South Africa vary significantly at a national level. Teague *et al.* (2013) noted that commercial cattle producers are generally involved with fenced grazing systems, which allow for better recovery of the veld and ensure a consistent supply of cattle to the markets. On the other hand, many smallholder and emerging farmers utilise communal grazing areas, where they have limited access to technology and/or extension services and therefore their herds are subject to continuous grazing (Mapiye, 2017). The difference between these two types of production systems illustrates the greater complexity of South African cattle production as well as the differences in the ability of the various managers to manage these different production systems.

The cattle industry in South Africa can be structured into four basic systems: Cow-Calf, Backgrounding and Feedlots (Finishing) systems and Stud Breeders (Fourie, 2014). Each of these systems has differing objectives, management practices, and regional applicability to areas such as the North West Province.

2.1.1.1 Cow-Calf Systems

The Cow-Calf System provides an ongoing breeding program (bulls and cows) to provide weaned calves that will be either sold or passed on to other phases of the production cycle. The Cow-Calf System remains the foundation of most beef production within South Africa and represents extensive production systems (Fourie, 2014). This Cow-Calf System is important due to its role in the foundation of extensive production systems found in semi-arid rangeland regions like the North West Province. Rangelands in the North West Province are utilised for grazing for breeding herds, as opposed to finishing. The Cow-Calf System is recognised by Oduniyi *et al.* (2020) as being vulnerable to challenges posed by climate variability and limitations associated with forage availability within South Africa‘s semi-arid zones. Climate variability and forage availability constrain fertility and weaning weight of calves from Cow-Calf Systems within semi-arid zones of South Africa.

2.1.1.2 Grower, backgrounding and feedlot systems

Feedlots or finishing systems represent a highly intensive production period, during which feeder cattle (after weaning or post-backgrounding) are placed into confinement for feeding high-energy diets to produce slaughter-ready cattle as rapidly and efficiently as possible. The South African feedlot and finishing phase is a major component of the country‘s beef production (Scholtz *et al.*, 2023). According to Scholtz *et al.* (2017), "between 70% and 80% of all beef produced in South Africa comes from the South African feedlot industry."

A feedlot is an area designated for the feeding or fattening of livestock (Junior *et al.*, 2013). Feedlots consist of camps with large amounts of livestock in a dedicated area where the livestock is purchased from commercial farmers at a desired weight (Rivera *et al.*, 2014). Highly modern feedlots will purchase livestock and weigh them, and animals of a similar weight are placed together in a camp. Through meticulous planning and perfect settings, animals receive ideal nutrition to achieve weight gain at a targeted rate, avoiding excessive fat accumulation while promoting protein mass development (Hentzen & Holm, 2025). The animals‘ growth rate is monitored during their stay, and once reaching the correct weight, they are sold to slaughterhouses (Stackhouse-Lawson *et al.*, 2013).

Feedlots vary in terms of size and also in terms of whether they are operated seasonally or as a full-time commercial business (Hentzen & Holm, 2025). The profitability of feedlots is dependent upon factors including the quality of weaner calves at entry to the feedlot, the average daily gain of those calves during their time in the feedlot, their classification when slaughtered and the length of time the calves remain in the feedlot (Scholtz *et al.*, 2023). Commercial feedlots do operate

within the North West Province, but there are fewer of them compared with the number operating in other provinces and therefore, much of the cattle population from this region is sent into feedlots in other regions (Hentzen & Holm, 2025).

2.1.1.3 Stud breeder systems

The Stud breeder system focuses on genetic improvement, bulls and heifers for sale and breeding rather than direct beef production. There are few stud breeders in the North West Province compared to other cattle production systems, but they play an important role in supplying improved and adapted genetics for emerging and commercial cattle farmers (Sainz *et al.*, 2023).

2.1.1.4 Summary: Cattle production systems

When analysing cattle production systems in South Africa and in the North West Province, it is essential to understand the three main types of production systems. Each system has distinct management requirements, capital and infrastructure needs, and interacts differently with sustainability, ecological constraints and farmer capacity (Negreiros *et al.*, 2022). In the North West Province, cow-calf systems are widespread, whereas feedlot and stud operations are less common, highlighting the necessity for customised methods that acknowledge the production system diversity when developing sustainable grazing and cattle strategies (Sainz *et al.*, 2023).

2.1.2 Natural resource availability in the North West Province

South Africa encompasses a total surface area of 122.5 million hectares, of which 103 million hectares are designated for agriculture, with merely 11% deemed suitable for agricultural cultivation from arable land (Minnaar, 2022).

2.1.2.1 Vegetation

South Africa contains seven biomes. Biomes are shaped by climatic factors, leading to the adaptation of plant communities to these conditions. A biome is the most extensive terrestrial community, distinguished by the homogeneity of its predominant vegetation. Natural vegetation occupies over 75% of the agricultural land in South Africa (Smith, 2006:22).

Beef production is ideally suited to the Savanna and Grassland Biomes in the summer rainfall regions of South Africa (Dickinson *et al.*, 2022:337). Significant beef production occurs in the Savanna regions, characterised by low rainfall and grazing capacity; however, the grass maintains its nutritional content for an extended duration. In the Grassland Biome, the grazing capacity is significantly elevated; nevertheless, the grazing value diminishes, particularly during winter, necessitating supplementary feeding (Gillespie & Flanders, 2010:284). Intensive beef

production can occur in regions with higher rainfall where pastures and crops are cultivated (Smith, 2006:151). Looking at Figure 2, it is clear that the North West Province of South Africa is predominantly the Savanna Biome and Grassland Biome. (Smith, 2006:22). The North West Province of South Africa is therefore ideally suited to beef production.

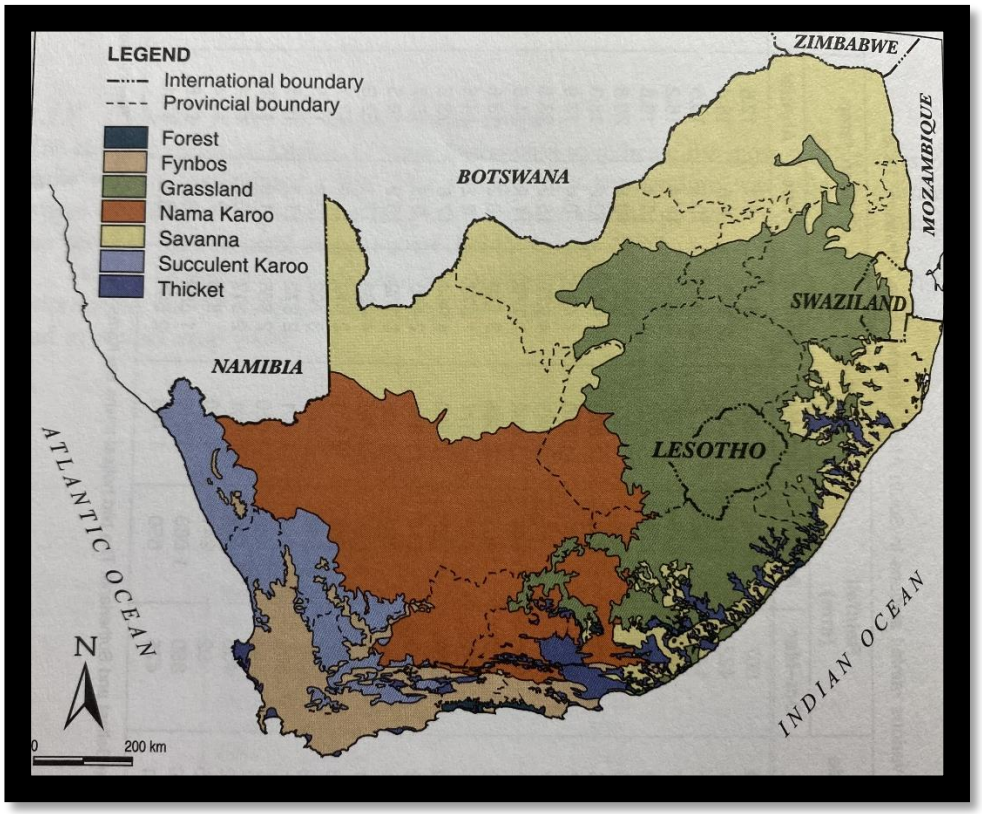

Figure 2: The biomes of South Africa (Smith, 2006:22)

2.1.2.1.1 Savanna biome

The vegetation includes grasses and trees (bushveld). The tree canopy coverage ranges from sparse to somewhat dense. The elevation varies from sea level to 2,000 meters. The majority of the Savanna Biome is situated in regions with summer rainfall, when precipitation surpasses 200 mm annually. This biome is utilised for the considerable grazing and browsing of vegetation by cattle and wildlife (Smith, 2006:23).

2.1.2.1.2 Grassland biome

The vegetation is primarily composed of grass species, with altitudes varying from 300 to 2850 meters above sea level. It is restricted to the summer precipitation zones, with the average annual

rainfall varying from 400 to 2000 mm. Frosts frequently occur during winter. The carrying capacity is comparatively high with careful veld management (Smith, 2006:23).

2.1.2.2 Veld types

The natural veld in South Africa can be divided into three broad categories in terms of grazing, namely sweetveld, sourveld and mixed veld. Figure 3 illustrates a map indicating how veld types are spread across South Africa (Smith, 2006:71). The map illustrates that the North West Province of South Africa has all three types of veld represented.

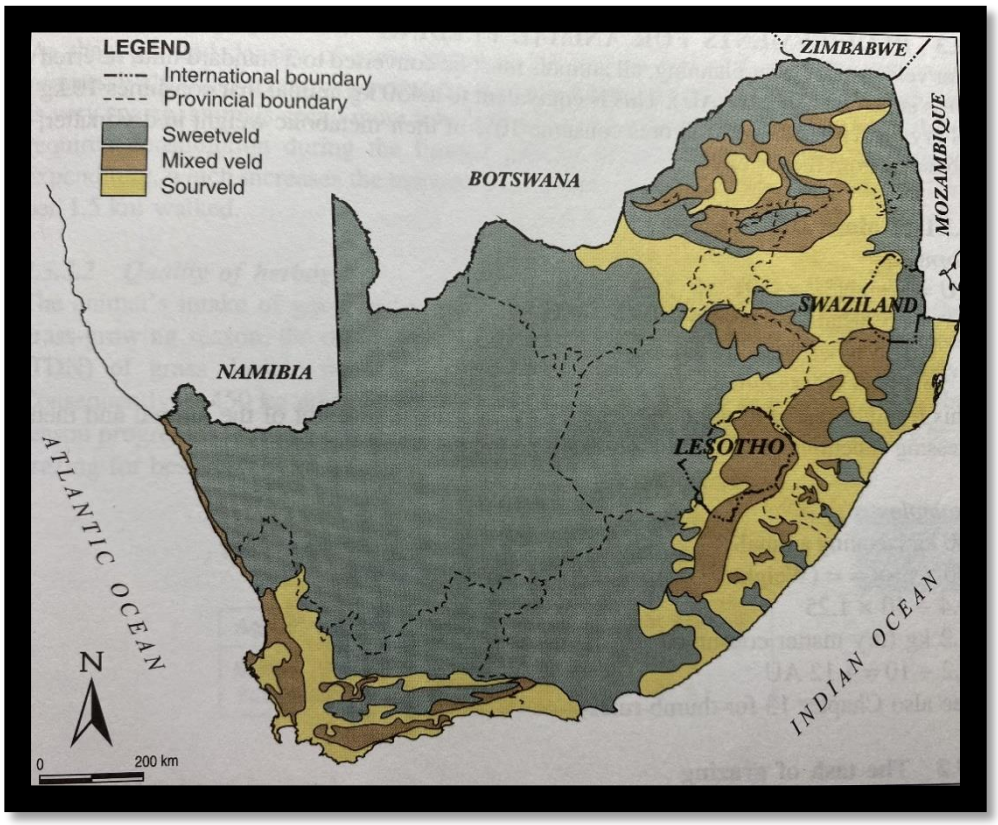

Figure 3: Sweetveld, sourveld and mixed veld in South Africa (Smith, 2006:71)

2.1.2.2.1 Sweetveld

In regions with summer rainfall, sweetveld predominantly exists at lower elevations when frost is infrequent. Annual precipitation typically falls below 600 mm, and the veld is susceptible to overgrazing. It exhibits a quicker recovery from disturbance than sourveld and is generally characterised by tall to fairly tall grassland. In regions with year-round precipitation, sweetveld is

found across a broad spectrum of heights. Despite year-round rainfall, its irregularity leads to a diminished carrying capacity (Smith, 2006:70-71).

The restoration of disrupted veld is gradual. The spring and autumn seasons offer the most dependable grazing conditions. The carrying capacity is typically limited due to a portion of the veld composition remaining ungrazed as a result of encroachment by undesirable species. The veld is susceptible to overexploitation and vulnerable to encroachment by diverse fynbos species. The arid summer frequently poses a significant challenge for grazing livestock (Snyman, 2012:104).

2.1.2.2.2 Sourveld

Sourveld is found at elevated altitudes and cooler temperatures compared to sweetveld. Annual rainfall typically exceeds 600 mm, and the veld possesses a greater carrying capacity than sweetveld (Snyman, 2012:104). Sourveld is generally characterised by short grassland. Grasses are edible and nutritious throughout the growing season; however, grazing is largely ineffective in the dry season, necessitating additional nourishment for animals. Sourveld may endure modest overgrazing; nevertheless, this will result in diminished productivity (Smith, 2006:71).

2.1.2.2.3 Mixed veld

This veld type serves as an intermediary between sweet and sourveld, exhibiting traits that lean towards either type, contingent upon whether it is classified as sweet-mixed or sour-mixed (Smith, 2006:71).

2.1.3 Challenges associated with the effective use of resources in the North West Province

2.1.3.1 Traits of the North West Province

As a predominantly semi-arid region, the North West Province presents cattle farmers with persistent natural resource constraints, particularly around forage availability, veld seasonality, and water security (Oduniyi *et al.*, 2020). The challenges arise from climatic unpredictability, biological traits of local rangeland types, and the escalating demand for land and water linked to both commercial and smallholder cattle rearing (Letsoalo *et al.*, 2025).

According to Oduniyi *et al.* (2020), the North West Province has significant variability of rainfall, long-term cyclic occurrences of droughts and high rates of evapotranspiration. These factors have a negative impact on both forage yield and the sustainability of grazing systems. In order to manage the uncertainties in this environment, farmers must therefore maintain drought reserves

and be proactive with regard to adjusting their livestock stocking so as to avoid further degradation of the ecosystem when dry periods are prolonged (Kennedy *et al.*, 2016).

2.1.3.2 Veld types in the North West Province of South Africa

The different types of veld in the province are an ecological challenge. For example, sweetveld and sourveld may exist together, but they have different production times and tastes. To keep species composition from changing over time, which often happens in semi-arid systems that are constantly grazed, sustainable grassland managers must match grazing pressure with the seasonal productivity peaks of species. The ecological conditions make it very hard for farmers in the North West Province to keep their breeding cows and young cattle fed all the time, especially in late winter and early spring when the veld is at its worst (Kennedy *et al.*, 2016).

2.1.3.3 Water availability in the North West Province of South Africa

Water availability constitutes a critical limitation influencing cattle distribution, production efficiency, and veld utilisation in the province (Letsoalo *et al.*, 2025). Rainfall is the most frequently recorded environmental variable among South African livestock farmers, as it directly influences surface water availability, forage development, and animal performance (Zenda, 2025). The North West Province has very few permanent streams, and groundwater levels are dropping, so many farms have to use boreholes, water troughs, and pipeline systems (Letsoalo *et al.*, 2025). These are expensive to keep up and are likely to break down. The uneven placement of water points can cause overgrazing in areas close to them, which can make soil erosion and rangeland degradation worse in communal and land reform areas (Zenda, 2025). This creates a self-perpetuating cycle in which inadequate water infrastructure reduces the amount of grazing land, which in turn concentrates livestock and makes soil degradation worse (Mapiye, 2017).

2.1.3.4 Other factors to consider

Another important factor to consider is the adaptation of animals to their environment. A climatically unadapted animal is like a poorly tuned car engine. It performs badly and is expensive to run. This animal exhibits reduced daily intake in elevated temperatures due to increased body heat or expends energy to sustain optimal body temperature in colder conditions. In both cases, the effectiveness of grass conversion is diminished (Zietsman, 2014:172).

Climate change, the different seasonal patterns of sweetveld and sourveld, and a lack of water make it hard to use natural resources effectively in the North West Province (Letsoalo *et al.*, 2025). To solve these problems that are all connected, we need to use adaptive grazing

strategies, build better water infrastructure, and manage the veld in a way that fits with the natural rhythms of the region‘s semi-arid rangelands

2.1.4 Market context of cattle farming in the North West Province

2.1.4.1 High relative feed intake and cattle frame size

An animal requires a specific quantity of feed daily to sustain its weight. Nutrients beyond the maintenance level are utilised, in order of importance, for growth, milk production in lactating animals, and fat deposition (Horn & Isselstein, 2022). Given the diverse frame sizes and milk production levels, significant variation in body condition (practical fertility) is evident. This will indicate the effectiveness of grass conversion (Bloch *et al.*, 2021). Assuming all other factors are constant, the animal with the greatest grass consumption relative to its size will exhibit optimal physical condition, leading to enhanced fertility and superior grass conversion efficiency (Britt *et al.*, 2021). Cattle must be bred and managed for optimal relative intake (intake: size). The genetic factors include frame size, climatic tolerance, resistance to parasites and diseases, and individual hunger (Negreiros *et al.*, 2022).

The frame size of an animal indicates that intake is not proportional to size but rather a function of metabolic size, which decreases relative to size as the animal increases in size (Zietsman, 2014:64). This indicates that, irrespective of other factors, larger animals exhibit a decreased relative intake (Britt *et al.*, 2021). It results in poorer body condition, reduced fertility, and less efficient grass conversion. The typical smaller-framed animal exhibits a greater relative intake than the average larger-framed animal, providing it with an advantage in body condition and fertility. The average 600-kilogram cow has a 67% higher absolute intake compared to the average 300-kilogram cow; nevertheless, the smaller cow demonstrates a 20% higher relative intake and, as a result, a 20% superior bodily condition (Negreiros *et al.*, 2022).

Conventional selection of cattle breeding material favours larger-framed animals, with the reason being that South African feedlots pay more money for larger-framed weaners (Jammer & Lombard, 2025). Frame size is a critical determinant of performance, efficiency, and profitability in feedlot systems because it influences growth potential, ideal finishing weight, feed conversion efficiency, and carcass classification outcomes (Bloch *et al.*, 2021). Animals with larger frames typically have the highest mature weight and, as such, require a longer period of time to achieve an optimal level of fat (Bloch *et al.*, 2021). On the other hand, animals with smaller frames achieve their optimal finishing weight sooner than those with larger frames; however, they typically weigh less when slaughtered (Baker *et al.*, 2020). Medium- to large-framed calves with strong growth

potential are more likely to achieve the carcass classifications (A2–A4) required by retailers and export buyers during their stay at feedlots (Jammer & Lombard, 2025).

2.1.4.2 Marketing channels for farmers in the North West Province

The cattle farming marketing landscape within the North West Province is shaped by a combination of formal and informal routes to the market; these different routes to the market create both unique opportunities and challenges based upon the type of cattle production being practised, the frame of cattle and the resources available to the producer (Musemwa *et al.*, 2008). Cattle farmers in Southern Africa typically sell their animals through four primary channels being direct sales to local buyers, auctions, feedlots, and abattoirs. Each option differs in price stability, transaction costs, and quality requirements (Madire, 2024). Cattle‘s phenotypic characteristics, such as body size and growth rate determine also determine which consumer markets will pay premiums for certain types of cattle (Musemwa *et al.*, 2008).

Feedlots are the largest formal market channel in South Africa, accounting for approximately 70–80% of the country‘s beef production (Scholtz & Jordaan, 2025). Farmers are attracted to feedlots because they provide a guaranteed buyer for their livestock, provide immediate payment and allow them to sell large quantities of weaned calves at one time. This is an advantage for the North West Province, which has many cow-calf operations (Madire, 2024).

However, feedlots primarily purchase medium- to large-framed calves with similar growth rates and therefore generally provide lower prices, or exclude from sale, those smaller-framed calves (Jammer & Lombard, 2025). The existence of this structural disadvantage to cow-calf producers who breed functionally efficient but feedlot non-conforming animals can be expected to result in a reduction in the number of these cow-calf operations over time (Musemwa *et al.*, 2008). Additionally, feedlots expose cow calf producers to price risks associated with weaned calf prices, which can be affected by maize prices, carcass demand and seasonal supply and demand dynamics (Scholtz & Jordaan, 2025).

Livestock auctions provide an easier access point for emerging and/or small-scale farmers into a marketing channel. Livestock auctions are unique because they do not require strict carcass or frame size to be met. Auctions will have price discovery as well as the possibility of receiving higher-than-expected bids when there is a high level of buyer demand. There are some disadvantages associated with livestock auctions, such as the cost of commissions, the expense of transporting the animals, the animals may lose weight due to stress before sale, and the variability in price based on who the buyers are that attend the auction (Zenda & Malan, 2021).

Due to a large number of butchers and local buyers, there is still an abundance of direct sales from local producers to consumers or butcheries in the North West Province. Madire (2024) states that direct sales for many farmers allow them to obtain cash immediately, reduce their costs on transactions, and allow them to determine the sale price of the animals, rather than through a formal grading system. Direct sales to consumers have the disadvantage of generally being sold at a lower price per kilogram compared to other markets. The absence of quality incentives, for instance, cattle with superior genetics, will not generally be considered in this form of marketing sales, resulting in lost value for exceptional animals (Zenda, 2025).

Abattoir sales represent a more regulated channel, often used by commercial farmers who can meet carcass classification and traceability criteria. Selling directly to abattoirs allows farmers to benefit from carcass-based pricing rather than live-weight pricing, potentially favouring well-finished cattle from either feedlot or grass-fed systems. O'connor *et al.* (2010) point out that carcass quality is impacted by a number of factors, including grazing management and finishing practices; therefore, animals being produced from structured grazing systems may be eligible for premium classification. A drawback with this marketing channel is that many small-scale farmers may experience difficulty in meeting the strict quality and health standards required by abattoirs, and also the additional costs associated with transportation, hygiene, and documentation (O'connor *et al.*, 2010).

2.1.5 Summary: Characteristics of cattle farming

Cattle producers in the North West Province have a variety of marketing opportunities available, each with their own benefits and limitations. The suitability of any marketing opportunity is contingent upon biological traits, including frame size and finishing ability, as well as the producer‘s production system, infrastructure level, and marketing approach. Consequently, adopting informed marketing decisions is crucial for cattle producers to attain economic sustainability in the cattle business of the North West Province (Archbald *et al.*, 2010:185).

2.2 Grazing management practices

2.2.1 Different grazing management practices are utilised in the North West Province

2.2.1.1 Grazing management systems

Numerous grazing management systems are methodically developed to implement the principles of veld management. The primary aim of a grazing system is to regulate the frequency and intensity of grass plant removal while preventing selective grazing. The following are descriptions of four grazing systems (Archbald *et al.*, 2010:185):

2.2.1.1.1 Continuous grazing or fixed stocking

Each group of animals is assigned a distinct camp. The stocking rate must be conservative, and this practice of grazing management necessarily results in selective grazing and degradation of the veld condition (Archbald *et al.*, 2010:185).

2.2.1.1.2 Rotational grazing

The grazing area is subdivided into at least one camp more than there are groups of animals. These methods tend to prioritise the animals over the veld. For instance, in a one-herd/three-camp system, the livestock may be rotated biweekly, offering minimal advantage to the grass while supplying fresh grazing for the animals (Archbald *et al.*, 2010:185).

2.2.1.1.3 Rotational resting

This system tends to favour the grass more than the animals. In a three-herd/four-camp system, each camp is allowed to rest for the entire growing season once every four years. In a three-camp system, each camp is rested in a rotating manner during spring, summer, and fall (Archbald *et al.*, 2010:228).

2.2.1.1.4 Rotational grazing and resting

These systems are of benefit to both the animals and the veld. These systems benefit both the fauna and the veld. In a one-herd/four-camp arrangement, the herd is cycled between three camps at biweekly intervals, while the fourth camp remains rested for the whole growing season (Dickinson *et al.*, 2022:282).

2.2.1.2 Rotational grazing and resting methods

In traditional veld management, the land is partially rested through low stocking rates, minimal animal impact, and selective grazing. The outcome is less grass vigour, allowing the establishment of tap-rooted plants such as trees and shrubs. Moreover, minimal browsing takes place, resulting in even less physical harm to plants. In contrast to this are the outcomes associated with Rotational grazing (RG) or High Density Grazing (HDG) (Dickinson *et al.*, 2022:282).

A number of different rotational grazing and resting methods have been developed, depending on the objectives of management principles (Smith, 2006:81).

2.2.1.2.1 Non-selective Grazing (NSG)

This system is referred to as High Use Grazing (HUG), which optimises herbage use within a pasture. Elevated stocking densities and grazing intensities compel animals to consume even unpleasant species. This approach is primarily useful in the sourveld (Smith, 2006:81).

2.2.1.2.2 Controlled selective grazing (CSG)

This system is referred to as High Performance Grazing (HPG). The stocking rate and grazing intensity are determined by palatable vegetation (Dickinson *et al.*, 2022:282). Animals are not compelled to consume the unappealing vegetation, which ultimately tends to grow moribund and perish. This technique has been effectively implemented in the Sour Bushveld region. Veld burning is not permitted to promote the decline of unpleasant plants and facilitate the emergence of palatable species. This approach is primarily suitable in the sweetveld (Smith, 2006:81).

2.2.1.2.3 Short-duration grazing (SDG)

Animals occupy a camp temporarily to avert excessive grazing of vegetation during their stay. The grass is permitted to regenerate prior to future grazing. The length of the grazing cycle and the duration of absence from a camp are determined by the exponential growth curve of grass, characterised by an initial sluggish growth phase succeeded by a quick growth phase. Grazing should occur towards the conclusion of the rapid growth phase (Smith, 2006:81).

2.2.1.2.4 Flexible grazing system (FGS)

The grazing area is normally divided into four cells or blocks, with each cell including several camps. Each growing season, one of the cells is rested in turn and burned. This cell thereafter becomes the prioritised set of camps and is grazed whenever the preferred grasses are ripe, regardless of the state of the other sets of camps. Cell two, which was incinerated the prior year, is assigned second priority, and cell three, which was incinerated two years ago, is designated as third priority. The fourth cell will be rested and burned in spring to establish the new priority cell. This grazing management system functions effectively in the sourveld (Smith, 2006:82).

2.2.1.3 Summary

As environmental concerns increase, countries move away from environmental degradation towards sustainable “intensification” (increasing production whilst reducing harm to the environment), so South Africa should inform its modernisation of grazing management in line with these global trends. For South Africa, this is especially important in the semi-arid provinces (like

the North-West Province) where they are vulnerable to changes in rainfall patterns (Garnett *et al.*, 2013).

2.2.2 Ecological impact of these different grazing management practices

2.2.2.1 Nature as the final judge

Mankind has inherited ecosystems that were once perfectly functional. Natural laws guaranteed the survival of the fittest and equilibrium among all organisms. Cattle populations affected by these restrictions have markedly different traits compared to those that adhere to human-imposed regulations. When the laws of nature are violated, a consequence must be incurred. In the context of cattle, where natural selection is no longer applicable, changes to the environment (selected grazing, excessive feed substitutes, antibiotics, dips, and de-worming drenches) are necessary to guarantee survival and production (Zietsman, 2014:104). This illustrates that, irrespective of the grazing system adopted, sustainable land use will be dictated by nature's fixed limits. Pro-active, flexible grazing management practices that work with nature are increasingly more likely to ensure productive rangelands that are resistant to the impact of climate change.

2.2.2.2 Ecological degradation as a result of unsustainable grazing management practices

Ecological sustainability refers to maintaining or improving the health of rangeland ecosystems (soil, vegetation, biodiversity and water cycles) while supporting livestock production (Fynn & Jackson, 2022). Ecologically sensitive dry and semi-arid regions are increasingly experiencing intense grazing pressure, resulting in their rapid degradation. The degradation of semi-arid grasslands often exhibits a consistent pattern in which grazing affects the species composition from long-lived perennials to annuals or short-lived perennials. Changes in species composition are also associated with a reduction in basal cover. Increased degradation leads to diminished production due to reduced cover, heightened runoff, and the loss of soil and nutrients, a trend commonly observed in grasslands and other semi-arid vegetation types (Snyman, 2009).

Ecological degradation is commonly described as "overgrazing". Overgrazing is the process in which vegetation undergoes significant grazing for a prolonged duration, and the natural vegetation does not have sufficient regrowth time to recover (Dlamini *et al.*, 2016). The vegetation decreases, and erosion takes place as the vegetation growth decreases (Hosseini & Sarfaraz, 2014). Overgrazing diminishes soil fertility and productivity, potentially facilitating the growth of invasive species and weeds, ultimately leading to desertification over time (Terdoo & Adekola, 2014). Worldwide, the evidence is clear that overgrazing, bad land management, and rangeland fragmentation are the major drivers of soil erosion, loss of palatable grasses, declines in

biodiversity and ecosystem breakdown (Briske *et al.*, 2008). Grazing systems that do not manage a balance between animal numbers and availability of forage create ecological thresholds difficult and expensive to recover from (Teague *et al.*, 2013).

2.2.2.3 Precursors to ecosystem health for sustainable grazing management practices

It is necessary to implement a monitoring system to evaluate the efficacy of the ecosystem. A photographic record of visible changes at various fixed locations is the minimum need. This will partially reveal the biomass of grass, as well as the composition of plant species and plant density (Dickinson *et al.*, 2022:251). More significant data will consist of metrics such as species composition, plant spacing, the quantity of topping and debris, together with the physical and chemical qualities of the soil. The outcomes of this monitoring must be utilised to evaluate the desirability of change. If not, modifications must be implemented in management (Archbald *et al.*, 2010:174).

It is essential to continuously monitor the events that led to ecological change. This entails evaluating soil and plant conditions almost every day concerning the impact of mouths and hooves. This allows the manager to control time, animal impact, and grazing selectivity to get the desired effect on ecosystem function (Dickinson *et al.*, 2022:251).

2.2.2.3.1 Disturbance of the soil surface.

Adequate soil surface disturbance is essential to aerate the soil, enhance water infiltration, and prepare a seedbed for the growth of preferred plant species. The extent of Animal Impact required to achieve this will differ based on soil surface conditions, even within the same property (Teague & Kreuter, 2020).

2.2.2.3.2 Selective grazing.

Selective grazing of grasslands will adversely alter species composition. The stock density necessary for non-selective grazing will fluctuate based on soil conditions (Teague & Kreuter, 2020).

2.2.2.3.3 Stocking rate

The alteration in stocking rate reflects both the quantity of grass produced and the extent of its usage. A declining trend may suggest adverse weather conditions and/or inadequate management (Zietsman, 2014:202).

2.2.2.3.4 Beef production (kilogram per hectare)

The quantity of beef generated per hectare is indicative of climatic conditions, management practices, and cattle genotype. The tendency may be either unfavourable or beneficial, necessitating management and/or breeding modifications or validating suitable actions (Undersander *et al.*, 2002).

2.2.2.3.5 Plant species composition

Alterations in plant species represent short-term alterations induced by animal impact, grazing selectivity, and temporal factors. As changes manifest in the short term (within one year in more humid regions and slightly longer in arid conditions), management can respond promptly to avert significantly adverse outcomes (Milazzo *et al.*, 2023).

2.2.2.3.6 Plant density

Plant density reflects not just soil type and climate but also animal impact. A reduction in perennial grasses would mostly signify inadequate soil surface disturbance (Milazzo *et al.*, 2023).

2.2.2.3.7 Grass colour

Dark green grass signifies optimal soil aeration and effective water and nutrient cycles. The preceding event to this is Animal Impact (Milazzo *et al.*, 2023).

2.2.2.3.8 Soil structure and soil fertility

This represents the definitive assessment of ecosystem vitality and an indication of all management strategies. Precise monitoring necessitates the physical and chemical study of soil (Milazzo *et al.*, 2023).

2.2.3 Economic and production outcomes for cattle farming in the North West Province

2.2.3.1 Stocking rate is the most important factor in determining profitability.

The fundamental concept of traditional veld management is a cautious stocking rate. Exceeding the officially recommended stocking rate for a specific area is believed to lead to veld degradation. Veld will likely remain stable at or below the recommended stocking rate, especially with regular extended rest periods (often no less than one year) and the potential application of fire (O'Reagain & Scanlan, 2012). This strategy will satisfy ranchers who evaluate performance based on production per animal. Superficially, it may seem that the veld is not deteriorating, considering the volume of material that must be incinerated on sourveld, together with the recovery of the veld

following a season of rest. It is unmistakable that yield per hectare and return on capital expenditure will be minimal. Very evident, if only to those experienced in time-controlled high Animal Impact (since veld degradation can be subtle), that the ecosystem is operating at a significantly diminished capacity and that traditional stocking rates are merely a per cent of their capability (Zietsman, 2014:202).

Stocking rate or carrying capacity is a dependent variable, influenced by management, rather than an independent variable affecting veld output, as traditionally believed; therefore, it does not directly affect veld degradation. A greater number of animals is necessary to enhance the veld, but they must be maintained appropriately (Undersander *et al.*, 2002).

A fundamental belief of conventional wisdom argues that the quantity of animals directly influences the degradation of the veld. It is suggested that each ecosystem can sustain a specific density of cattle per unit area, with deterioration occurring only when this threshold is exceeded. The outcome is that when the veld is visibly declining, or individual animal performance fails to meet expectations, the recommendation is to decrease cattle numbers (O'Reagain & Scanlan, 2012). Farmers need to recognise that carrying capacity and stocking rate are dependent variables controlled by several circumstances, which can be managed through the control of hoof and mouth populations. Factors include effective rainfall, soil aeration, nitrogen cycling, plant succession, plant density, veld utilisation, and efficient photosynthesis. Consequently, stocking rates can be significantly augmented by effective management. (Zietsman, 2014:202).

If we regard stocking rate as a variable influenced by management rather than a fixed constraint in nature, the resulting increase in animal density per hectare, sustained without compromising either livestock or land, will facilitate healthy recovery and promote ecological stewardship. This approach will enhance production through a greater number of cattle per hectare, which yields more kilograms of meat per hectare, thereby augmenting the farm‘s gross income and profit. Performance should be evaluated on a per-hectare basis rather than per animal. We will recognise that increasing profits is not achieved by reducing our numbers, but rather by maximising the quantity of beneficial forage per hectare that is consistently available and well-distributed, thereby enhancing the land‘s carrying capacity. In essence, through effective grazing and management practices that optimise forage production (Zietsman, 2014:203).

2.2.3.2 Increasing stocking rate

To increase the stocking rate, the primary factor influencing profitability, it is essential to maximise the utilisation of grass and browse. In certain regions of the world, all resources can be completely exploited by allowing an adequate number of animals to remain in a paddock for an extended

duration. These regions are often arid, characterised by uniform soils and palatable species. The predominant ranching areas comprise vegetation with differing palatability and acceptability for livestock. In such circumstances, the sole method for improving utilisation is via increasing stock density and improving rumen function through supplementing. Higher stocking rates become even more important with ever-increasing land prices relative to the conventionally accepted stocking rate (Zietsman, 2014:203).

2.2.3.3 Selecting for profit

Regardless of the breeding strategy utilised for herd enhancement, be it traditional purebreeding or purebreeding of crossbreds, intra-herd selection is essential (Gillespie & Flanders, 2010:265). To achieve maximum sustainable profit per hectare, appropriate selection criteria must be employed. Absolute performance metrics, including weaning weight, 12-month weigh, weight per day of age, Average Daily Gain (ADG), and Feed Conversion Ratio (FCR), need to be measured. When heifers are selected for breeding or as replacements for older cows, these performance metrics, with physical criteria suited to the grazing management practice, should be prioritised (Zietsman, 2014:144).

2.2.3.4 Weaning percentage

The weaning percentage is one of the most important measures of reproductive performance as it represents the number of calves successfully grown through to weaning age relative to the breeding stock in a herd. The higher the weaning percentage, the greater the kilograms of beef per hectare. Therefore, the weaning percentage has a significant impact on the profitability of the producer within extensive production systems (Thompson *et al.*, 2020).

Letsoalo *et al.* (2025) report that successful South African producers monitor fertility and reproduction data most often, which they state influences herd productivity more so than the size or growth rate of each animal individually. A herd with average-sized mature cows that consistently achieve high weaning percentages will produce more than a herd of larger frame cattle with poor reproductive success. This supports the view that producers should be selecting their breeding stock based on fertility rather than only focusing on growth potential (Thompson *et al.*, 2020).

2.2.3.5 Weaning weight

As a traditional benchmark of genetic potential, weaning weight has proven to be a poor indicator of overall performance under veld conditions. Heavier weaner calves are more likely to be sired

by larger-framed females with higher maintenance needs, thereby potentially requiring additional nutritional resources to maintain body condition (Gillespie & Flanders, 2010:157).

In an evaluation of market-based pricing strategies, Jammer and Lombard (2025) indicate that heavy weaners have been given premium prices within the feedlot system. This strategy is, however, limited as it will necessitate increased nutrition for large-framed cows in order to maintain their body condition, resulting in increased input costs for producers operating in the veld system. As such, the value of weaning weight must be considered in conjunction with cow size, specifically kilograms weaned per 100 kg of cow maintained, a measure that Jammer and Lombard (2025) demonstrate is closely correlated with profitability.

2.2.3.6 Operational costs

Profitability on an extensive cattle operation is greatly influenced by many different operational expenses such as the cost of feed, veterinary treatments, labour and physical (infrastructure) requirements of an operation (Gillespie & Flanders, 2010:334). Farmers located in the North West Province experience greater pressure because they are subject to variable climate conditions (drought), varying levels of forage quality and long hauls to market/other locations, increasing the operational expense of an operation. The factors of cost associated with operating an extensive cattle operation emphasise the necessity of selecting cattle that will do well in low-input environments (veld conditions) rather than selecting cattle that require supplementation to function effectively (Miranda *et al.*, 2021).

2.2.3.7 Mortality rates

A decline in animal numbers due to death reduces an operation‘s profit potential through a decrease in its number of marketable animals and also by negatively affecting the efficiency of the breeding herd. Mortality is often increased when animals have inadequate nutrition, are exposed to various diseases, do not have adequate access to clean water, and experience poor management practices during droughts (Scholtz & Gaspar, 2019).

2.2.3.8 Feed and supplements

Feed and supplement expenses increase significantly when cattle are genetically incompatible with veld conditions. Instead of choosing large-framed animals that require increased concentrates and prolonged feeding periods for optimal finishing, selecting animals with superior relative feed intake efficiency could reduce farmers‘ reliance on commercially purchased feeds (Gillespie & Flanders, 2010:311). There are clear advantages for farmers in the North West

Province to select moderate-framed cattle that have the ability to maintain body condition using only natural forage, especially during droughts (Carvalho *et al.*, 2020).

2.2.3.9 Labour

Although high-intensity, adaptive grazing systems require more frequent camp movements and therefore appear labour-intensive, research consistently shows that these systems ultimately reduce total labour demands by improving animal health and lowering management interventions over time (Barnes *et al.*, 2021). Teague *et al.* (2013) argue that multi-paddock, high-density grazing necessitates consistent herding and oversight. Nevertheless, the superior forage quality, reduced disease prevalence, and improved animal welfare linked to these systems significantly reduce the time allocated to treatments, supplementation, and crisis management.

Barnes *et al.* (2021) confirm this by demonstrating that regenerative and adaptive grazing systems markedly diminish veterinary interventions and mortality rates, as cattle benefit from enhanced nutrition, improved rumen functionality, and reduced stress levels. Farmers also benefit from higher conception rates. Wang *et al.* (2018) show that cows kept on high-quality, well-managed grazing systems have better reproductive performance, which means that farmers have to spend less time dealing with problems that come up during calving and recovering the herd. When the death rate goes down, the percentage of cows that give birth goes up, and cows need fewer medicines, the extra work that goes into rotating the camp becomes not an extra burden but a very effective use of time. Consequently, even though high-intensity grazing means that animals move around more often, the overall economic and biological benefits lead to less work being needed and a more stable and self-sustaining production system (Teague *et al.*, 2013).

2.2.3.10 Veterinary care

The veterinary cost for a group of cattle, including costs for vaccinations, parasite control and emergency treatment, will be higher if the cattle have low genetic resistance or do not match their environment well (Mpofu *et al.*, 2023). Cattle can become vulnerable to disease when they are under stress due to a lack of proper nutrition and/or access to water in semi-arid regions (Oduniyi *et al.*, 2020). When selecting cattle that have shown to be resilient to parasites, drought conditions and endemically prevalent diseases, the cost of veterinary care as well as the overall health and stability of the herd will improve (Mpofu *et al.*, 2023).

2.2.3.11 Fencing and infrastructure costs

Fencing, water points, and handling facilities represent long-term capital expenses that directly influence grazing efficiency and labour requirements (Gillespie & Flanders, 2010:357). Cattle that are adapted to their environment and need fewer human interventions put less stress on handling facilities and veterinary infrastructure. Cattle that need to be dipped, dosed, or supplemented often put more strain on infrastructure and increase depreciation costs of the equipment used (Bailey & Brown, 2011).

2.2.3.12 Summary: Lower long-term input costs

The overarching economic benefit of selecting cattle for adaptability, fertility, and veld efficiency lies in the long-term reduction of input costs. Regenerative grazing (high-intensity grazing management practices) enhances soil health and forage productivity, reducing fertiliser, feed, and veterinary inputs over time. Profitability in the North West Province is driven not by producing the heaviest individual animals, but by lowering costs and improving productivity per hectare through ecologically aligned stocking rate (Teague *et al.*, 2013).

2.3 Sustainable Development Goals (SDGs) are incorporated into grazing management practices for sustainable cattle farming.

The global demand for animal goods, especially meat, is increasing due to the expansion of the human population, greater prosperity in developing countries, and a related shift in the consumption of cattle products. The South African middle class has markedly grown in the last decade, leading to a substantial rise in demand for cattle goods (Palmer & Scholtz, 2013). This means that the conservation of biodiversity among flora and animals, alongside the increasing demand for beef cattle products, has become a global need (Boakes *et al.*, 2024).

The environmental repercussions of heightened livestock populations include land degradation, water depletion and pollution, as well as dangers to biodiversity, especially when production systems are inadequately managed (Palmer & Scholtz, 2013). The evolving environmental, social, and economic situation demands increased creativity from cattle farmers (Oduniyi *et al.*, 2020).

As the environment faces mounting pressure from rising environmental pressures, along with a substantial increase in demand for livestock products, there has been an emphasis globally placed on policy frameworks to adopt more environmentally conscious methods of agricultural practice. In 2015, the United Nations endorsed the 17 Sustainable Development Goals (SDGs), which collectively serve as a global plan to address numerous issues, including environmental

degradation, climate change, food insecurity, and unsustainable production practices. These SDGs are commonly referred to as the 2030 Agenda for Sustainable Development (Henderson & Loreau, 2023).

Poor grazing systems lead to soil erosion, bush encroachment, an increase in invasive species and a deterioration in the land's carrying capacity, threatening the life of the farming enterprise (Snyman, 2012). On the other hand, modern grazing systems adapted for the drier areas (rotational or high-density grazing or adaptive multi-paddock grazing) show improvements in recovery of depleted veld, biodiversity, forage-use efficiency and drought resilience (Teague *et al.*, 2013).

The SDGs outline how sustainable cattle production, specifically sustainable grazing management, can contribute to goals related to Goal 2 (Zero Hunger), Goal 12 (Responsible Consumption and Production), and Goal 15 (Life on Land). As a result of land and water resource limitations and biodiversity risks due to poor grazing system management, it is clear that sustainable grazing practices that optimise both ecological integrity and productivity are needed (Messner *et al.*, 2025).

As agricultural pressures increase, the literature continuously highlights the necessity of effective grazing management strategies to prevent land degradation, maintain ecological efficiency, and guarantee the long-term profitability of cattle farming operations (Fynn & Jackson, 2022). Various grazing management practices contribute to sustainability by directly influencing ecological integrity, resource efficiency, and long-term farm productivity. Poorly managed continuous grazing accelerates soil erosion, reduces vegetation cover, and diminishes carrying capacity, thereby undermining biodiversity conservation and long-term food production objectives. Therefore, this research aims to identify sustainable grazing management practices for cattle farmers in the North West Province of South Africa. Identifying that sustainable grazing management practices offer not only environmental stewardship options, but also enhance long-term farm profitability.

2.4 Perceptions and barriers to adoption of grazing management practices

2.4.1 Perceptions regarding traditional versus modern grazing management practices

The perceptions around the management of grazing for farming are an important element which has been shown to be one of the key factors influencing farmers in their adoption of modern, sustainable and more efficient grazing systems (Bodiba *et al.*, 2024). Traditional grazing management methods, such as continuous grazing, have been shown to be long-standing in the culture, generations and belief in areas such as the North West Province in South Africa (Slayi *et al.*, 2023). The perceptions of farmers on grazing management have strong associations with

farmers‘ direct experiences of raising livestock in highly variable climates, and thus, they tend to be sceptical about adopting new grazing methods that may appear to be more complicated or foreign than what they currently use. Grazing methods such as rotational, holistic and high-density grazing methods require farmers to rethink several aspects of traditional grazing management, including stocking rates, veld recovery times, animal impacts and labour requirements (Bodiba *et al.*, 2024).

A sustainable grazing management practice needs to be managed to ensure effective production of cattle, and the person responsible for the management is known as a farmer. The farmer makes decisions to achieve production objectives and is therefore considered the decision-maker (Comoé & Siegrist, 2015). The choices of a farmer can positively or negatively affect the environment, and his decision-making may be influenced by his awareness of environmental impact, his attitude towards it, and his behaviour regarding it. From an agricultural point of view, a farmer‘s decision may be influenced by their perception of how other farmers respond to environmental factors. In agriculture, attitude can affect a farmer‘s decision-making (Farmar-Bowers & Lane, 2009).

According to Zhang *et al.* (2015), a farmer may possess extensive knowledge of adverse effects, yet if their attitude is negative, they may opt for decisions that prioritise personal gain over environmental considerations. Awareness is crucial in a farmer‘s decision-making, since it influences choices based on knowledge of elevated production ratios (Farmar-Bowers & Lane, 2009). A degree of environmental awareness exists among certain individuals, as some receive education on environmental conservation within their academic curriculum (Zhang *et al.*, 2022).

Despite a farmer‘s awareness of his or her environment, he or she may nevertheless make judgements deemed correct without comprehending the profound implications of such actions for the ecosystem, impacting their behaviour (Comoé & Siegrist, 2015). These attributes that may influence the decision-making process of a farmer on whether he or she will adopt a sustainable grazing management practice are illustrated in Figure 4 below (Labuschagne, 2018).

Figure 4: The attributes that may influence the decision-making process of a farmer on whether he or she will adopt a sustainable grazing management practice (Labuschagne, 2018)

While modern methods of grazing can offer both ecological and economic benefits in the long run, the acceptance of such methods by many farmers is determined by factors as diverse as their trust in the method, including their perception of the risks associated with it and their perception of the applicability of the method to their farming situation (Letsoalo *et al.*, 2025). This interplay of awareness, attitudes, and social norms underscores the importance of tailored extension services, peer learning, and practical demonstrations that showcase successful implementations of sustainable grazing (Slayi *et al.*, 2023). This type of engagement is essential for improving veld conditions and increasing the profitability of farms through sustainable grazing techniques (Bodiba *et al.*, 2024).

2.4.2 Barriers to the adoption of sustainable grazing management practices

Despite the well-documented ecological and economic benefits of sustainable grazing systems, many farmers remain hesitant to transition from traditional practices (Bodiba *et al.*, 2024).

2.4.2.1 Knowledge gaps

One of the most significant barriers to adopting modern grazing systems is the existence of technical knowledge gaps, especially for those who use generational knowledge as their primary means of obtaining information and do not have ready access to updated technical advice or assistance (Letsoalo *et al.*, 2025).

2.4.2.2 Financial constraints

Financial constraints are a second and nearly equally important factor (Bodiba *et al.*, 2024). Modern high-intensity grazing systems generally require an initial capital expenditure for fencing, water infrastructure and additional labour, in order to move cattle more frequently than they would be moved under older grazing management practices (Slayi *et al.*, 2023). Financial barriers tend to be most evident for smaller and emerging farms. Many do not have collateral, and/or cannot guarantee land tenure for extended periods of time, which limits their potential for long-term improvement in farm infrastructure (Bodiba *et al.*, 2024).

2.4.2.3 Cultural and behavioural resistance

Another barrier to adoption is cultural and behavioural resistance (Bodiba *et al.*, 2024). Grazing practices are intricately linked to farming identities and are frequently upheld by social conventions and the intergenerational transfer of established methods. Messner *et al.* (2025) emphasise that many farmers and other producers will either accept or refuse new practices (innovations) based on whether they believe those practices are "legitimate" in the eyes of their fellow network members and whether or not they support or conform to existing social norms and knowledge systems (Slayi *et al.*, 2023). Innovations such as high-density rotational grazing will also be met with social resistance when they contradict long-held beliefs and traditional ways of thinking about cattle management (Messner *et al.*, 2025).

2.4.2.4 Risk perception

Risk perception, especially concerns about transitional production losses, is also a barrier to adoption for cattle farmers (Bodiba *et al.*, 2024). Many farmers fear that implementing rotational or high-density systems may temporarily reduce animal condition, increase labour strain, or destabilise herd dynamics. Some cattle producers often distrust modern grazing recommendations because they perceive them as risky, especially under variable rainfall conditions (Teague *et al.*, 2013). This fear is amplified in semi-arid areas like the North West Province, where even small mistakes in timing, stocking rate adjustment, or rest periods can have severe consequences (Messner *et al.*, 2025).

2.4.3 Summary: Perceptions and barriers to adoption

Farmers' perception and trust in their grazing management will determine if they follow a traditional grazing system versus a modern grazing management system. The major reason for this is that many farmers have developed long-standing traditions of farming that have been passed down through generations of their families. They also have a large amount of risk aversion

because climate variability has become increasingly unpredictable. Although most farmers understand the biological and financial implications of using rotational or high-density grazing as opposed to continuous grazing, they are very reluctant to make changes from what they are familiar with.

A farmer's attitude toward adopting a new practice, their level of environmental awareness, and how other farmers in their community perceive their farming practices can be important influences on their willingness to adopt a new practice. Societal norms and cultural values tend to reinforce a continuation of present-day practices. Risk and familiarity, as well as an individual's sense of environmental responsibility, will significantly influence decision-making; therefore, it is evident that to achieve sustainable grazing, a combination of the ability to apply technical knowledge, a positive attitude, trust, and the influence of peers will be necessary.

The implementation of sustainable grazing management strategies is hindered by interconnected knowledge, financial, cultural, behavioural, and climatic obstacles. Addressing these barriers necessitates focused extension assistance, empirical evidence from successful implementers, customised funding strategies, and community-oriented learning platforms that synchronise innovation with local contexts.

2.5 Guidelines and tools for the implementation of grazing management practices

Embracing modern, more sustainable grazing management techniques or practices is essential for successful cattle production in the North West Province of South Africa (Messner *et al.*, 2025). Sustainable grazing management is more than just a technical modification, but an adaptive process that is shaped by a combination of ecological and socioeconomic factors, as well as the ability of the farmer to understand and react to environmental feedback. The decision of farmers to adopt modern grazing systems will be directly influenced by the level of credibility and contextual relevance of the knowledge they are exposed to with regard to their specific area of operation. The North West province has climate variability and a variety of veld types along with limited resource availability that creates a requirement for improved grazing practices, but also creates barriers to the implementation of those practices (Messner *et al.*, 2025).

Oduniyi *et al.* (2020) conducted a study examining the adaptive capacity and socioeconomic factors that drive cattle farmers to adopt more sustainable management practices. The research was conducted in the North-West Province of South Africa. The study determined that there is a clear necessity for guidelines to assist farmers in implementing sustainable management practices. Bilotto *et al.* (2024) determined that limited adaptive capacity and significant sensitivity

to the climate crisis necessitate localised adaptation strategies. Trade-offs between production, conservation, prosperity, and adaptation require contextualisation and collaborative innovation design to provide credibility, legitimacy, and adoptability. Well-formulated guidelines are essential to assist farmers in interpreting ecological signals, adjusting stocking densities, planning rotational schedules, and evaluating veld recovery (Undersander *et al.*, 2002).

Collaborative learning networks give real-world proof, minimise risk, and enhance trust in progressive grazing systems, making ranchers more likely to adopt them. Social learning methods simplify ecological principles and make sustainable grazing more accessible to more producers (Kennedy *et al.*, 2016). Other very important tools include planning and infrastructure tools that support herd movement and veld management. Well-spaced water points, movable kraals and temporary fencing systems are necessary to achieve an equal grazing pattern and to limit localised degradation for effective rotational grazing. These tools allow for the strategic use of higher stocking rates, for the reduction of selective grazing and for the acceleration of veld regeneration (Undersander *et al.*, 2002:22).

Implementation of Sustainable Grazing Management is dependent upon three components: An integrated set of tools, guidelines and practical demonstrations by peer-led mentors already implementing the grazing management practices. When these components are grounded in local conditions and co-developed with the farmers expected to adopt them, they create a credible, practical, and resilient foundation for long-term, sustainable cattle production in the North West Province.

2.6 Theoretical framework underpinning the study

This study is underpinned by an integrated theoretical framework drawing primarily on ecological systems theory, rangeland theory, carrying capacity theory, and sustainable agriculture theory. These theories are supported by elements of management decision-making theory. Ecological and rangeland theories provide the foundation for understanding the relationship between grazing intensity, stocking rates, veld condition, and ecosystem resilience, which is central to evaluating traditional and high-intensity grazing practices. Sustainable agriculture theory, particularly the principles of sustainable intensification and the Triple Bottom Line, informs the assessment of grazing systems in terms of environmental sustainability, economic viability, and long-term farm resilience.

Management and behavioural decision-making theory assist in interpreting how farmers' perceptions, risk considerations, and resource constraints influence grazing management choices

in practice. Collectively, these theoretical perspectives guide the interpretation of qualitative data in this study by framing grazing management as a dynamic system shaped by ecological limits, sustainability requirements, and human decision-making within the context of cattle farming in the North West province of South Africa.

2.7 Chapter summary

Two primary objectives of commercial cattle farm management are enduring economic viability and ecological sustainability. Ecological sustainability includes rangeland health and biodiversity. An optimal rangeland condition will be attained by appropriate stocking rates and grazing management strategies that provide extensive coverage of selected grasses for enhanced grazing capacity and soil conservation. Biodiversity will be augmented by promoting structural variability throughout the ranch through fire, grazing, and their interplay (Fynn & Jackson, 2022).

Economic sustainability is a vital objective, evaluated by profitability. Revenue from cattle production is determined by the number of animals sold and their body condition and weight, which affect carcass quality and grading (price per kilogramme). Despite the effectiveness of cattle management in enhancing grass composition, cover, and productivity on a ranch, if operational expenses exceed revenue, the ranch becomes economically unviable and the management method ineffective (Fynn *et al.*, 2017). Consequently, sustainable farm management must assess the impact of grazing strategies on veld condition (ecological sustainability), cattle productivity, and operational costs (economic sustainability), as well as biodiversity (biological sustainability) (Fynn & Jackson, 2022).

Achieving maximum sustainable profit per hectare requires a highly productive veld. This involves controlling hooves and mouths to ensure that each animal positively impacts all natural processes within the environment. In general, an increase in cattle leads to enhanced veld productivity and increased profit. This contradicts traditional management, wherein each new animal worsens the adverse impact on individual performance and the ecosystem.

In the traditional grazing management sense, the rationale would be to enhance absolute production per animal, even if it necessitates a reduction in stocking rate. This mindset leads to diminished returns on investment and disregards the sole viable method for enhancing veld and profitability, especially in areas with seasonal rainfall, like the North West Province of South Africa. Profitability can be optimised by adopting a "per hectare" measurement of livestock production as opposed to "per animal", and through selecting cattle based on their potential for veld efficiency, fertility, and minimal inputs (e.g., feed, labour), as opposed to maximum rate of growth.

Despite the benefits of more sustainable grazing practices, it appears that many factors have impeded the development of modern grazing systems at the farm level. This includes farmers‘ perceptions of the relative merits of each system, cultural practices and attitudes towards farming and livestock management, and a high degree of risk aversion amongst farmers. These elements appear to be exacerbated by economic limitations, a lack of information/knowledge regarding the rotational grazing systems, and uncertainty about climate conditions.

Effective and profitable farmland management strategies, particularly grazing management approaches, must be grounded on sound ecological and economic principles (Fynn *et al.*, 2017). The efficient operation, resilience, and sustainable utilisation of natural resources depend on sufficient genetic diversity and robust ecosystems (Oduniyi *et al.*, 2020). Therefore, there is a need for a study in the North West Province of South Africa to investigate sustainable and profitable grazing management practices for cattle farmers. The literature also revealed that there is limited qualitative research on farmers' lived experiences in the North West Province of South Africa.

Building on the insights gained from the reviewed literature, the following chapter describes the research methodology employed to explore grazing management practices within the North West Province.

CHAPTER 3

RESEARCH METHODOLOGY

The preceding chapter synthesised existing research and theoretical perspectives that inform the current study. This chapter focuses on the methodological design of the research, detailing the qualitative approach, sampling strategy, data collection procedures and analytical techniques used.

3.1 Introduction

As the literature suggests, certain grazing management practices tend to be a possible solution for profitable and sustainable cattle farming. A sustainable grazing management practice assists cattle farmers to mitigate the effects of declining pastures, price uncertainty and rising input costs on the sustainability of their farms. The challenges associated with sustainable grazing management practices were also reviewed in the literature. Sustainable grazing management practices also ensure more control over the farming business, reducing short-term and long-term risk and ultimately driving sustainability.

This area is important because the North West Province has the most grazing land in South Africa. This means that there are a lot of cattle herds and a large number of pasture-based cattle farmers living in the province compared to other areas. The province is also known for having some of the largest cattle herds in South Africa, which makes it even more appropriate and relevant as the focus area for the study.

The main objective of this study was to investigate which grazing management practices are viable options for sustainable cattle farming in the North West Province of South Africa. The personal knowledge and perspectives of the farmers have been empirically studied in order to achieve this objective. The empirical study and literature review aided in addressing the secondary objectives. In this chapter, the research process and research design are discussed. The chapter will conclude with how the data will be collected, the population of the study, the sampling method and how the data will be analysed.

3.2 Research paradigm

A research paradigm is a holistic view, set of beliefs, or philosophical framework that guides how a researcher understands reality and how knowledge about that reality should be generated (Kivunja & Kuyini, 2017:2-3). Ontology is concerned with developing theories that help to explain the nature of reality (Bryman *et al.*, 2021:29). The researcher believes in constructionism as an ontological perspective because nothing stays the same forever. An organisation (even farming operations) has to adapt to changing elements (Bryman *et al.*, 2021:30). These changing elements in farming operations include climate change, changes in the natural environment, changing markets and price volatility (Algimantas *et al.*, 2024). The researcher also believes that an organisation is nothing without the people in it, and as times change, people change, and the farming organisation has to adapt to this progression (Ramesh *et al.*, 2023).

Epistemology is the theory of knowledge that flows logically from ontology (Bryman *et al.*, 2021:31). The researcher of this study desires to objectively gather data by observing phenomena directly or measuring them using surveys or other instruments. This means the researcher follows interpretivism as a research paradigm or epistemological approach that advocates applying natural science methods to study and understand social reality objectively (Bryman *et al.*, 2021:34). Research relies on measurement and reason (Busetto *et al.*, 2020). In this study, the researcher would thus want to use methods to determine answers, reasons for actions, and solutions accurately. Cattle farming is a practical business, and one needs to apply logical reasoning and evidence in decision-making. The results should also be repeatable if the theory is applied repeatedly under the same circumstances (Bryman *et al.*, 2021:34).

3.3 Research approach and design

According to Arbale and Mutisya (2024), the research approach is the approach to theory development and can be either deductive, abductive, or inductive. The research approach applicable to this study is an inductive approach to inquiry (inductive reasoning). The reason is that research must be done to generate a theory in this regard. Inductive reasoning serves as a methodological approach for researchers, starting with specific examples, patterns, or experiences to formulate bigger ideas, concepts, or theories (Kim, 2021).

Unlike testing a confirmed hypothesis, inductive reasoning allows the researcher to explore a specific phenomenon, recognise recurring themes, and formulate conclusions based on data collection. Inductive reasoning is typically utilised in qualitative research, as it facilitates an open, flexible, and exploratory investigation approach, allowing research findings to be built incrementally from foundational levels (Kim, 2021). At the end, the study must include obtaining

usable conclusions from the data gathered. Usually, an induction is associated with a qualitative research approach (Bryman *et al.*, 2021).

In this study, a qualitative research approach will be applicable. The primary rationale for undertaking a qualitative study is its exploratory nature. Because the topic has limited existing literature in this specific context, participant feedback will be especially valuable for generating meaningful insight (Creswell & Creswell, 2023:59). The qualitative approach emphasises the subjective assessment of selected participants regarding their opinions (Sahu, 2013:4). Subjective pertains to matters grounded in an individual‘s ideas, feelings, interpretations, and views. An objective statement pertains to information that may be factually validated, independent of personal emotions or preferences. A statement can be established as factual (objective) but cannot be substantiated (subjective) due to its reliance on individual interpretation or judgment (Mobbs, 2021). As a researcher, one will also have to understand the participants' perspectives on the topic or issue. Qualitative researchers inductively organise data into abstract units to identify patterns, categories, and themes (Creswell & Creswell, 2023:26).

After studying the different designs, it is concluded that a descriptive comparative design will best fit this study. The primary benefit of comparative designs is in their capacity to utilise the unique characteristics of two or more examples as a basis for theoretically making observations on opposing conclusions (Bryman *et al.*, 2021:117). In this study, grazing management practices will be explored. The advantages and disadvantages of the practices will also be considered. Data will be collected from the participants, including production norms and data presented in words. The qualitative research approach is expected to uncover contextual aspects and considerations that numerical data alone might not reflect (Pruzan, 2016:188).

An analysis and interpretation of the data collected from participants will yield significant insights into the efficiency of various management techniques. This comparison will provide insight into which approaches are seen as most advantageous and likely to produce optimal outcomes, therefore guiding future recommendations and decision-making. According to Adams *et al.* (2014:64), the research strategy entails how the research will be conducted. Determining the strategy depends on the research question. The nature of this study is fundamentally exploratory and investigative, seeking to uncover insights rather than test predetermined hypotheses (Adams *et al.*, 2014:64).

3.4 Population and sampling for the research study

3.4.1 Population and criteria for eligibility for participation

The study sampled individuals, called farmers. Criterion sampling was the type of purposive sampling used. Criterion sampling presupposes that only individuals or cases that meet particular criteria will be sampled (Bryman *et al.*, 2021:225).

For a farmer to be eligible to participate in this study, the following inclusion criteria were specified:

- The Farmer must be at least 18 years of age.
- The farmer must actively implement a particular grazing management practice on his or her farm.
- The farmer must have 100 or more cattle. Larger-scale cattle farmers are more likely to possess diverse and long-term experience with different grazing techniques, facilitating deeper insights and more significant comparisons between grazing management practices.
- The farmer must collect data in an accurate and traceable manner.
- The farmer must be in the North West Province of South Africa.
- The farmer must have implemented the grazing management practice for at least three years to ensure repeatability of data over different seasons and longer periods.
- The farmer must be willing to participate in an in-person, face-to-face interview and share relevant information about their management practices.

The exclusion criteria for the population of this study are as follows:

- If the farmer is younger than 18 years old.
- If the farmer is not implementing a particular grazing management practice on his or her farm.
- If the farmer has fewer than 100 cattle.
- If the farmer does not collect data in an accurate and traceable manner.
- If the farmer is not located in the North West Province of South Africa.
- If the farmer has not implemented the grazing management practice for at least three years.

- If the farmer is not willing to participate in an in-person, face-to-face interview, or is not willing to share information about their management practices.

3.4.2 Sampling

In this study, the chosen method of sampling is a non-probability method. Non-probability sampling method entails a sample that has not been selected using a random selection approach. This indicates that specific units within the population have a higher probability of being chosen compared to others (Bryman *et al.*, 2021:211).

Purposive snowball sampling, which is a non-probability form of sampling, was applied to this study. Purposive sampling aims to strategically select individuals who are relevant to the subject matter questions. Typically, the researcher aims to ensure an adequate level of diversity in the sample so that participants reflect a range of distinct and relevant characteristics. The goal is to ensure that the participants have different characteristics, experiences, viewpoints or backgrounds that are relevant to the study (Bryman *et al.*, 2021:224). For this study, information was obtained from cattle farmers implementing different grazing management practices. The individuals participating in the study were carefully selected to ensure the study‘s success by obtaining the needed information.

3.4.3 Sample size

Being a qualitative study, it was difficult to determine the exact sample size. Guest *et al.* (2006:65) stipulate that data saturation is the point in data collection where new information is no longer added to the codebook. Various factors could contribute to data saturation, such as the topic and aim of the study, the participants, and the chosen methods of collecting and analysing the data (Tran *et al.*, 2016:88). The participants of this study have to actively implement the grazing management practice and meet the inclusion criteria specified. They also need to find a study relevant and represents the specific group, category, or style of a grazing management practice.

In this study, the aim was to interview participants implementing different grazing management practices. Finding enough participants implementing traditional grazing management practices was not difficult, because most farmers employ this style of management in the North West Province. The challenge was in finding a sufficient quantity of credible farmers engaging in modern, sustainable grazing management practices.

A study by Guest *et al.* (2006:74) concluded that data saturation happens after 12 interviews, which would indicate the final sample size and more than 90% of the codes will have been developed. The proposed target sample size for this study was approximately 15 participants. If

data saturation has not been reached after the initial interviews, more interviews would have been scheduled. During the conduction of the interviews, data saturation became evident in the 6th interview. An additional two interviews were then conducted, bringing the total number of interviews to eight. The actual sample size was therefore reached when data saturation was achieved, plus two additional participants.

3.5 Recruitment strategy

The inclusion and exclusion criteria were taken into consideration to guide the selection of participants. The researcher is presently employed by a fertiliser company located in Klerksdorp and is engaged in the marketing and direct distribution of fertiliser goods to clients throughout the North-West Province. This professional position offers the researcher consistent on-site access to a network of farmers. The researcher has acquired contextual knowledge about farmers employing various grazing management strategies through ongoing involvement in the agricultural industry. This existing familiarity improves the likelihood of locating and recruiting appropriate volunteers for the study.

Upon receiving ethical clearance for the study, the researcher proceeded with participant recruitment using a direct, context-appropriate approach. While conducting farm deliveries, the researcher requested an opportunity to briefly explain the purpose and nature of the study to the farmer. If the farmer expressed interest and willingness in participating, an informed consent letter was provided. Upon signing the consent form, the farmer formally agreed to participate and willingly shared their contact details. These details were used to arrange a face-to-face interview at a date, time, and location that were convenient for the participant (Creswell & Creswell, 2023, p. 127).

The researcher also used a purposive snowball sampling technique to support participant recruitment. After each initial interview, the researcher asked the participating farmer to suggest additional potential participants who met the study's inclusion criteria. This study did not require the involvement of gatekeepers. Each participating farmer owned and managed their farming operation, thereby allowing the researcher to communicate directly with them once informed consent was obtained.

3.6 Informed consent process

The researcher initially consulted participants during an on-site visit to farms to deliver materials and make a face-to-face request to the farmer if they were willing to participate in this research study. The participants were informed that if they agreed to participate in this research study, their

participation would be voluntary, the interview would be recorded, and the data would be publicly available in the form of results publications, such as peer-reviewed journal articles or conference papers. If they disagreed, they were not interviewed for this study. Participants were also informed that even if they initially agreed to participate in this study, they were free to change their minds and withdraw their participation if they became uncomfortable.

Gaining informed consent for voluntary participation was very important in this study. The prospective research participants were given as much information as they needed to make an informed decision about whether or not to participate (Bryman *et al.*, 2021, p. 165). The researcher of this study gained written, rather than verbal, consent from research participants by asking them to complete and sign a consent form. This was particularly important in this study because the research involved the collection of personal, managerial, and possibly financial information about the farming entity. It was also respected if the participant initially agreed to participate in the study but decided (before or during the interviews) to withdraw from the study.

Privacy was also paramount in this study, and it was made clear to the participants that their individual personal information, for instance, names of farmers or their farming entities, would not be used or communicated. Some farmers are very secretive about their accomplishments or recipe for success. If their information is not protected, one will not be able to gain valuable insights into the management style.

It is important to note the role of the researcher. Dealing with farmers, there is a specific code of behaviour or unwritten rules of conduct that one must follow. In this context, the unwritten rules refer to demonstrating respect for farmers lived experience, engaging knowledgeably and appropriately in discussions about livestock, crops, and farming equipment, and presenting oneself in a manner that aligns with farming culture, including practical dress and conduct. Adhering to these norms helped establish trust and credibility, which facilitated open communication, sustained participation, and more authentic sharing of information during the data collection process.

Thus, the researcher was personally involved and mediated the relationship for effective participation and transparent sharing of information. It would have been tough for someone to do the practical research if the researcher were not known to the farmer. It was consequently vital for the researcher to maintain active involvement throughout the research process.

3.7 Data Collection and Interview guide

3.7.1 Data collection

Interviews are one of the most common forms of data collection within qualitative research, and descriptive methods allow for interpretation (Guest *et al.*, 2011:3). In this study, face-to-face, semi-structured interviews using an interview guide were used to gather data. As a researcher, the study was undertaken with a well-defined focus. Therefore, a face-to-face interview was best suited to ensure that the specific topics are addressed. Additional structure can be implemented when the researcher possesses a distinct understanding of how the data will be processed (Bryman *et al.*, 2021:270).

The participants of the interview were farmers. The researcher has extensive experience engaging with farmers and has learned that a conversation can easily be diverted from the intended topics to other topics not relevant to the conversation. Working with a semi-structured interview type covered a broad range of contexts where the interviewer had a series of questions on an interview schedule, but could vary the sequence of the questions (Bryman *et al.*, 2021:270). Accordingly, when the discussion deviated from the topic, the interviewer was able to redirect it toward the intended focus.

Considering the cultural background and communication preferences of traditional farmers in South Africa, telephonic interviews (conducted by phone) or online interviews (conducted via platforms like Zoom, Skype, or Teams) may be perceived as impersonal and insufficient for establishing trust with the interviewee. Farmers in the North West Province generally favour in-person, face-to-face contact, which is regarded as more genuine, respectful, and favourable to open communication. The participants were able to deliver more accurate responses and insights due to the natural environment in which they were working (Kuada, 2012:93). The combination of this first-hand look with the critical grazing management practice approach resulted in the collection of significant qualitative information (Kuada, 2012:99).

Therefore, in-person, face-to-face interviews were prioritised to facilitate a more sincere and personal interaction that aligns with the farmer's expectations and enhances richer data collection. This study explored various grazing management practices for sustainable cattle farming. The researcher's day-to-day work involves delivering and marketing fertiliser products, which does not create a conflict of interest**.** An independent person was thus not essential during the face-to-face interviews.

This procedure for interviews required travelling to the different locations where the farming entities were located. The farms are scattered all over the North-West province, which significantly affects travel, fuel, and accommodation costs. Access to the intended number of participants was, as expected, not challenging. With adequate planning, the participants were successfully engaged. The researcher contacted the chosen participants in advance. All interviews were conducted at a date, time, and place convenient to the participant.

3.7.2 Interview guide

An intended interview document or guide with questions was compiled and used to collect data. The questions were designed to address the study's objectives and explore different grazing management practices implemented by cattle farmers. This method provided a balance between predetermined questions and flexibility to follow relevant discussion paths as they emerged. All interviews were audio-recorded with participants' consent, facilitating the researcher's attention on the normal progression of discussion while guaranteeing precise transcription and eventual data analysis. This continuity during the interview also guaranteed uniformity in questioning methodology, investigative depth, and relationship development.

The interviewer deliberately established a welcoming, non-threatening environment to promote transparency. Ethical considerations were prioritised, ensuring that any personally identifying information that might compromise participation would remain unreported, in compliance with ethical research standards. The benefits of participating in the study were also explained to the participants, which were that their insights may contribute to sustainable grazing management practices for cattle farmers in the North West Province of South Africa.

During each interview, the researcher documented field notes to record non-verbal signals, emotional expressions, and contextual observations that could enhance the interpretation of the spoken data. Field notes were utilised to document instant reflections, emergent themes, and significant dynamics during the data collection process. This study employed them to improve convergence and boost credibility. At the end of each session, the participants were thanked for their inputs, time and participation.

Each interview lasted approximately 45 to 60 minutes, depending on the extent of the participant's knowledge and information. Afrikaans was the preferred language each participant chose for the interviews, and subsequently, the interviews were conducted in Afrikaans. Afterwards, each interview was first transcribed in Afrikaans and then translated into English. The researcher translated the Afrikaans interview transcripts personally to ensure deeper immersion in the data and to preserve the contextual accuracy of farming-specific terminology and expressions, which

were inadequately conveyed during initial third-party translation attempts, thereby supporting more reliable qualitative analysis. Translated transcriptions were then checked afterwards by a certified language editor. After the interviews, the results were analysed, interpreted, and presented in the study‘s findings.

The Interview guide was divided into Sections A, B, C and D, aligning with the research questions of the study:

- Section A: Aligned with the first secondary research question: What are the characteristics of cattle farming in the North-West province of South Africa?
- Section B: Aligned with the second secondary research question: Do the current grazing management practices followed by farmers in the North-West province of South Africa ensure sustainability?
- Section C: Aligned with the third secondary research question: Why are some cattle farmers in the North-West province of South Africa still using traditional grazing practices as opposed to adopting modern, more sustainable grazing management practices?
- Section D: Aligned with the fourth secondary research question: Are there any existing practical guidelines or tools that have been developed for the implementation of sustainable grazing management practices in the North-West province of South Africa?

3.8 Data analysis

The qualitative research method was applicable in this study because a more in-depth and holistic understanding of grazing management practices implemented by cattle farmers could be explored. This study used a thematic analysis approach, which is optimal for assessing qualitative data due to the emphasis on discovering themes and patterns (Saunders *et al.*, 2023:656).

Thematic analysis is a systematic and flexible methodology that equips academics with a means to analyse data efficiently (Kiger & Varpio, 2020:1). Researchers deploy thematic analysis as a strategy for data analysis, which entails coding qualitative data to discern repeating patterns and themes pertinent to the study objectives (Saunders *et al.*, 2023:656).

Saunders *et al.* (2023:656) characterise thematic analysis as a qualitative data analysis method that entails the identification, assessment, and documentation of recurring patterns. The strategy necessitates interpretation in the selection of codes and the generation of themes, rendering it a data description methodology. Thematic analysis can be categorised into six components: data familiarisation, data coding, initial theme generation, theme development and review, theme refining, defining and naming, and lastly writing up (Saunders *et al.*, 2023:656). Thematic analysis

is an essential tool for systematically and effectively examining qualitative data (Kiger & Varpio, 2020:2). According to Adeoye (2024:30-41), data analysis starts with transcription. Checking and re-checking the transcriptions for accuracy and transcribing the interviews verbatim will aid in the analysis.

This study utilised a qualitative data analysis software called ATLAS.ti to do thematic analysis. ATLAS.ti is a qualitative research instrument employed for coding and evaluating transcripts and field notes, creating network diagrams, and devising data visualisation concepts (Paulus & Lester, 2016).

The steps below describe the methodological approach adopted for analysing the data (Kiger & Varpio, 2020):

- Data familiarisation

Data familiarisation is the process of being acquainted with the data collected during interview sessions. This entails transcribing data and analysing it to discern preliminary concepts (Kiger & Varpio, 2020:4).

- Generating initial coding

Code creation involves recognising the most relevant elements of the data and methodically coding across the whole dataset (Kiger & Varpio, 2020:4).

- Identifying themes

Searching for themes involves coding data into probable topics and aggregating all relevant data for each theme. The coding and categories will enable the researcher to identify themes regarding their perceptions and experiences. These themes will also identify sub-themes, requiring revision to generate a map of themes. (Kiger & Varpio, 2020:4).

- Reviewing themes

The review of themes involves assessing their relevance to the coded extracts and the entire data set, and thereafter, constructing a thematic ‘map‘ of the investigation. The validity and reliability of the themes relevant to the research will allow the researcher to add to the thematic map (Salleh *et al.*, 2017).

- Defining themes

The themes step involves ongoing study to refine the specifications of each topic and the preceding analysis, culminating in clear definitions and designations for each theme. Each theme will need to be analysed, defined and named accordingly (Kiger & Varpio, 2020:4).

- Generating a report

Generating a report encompasses the conclusive analysis, correlating it with the study topic and existing literature, culminating in the final document (Khokhar *et al.*, 2020).

Figure 5 below presents an illustration of thematic analysis.

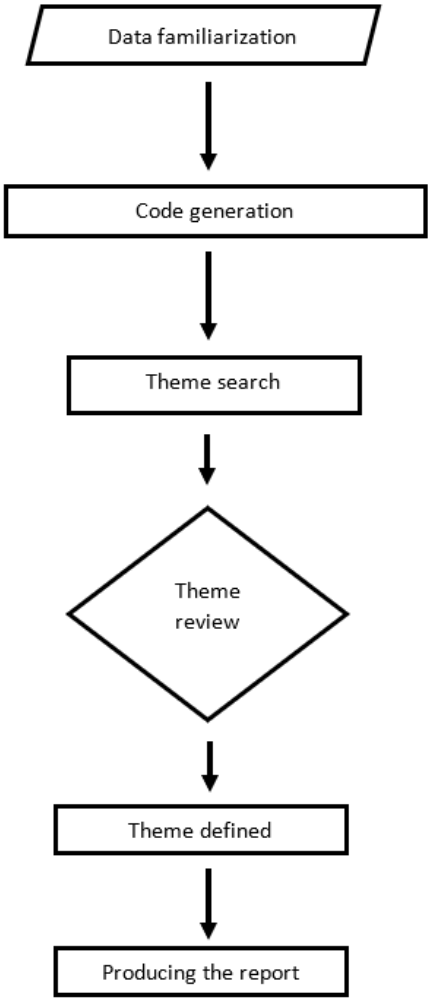

Figure 5: Flow chart for thematic analysis (Khokhar *et al.*, 2020)

3.9 Trustworthiness of the data

Qualitative research depends on descriptions and seeks to comprehend the significance of perceptions. In the absence of quantitative evidence, the findings of a qualitative study necessitate trustworthiness (Adler, 2022:598). According to Connelly (2016:435), a study must satisfy five criteria to ensure dependability and trustworthiness:

- Credibility: The qualitative study must demonstrate assurance in the accuracy of the findings.
- Dependability: The study‘s data must exhibit stability.
- Confirmability: The data collected must be consistent and repeatable.
- Transferability: The study‘s results should be applicable in alternative contexts.
- Authenticity: the degree to which a study accurately reflects the lived experiences, viewpoints, and realities of participants in a just, equitable, and truthful manner

It was crucial to have trustworthy research findings in this study exploring grazing management practices for cattle farmers in the North West Province of South Africa. Adler (2022:599) believes that transparency is essential in qualitative research, which should be evident through the researcher’s methodologies, epistemological frameworks, and theoretical foundations.

Various methods and techniques were used to ensure both trustworthiness and transparency of the data. The development of a concise guide to interview participants about their perceptions and experiences assisted the interviewer in having a consistent approach and avoiding bias, such as asking leading questions. The focus was on asking open-ended questions. The interview guide ensured fairness, consistency, and neutrality during the interviews.

The researcher cross-checked and validated interpretations to enhance the trustworthiness of research findings by using data from multiple sources, such as interviews, fieldnotes, and observations throughout the interview process. Also, collaborations were made with agricultural experts and peers to discuss the research process (which includes interview guides, coding, and data analysis processes). This helped address potential biases, thereby providing broader perspectives on data interpretations and research findings.

Sharing the interpretations of research findings with participants was another measure for confirming the findings‘ accuracy and checking whether the participants’ perceptions are well represented. Lastly, audio recording (with the consent of participants) and capturing non-verbal communication or body language through field notes were used to enhance the accuracy of data

transcription. Throughout the study, validity and credibility were prioritised. Facilitating access to information also enhanced transparency and dependability (Cloutier & Ravasi, 2021:114). Transcripts include participation numbers (to maintain anonymity), and data tables will enhance comprehension. Cloutier and Ravasi (2021:114) asserted that tables embody valuable ontological and analytical data, potentially substantiating results. The researcher practised mindfulness to reduce bias and recorded all decisions about coding and topic development (Freeks, 2017).

3.10 Research ethics and alignment with POPIA regulations

The university requires the study to be approved by the Ethics committee. Application of the research proposal to the research committee was therefore crucial for timely approval and completion of the study. This research study was considered low risk as the participants were adults, the topic covered a non-controversial subject matter, and anonymity was provided.

This study has been registered with the Economic and Management Sciences Research Ethics Committee (EMS-REC) with the ethics number NWU – 00858 – 25 – A – 4. According to the NWU Institutional Research Ethics Regulatory Committee (IRERC), this research was executed with integrity, accountability, professional courtesy, equity, and responsible stewardship on behalf of others.

The following ethical considerations were adhered to during the research study:

- Risks: Minimal risks were associated with this study and during participation.
- Confidentiality: This research was conducted anonymously. The participant‘s identity and the information they provide remain confidential, known only to the researcher and the study supervisor. The recordings will be erased three years after the completion of the study and will not be shared with any third party.
- Right to withdraw: As voluntary participants, individuals could withdraw at any moment without repercussions.
- Questions and doubts: Participants were entitled to request clarification regarding the research, research questions, or any enquiries pertaining to the method. Contact details were provided to each participant in the consent form to communicate with the researcher via telephone or email.

Alignment with the Protection of Personal Information Act (POPIA) regulations governing data and privacy of the participants was of utmost importance. This study complies with POPIA, Act no. 4 of 2013. The following measures were in place to ensure that personal information is protected:

- The researcher will respect the privacy and confidentiality of data and information by not including the names of the involved farmers or their farming entities in the study.
- A unique participant code will be used in all documentation and data files to ensure confidentiality.
- The information provided by one farmer will not be discussed or revealed to another farmer during the face-to-face interviews or data collection process.
- The recordings of the interviews, all data obtained, transcripts, and information will be stored in a cloud-based folder protected by a specific username and password. Only the researcher and the supervisor will have access to the folder.
- This folder will be permanently deleted three years after the completion of the degree.
- All information will only be used for this academic study and will not be shared with any third parties.

The time and location of the interviews were also respected. Being on time for an appointment is important for the culture of the participants (farmers) and also to respect their property, loved ones, type of operation, practices applied, and beliefs they have, as the interviews were executed at a place where it was convenient for the participant.

3.11 Accumulation of the data

As the researcher did the transcription, the audio recordings of the interviews, all data obtained, transcripts, and information will be stored in a cloud-based folder protected by a specific username and password. Only the researcher and the supervisor will have access to the folder. This folder will be permanently deleted three years after the completion of the degree. All information will only be used for this academic study and will not be shared with any third parties.

3.12 Publication of findings

This research and its findings will be submitted as a partial requirement for an MBA degree at NWU Business School as a mini-dissertation. After finalisation, it may be made available on the mini dissertation database of the NWU.

3.13 Chapter summary

Chapter 3 laid out the theoretical methodological base for the study on grazing management strategies within the North West Province. This study utilised a constructionist/interpretivist approach, recognising that agricultural practice, environmental conditions, and the behaviour of humans are ever-changing. To understand the different types of grazing management

strategies currently being implemented by farmers, a qualitative inductive methodology was used as well as a descriptive comparative approach was utilised to examine how the strategies have changed over time. To determine which participants would be most suitable for the study, purposive snowball sampling was utilised to select participants; eight complete interviews were conducted with participants when data saturation was attained. Semi-structured in-person interviews facilitated through an interview guide, audio recorders, and field notes were used to ensure consistency and reliability of data collected and provide a high level of context to the data collected.

The data from the study, using thematic analysis, were analysed in accordance with the stages of familiarisation, coding, theme development, refining themes, and finally reporting on findings. Several strategies were utilised to enhance the reliability of the data collected: these included triangulation, participant validation, expert consultation, thorough documentation, and clear analytical methods. Ethical considerations were followed at each stage of the research process, along with POPIA (Protection of Personal Information Act) regulations to ensure participant confidentiality, participant informed consent, participant voluntary participation, and secure storage of the data collected.

These considerations provided a solid methodological, ethical, and reliable base for the empirical findings presented in Chapter 4. With the methodological approach clearly established, Chapter 4 presents the empirical findings derived from the interviews and offers a detailed thematic analysis of the data.

The Informed Consent form used for this study is attached as **Annexure A.**

The Ethics Approval Letter is attached as **Annexure B**

The Title Registration Letter is attached as **Annexure C**

The Interview Schedule is attached as **Annexure D**

CHAPTER 4

RESEARCH RESULTS

The previous chapter outlined the methodological framework guiding the study, including the data collection and thematic analysis processes. This chapter presents the findings derived from the interviews, organised into themes that illuminate farmers' experiences, challenges, and perceptions regarding grazing management practices.

4.1 Introduction

This chapter presents the empirical findings and interpretation from a Braun-and-Clarke–aligned thematic analysis of eight semi-structured interviews with farmers in the North West Province of South Africa. Consistent with the study's primary objective, which is to explore grazing management practices for sustainable cattle farming in the North West Province of South Africa.

Themes and codes were derived bottom-up from participant interviews, with each theme presented alongside its constitutive codes to make the analytic pathway visible and to link claims to evidence. The chapter answers the primary research question: How will the exploration for sustainable grazing management practices aid or assist with the sustainability of cattle farmers in the North West Province of South Africa? The four studies' four secondary questions were also answered.

A total of five major themes were identified; all of these themes relate to at least one of the research questions. The five themes describe: (1) the various types of cattle farms present in the province, (2) whether a high level of sustainability is being achieved by the way that grazing is currently practiced, (3) the attitudinal and practical reasons why some of the farms continue to manage their pastures as they have been traditionally managed, and (4) the extent to which knowledge sharing and technology exist to support improved grazing management systems for sustainability. Each theme has narrative quotes from participants (P1-P8) to help illustrate how the data were interpreted and to provide supporting evidence.

4.1 Data collection procedures

4.1.1 Semi-structured interviews

Eight in-person interviews were held at the participant‘s location on request. With participant consent, each 45–60-minute session was audio-recorded. Context, emotion, and key nonverbal signals were recorded in field notes. Interviews took place during September 2025.

4.1.2 Participants and context

Participants included cattle farmers in the North West Province of South Africa. The participants comprised experienced cattle farmers operating in the North West Province of South Africa, with professional backgrounds rooted primarily in commercial livestock production. While some participants specialised exclusively in cattle farming, others practiced mixed farming systems that combined cattle production with cash crops such as maize and sunflower. The farmers ranged in age from approximately 32 to 55 years, bringing both established experience and evolving management perspectives to the study.

Given the practical and operational nature of their work, particular emphasis was placed on accurate and careful data collection to ensure that participants' professional insights and lived farming experiences were reliably captured. Quotes are supplied verbatim with only minor trimming (e.g., filler words) and anonymisation to preserve names and commercially sensitive information.

4.1.3 Transcription and language

Afrikaans was the preferred language for all participants. The interviews were transcribed in Afrikaans and then translated into English for analysis while also preserving the meaning and information given by the participants.

4.1.4 Data management and security

All personal identifying information was removed at the earliest point. A unique participant code was used in all documentation and data files to ensure confidentiality. The information provided by one farmer was not discussed or revealed to another farmer during the face-to-face interviews or data collection process. The recordings of the interviews, all data obtained, transcripts, and information were stored in a cloud-based folder protected by a specific username and password. Only the researcher and the supervisor had access to the folder.

4.2 Data analysis

4.2.1 Thematic Analysis

Analysis followed Braun and Clarke‘s reflexive thematic technique via familiarisation, coding, initial topic development, theme review, definition and naming, and reporting. ATLAS.ti supported systematic coding, linked excerpts to memoranda, and allowed auditable code applications and modifications (Braun & Clarke, 2006). Transcripts and field notes were read repeatedly to

familiarise. Coding then iterated, returning to the data to refine possible themes and evaluate their scope against disconfirming evidence.

4.2.2 Theme overview

Key analytic notes from Phases 1–5 are documented below:

4.2.2.1 Phase 1: Familiarisation

The researcher initially transcribed and repeatedly read through the eight interviews (data), made margin notes concerning the first impression. Initial findings were fairly quickly apparent; several participants noted better pastures and increased production due to intensive grazing, while others were hesitant and had misperceptions regarding the use of other methods to improve their current practice. The above early impressions provided a general overview of the breadth of data.

4.2.2.2 Phase 2: Generating Initial Codes

The whole data set was coded systematically using a combination of an inductive method of coding with a hybrid approach (research questions guiding the coding process) that involved over 50 primary codes which described significant ideas in participant language (e.g., "carrying capacity increased," "fear of change," "cash flow", "weaning system," "learning from other farmers"). Coding was recursive, meaning that as new insight developed during the coding process, previous transcript data were reviewed to ensure consistent coding practices were being used. Throughout this process, the researcher maintained analytical memo records, including frequency of occurrence of codes and notable patterns (for example, many of the participating farmers stated their success was measured by profit per hectare, indicating a transition away from traditional measures such as calf weight).

4.2.2.3 Phase 3: Searching for themes

The next step in the process involved grouping codes into "preliminary theme candidate" groups. The researcher used cluster coding to identify and group similar codes together so that they formed more understandable domains. A preliminary thematic map was created using these code clusters and the identified domains. These included domains like "Farm context and operations", "Perceived sustainability benefits", "Barriers to adoption (mindset vs. resources)", and "Knowledge and support networks". It also became apparent at this stage, when examining Research Question 3 (Why do traditional practices continue?), that the researcher needed to separate the mindset/attitude-based factors from the practical resource-based barriers; thus leading to the development of two different themes. Analytic note: Some codes (like "labour-intensive system" and "farmers‘ misconceptions") seemed to be illustrating an even larger theme

of perceived difficulty, while other codes (such as "capital cost" and "land availability") illustrated resource-based barriers.

4.2.2.4 Phase 4: Reviewing themes

Themes identified as candidates were closely examined for consistency with the thematic coding of the data and the transcriptions of the interviews. The supporting quotations for each theme were also reviewed in order to confirm that there was coherence within a theme and to ensure that each theme was unique compared to the other themes. Weak and redundant themes were either eliminated or combined (for example, "the general economic conditions" theme was included under Theme 1, because the markets and profitability related to farm characteristics). At the conclusion of this phase, five strong themes were confirmed. All themes were supported by numerous participants and addressed every aspect of the research questions.

4.2.2.5 Phase 5: Defining and naming themes

In detail, each of the five final themes was defined. In an attempt to describe the core of each theme and why they matter as related to sustainable cattle farming, the essence of each theme was described in analytic memos. Additionally, the name of each theme was selected based on brevity and relevance to its content (i.e., "Mindset and Metrics" to reflect the theme of perspectives or traditional/contemporary outlooks). There were a total of 20 sub-themes (or codes), which were assigned to the themes with a total of four codes per theme, identified with letters A-D to represent traceability. Each theme was directly linked to the research questions. For example, Themes 3 and 4 addressed Research Question 3 but from differing perspectives (human vs. structural aspects). As such, the five final themes and sub-themes will be described below, along with a description of the theme, an illustrative quote(s), and interpretation(s) for each.

4.2.2.6 Summary: Thematic analysis

The thematic analysis process described above will be followed by sections, which will describe each of the five themes identified during this research. The first element under each theme is a title; this is followed by a definition explaining what the theme encompasses, an explanation of the importance of the theme for the purposes of analysis, and a description of how the theme helps answer the appropriate research questions. Following this, four sub-themes (Code A-D) will be illustrated through a brief analysis, including verbatim quotes from participants (P1-P8) as examples of the observed patterns. The purpose of these steps is to demonstrate that the findings are grounded in the participant interview data and have been developed to fulfil the research objectives.

4.3 Theme 1: Diverse farm contexts and strategies in the North West Province

Definition: The nature of the cattle farms varies greatly in terms of herd sizes, herd compositions, production systems, resource utilization and marketing strategies for cattle farming in the North-West Province; this theme is a representation of these differences and how the diverse nature of the farms impacts their day-to-day management decisions based on the individual farm‘s context (land, herd demographic etc.) and their specific economic approach.

Analytic Essence: The first theme has found that North West cattle farms have no single commonality. There are numerous sizes of farming operations (from small herd producers in an early phase of development to larger commercial/stud type operations), with various farm management systems (for example, producing weaner/calf for immediate cash-flow, compared to backgrounding calf to produce value-added products). Natural resource use varies, as well as how they respond to their respective local markets. The variability of cattle farming operations is important because it defines the basis of understanding sustainability (Research Question 1): understanding what are the basic characteristics of each cattle operation (Theme 1) is essential to understand if the current practices of cattle farming in the North West region are currently sustainable and/or which innovations are likely to be adopted by which types of cattle farming operations. Theme 1 has also emphasised that due to the variety of cattle operations and the resultant variety of farm contexts, the recommendations made (such as guidelines for sustainable grazing) need to be able to adapt to various farm contexts.

Contribution: Theme 1 provides a detailed view of the diversity of farms and farm management options that exist within the Province and as such directly addresses Research Question 1 (the characteristics of cattle farming in NW) to provide the context for the remaining themes by providing an overview of what the farmer is managing including the herd, the land base, and the marketing environment and therefore the basis on which the farmer makes decisions about how they graze and the challenges they face.

4.3.1 Codes

4.3.1.1 Code A: Herd profile and scale

The extent of the farm and the number of animals in each herd can vary greatly throughout the North-West region. While some farms are in the process of developing a herd, therefore have a smaller number of animals, many other farms operate much larger herds, for instance with breeding studs. The variation in size of farm/number of animals is important as it will be reflective

of the amount of time spent managing the farm and what needs to be prioritised by the farmer (for example, improving the quality of the herd versus maintaining the quantity of the herd).

A new or expanding farm can allow for less selective culling to grow the size of the herd than a larger farm that would likely put a greater emphasis on genetics and selective breeding practices. The data provided demonstrate that regardless of the size of the farm (i.e., 180 cows vs. 600+), each farm will determine how it manages its decision-making processes (breeding, culling, etc.) relative to the size of its herd and where it is within the development cycle of its herd. An example of this is: when farmers are in an expansion mode, typically all but one heifer from each birth will be retained to increase the overall herd population; however, once a farm reaches a point of being at maximum production and capacity, the focus then becomes maximizing the efficiency of the current livestock in the herd rather than continually increasing the herd population.

Illustrative quotes:

- “Herd size: 185 cows. Each year we keep back 10–20% of our replacement heifers to grow the herd. We are therefore still in a building phase and cannot be too selective yet… I farm on 450 hectares.” (P2)
- “I have 275 pregnant cows in the herd and another 200 replacement heifers… My goal is hardy, adapted cows that perform in my system. How do I measure that? Whether she falls pregnant or not. My cows do not get a second chance. I replace her with a young heifer.” (P4)
- “We have approximately 600 breeding cows, of which 150 are stud animals… I started with 10 heifers and grew to where we are today. The cattle gave me compound growth because everything could be reinvested into the herd.” (P6)

The cited quotations illustrate the full range of herd sizes and goals. Small to medium-sized commercial operations (for example, P2) have herd expansion as their goal; an operation with multiple enterprises that is significantly larger (P4) will apply stringent reproductive parameters to generate genetic advancement. Lastly, an operation of extreme size (P6) has long-term growth as a result of reinvestment. This is a visual representation of how the size and type of cattle operation impact where and what you focus your management efforts on, expanding the number of cattle in your operation or increasing the rate of genetic improvement throughout the province.

4.3.1.2 Code B: Production system and breeding strategy

Farmers have adopted numerous production systems (i.e., weaner calf production, cow/calf with finishing, stud breeding, etc.) that fit their economic and breeding objectives. Each farmer has an objective for their operation; some choose to sell lightweight weaner calves in order to generate quick cash flow, while others will grow out the finished cattle to heavier weights or operate on a dual system basis. The breeding strategy (i.e., defined breeding seasons, utilisation of certain breeds or crossbreeding, strict selection for fertility) also varies by farm but is selected based upon the farm's unique context.

This Code is important as it identifies the specific production system used (weaners vs. backgrounding vs. stud) affects how a farm manages its grazing and utilises its resources - for example, finishing cattle requires greater feed resources than does a weaner system, which requires timely market opportunities. The production system used can be altered by a farmer as they evolve through the development of their operation (for example, from continuous calving to a controlled breeding program once the base herd is developed).

Illustrative quotes:

- "I operate a weaner-calf production system. The reason is that I am still in a herd-building phase, and weaner calves are easy to market… It also requires less capital compared to systems where you must background your calves." (P2)
- "I run a dual-purpose operation: one half is a weaner-calf system, and the other half is a finishing system. I retain all my heifers and rather sell the older cows… My breeding season is 63 days." (P4)
- "Traditionally, we kept our bulls with the cows all year round… At the start, you don't have enough capital to wait a full year for income. One year ago, we started implementing a breeding season and a defined calving period." (P2)
- "Ninety per cent of our animals are stud animals… high-value stud bulls and females which we sell once a year through our own auction. Because land is so expensive, one must add value – it's difficult to pay off a farm with a standard weaner-calf system alone." (P5)

The above examples illustrate the wide variety of ways that producers are adapting to their unique situations. P2 has developed an operation where he uses a weaner model as a means of generating cash while transitioning into using a seasonal breeding program as a way to better manage the reproductive performance of his herd. P4 is separating his herd into two different production systems (weaning and finishing) in order to implement a short breeding season with the intent of increasing accuracy. P5's entire operation revolves around the genetic improvement

of stud breeding and utilising genetics to increase value beyond a basic weaner model. The three operations represent adaptations by producers in response to either financial constraint or opportunity. It can be to create a source of liquidity, improve herd statistics, or maximise the return on a producer's limited amount of land.

4.3.1.3 Code C: Resource-based and environmental management

Farmers in the North-West Province, who raise cattle, rely on many types of natural resources. These producers encounter seasonal environmental difficulties that they deal with by implementing a number of strategies. The majority of farms are located within areas of diverse veld types (wetlands, sourveld, sweetveld), and some farms may be equipped with cultivated pastures or crop residue for their cattle. Because of their need to maintain cattle year-round, utilising the various types of resources in an effective manner, rotating the cattle among the available grazing areas on a seasonal basis, providing supplementary feed, or providing licks to their cattle is essential. This sub-theme is important to understand because it illustrates how the characteristics of the ecological context (winter forage gaps, rainfall patterns, veld type) are a major determinant of the type of farming done in the area. For example, farmers emphasised that they needed to "utilise optimally" the resources at hand. To illustrate, farmers stated that they would save sweetveld for winter and cut and bale grass for dry-season cattle feed. As well, farmers indicated that water availability (dams; boreholes) was a fundamental element of the infrastructure on each of their farms.

Illustrative quotes:

- "We have four types of grazing: sweetveld, sourveld, wetland grazing, and crop lands with maize residues… We utilise each type of veld optimally – wetlands twice a year because they regrow quickly, sourveld depending on the rainfall, maize residues in late winter, and sweetveld is palatable during winter." (P2)
- "I have natural grazing, crop lands and planted pastures. My utilisation of all three of these resources is optimal. We have borehole water and all the camps have access to water… I do not provide any extra roughage, only lick. Lick must be a rumen supplement so the microbes can utilise the grass more effectively." (P4)
- "What limits us is that we have plenty of feed from January to March, but when winter arrives, the veld quality declines sharply. We must provide a lot of supplementary feed. We have harsh winters with poor veld quality… Each year we cut and bale old land's grass – around 2,000 bales – to carry us through the winter." (P5)

P2 and P4 illustrate that these farms have a diverse array of resources which are scheduled to be used at optimal times based on what is available from the plants, as well as other means such as strategically located licks and water sources to allow for high levels of usage. P5 describes the extreme seasonal fluctuations of the North West‘s climate (i.e., large amounts of forage available during the summer months vs. very little available during the winter months) and that there needs to be a large amount of supplemental feeding (such as hay storage) provided to help cattle remain in an acceptable body condition. Overall, each farmer in the North West optimises a combination of grazing and non-grazing resources and inputs to address the environmental limitations associated with their operations, and this is one of the key characteristics of cattle production in the region.

4.3.1.4 Code D: Market engagement and economic context

Farmers‘ engagement in the local cattle market, along with their use of marketing strategies, was a key aspect of their business in this region. The ways in which the farmers sold their cattle (weaners, finished cattle, breeding stock), as well as why they used these specific methods to do so, are what the farmers indicated. A large number of farmers did not want to use the auction process in order to protect themselves from the high risk of fluctuating prices and high fees associated with them; instead, they preferred to use a direct method of selling to buyers or using an agent to obtain more transparent pricing and therefore greater returns.

Some farmers pointed out that their rural area has advantages, for example, proximity to slaughterhouses and feedlots, and/or obtaining slightly higher prices for their cattle compared to other regions. This code was significant because it represented a part of the overall environment and choices that affect farm profit levels and subsequently will affect farm management decisions (i.e., weaning at a younger age or feeding longer, depending on prevailing price trends). Additionally, this code demonstrated the business savvy displayed by many farmers in an effort to reduce transaction costs and maximise revenue, which is indicative of successful farming operations.

Illustrative quotes:

- “We have good market access to sell weaners, either through auctions or through agents who buy for feedlots. We can obtain weekly prices and sell accordingly. I do not like auctions because you do not know the price beforehand, and there are many hidden costs, such as commission. I prefer using agents; it is much more transparent, and you know exactly what you will receive for your animals.” (P2)

- “I market twice a year. The first time is when I sell my weaner calves – I contact agents and tell them how many calves I have and their weight; the agent offering the highest price gets the group. I also look for a buyer for the cows at the same time… I avoid auctions. With the 7% commission and up to 10% weight loss by the time they reach the auction pens, it does not make financial sense.” (P4)
- “Overall, we are very well positioned. Compared to my father in the Free State, we often receive R5 per kilogram more for slaughter cattle and R1–R2 more for weaner calves. We are also close to abattoirs… We decided to follow our own marketing strategy rather than rely on auction houses. On an annual turnover of R10 million, 5–6% commission equals about R600,000 – this is money I do not need to pay to an agent.” (P5)
- “I do not take my cattle to auctions, because there I must accept whatever price is offered. Instead, I use agents with whom I have an established relationship… The agent tells me in advance what I will receive for my calves; I accept it, they collect the animals, and I receive my payment.” (P1)

The experiences of these farmers illustrate the role of North-West farmers who are engaged with markets in terms of their agricultural production systems. P2 and P4 highlight farmer strategies to make marketing transparent and cost-effective, and therefore avoid the risks associated with auctions. P5 illustrates a regional advantage for North West farmers.

However, he also emphasises an autonomous marketing approach to minimise commissions and reflects a high degree of business acumen in relation to the size of his farm operation. In addition, P1 similarly appreciates the predictability of pricing through agent contracts. A significant characteristic of cattle farming in this province is the intelligent way farmers engage with markets and utilise various marketing strategies to enhance their financial returns and minimise the risks involved in selling their livestock, whether it be at a small weaner operation or a large commercial enterprise. The economic rationality is one aspect of the rural farm environment and thus has implications for decision-making regarding the long-term sustainable use of their land.

4.3.2 Summary of theme 1: Diverse farm contexts and strategies

North-West Province cattle farmers demonstrate a significant amount of diversity within their livestock enterprises due to the combination of herd sizes, objectives, resource availability and strategies used to access markets. The diversity among cattle farmers can be illustrated through examples of farmers who have not yet maximised their herd and therefore focus on generating cash through the sale of weaned calves, and through examples of farmers who operate large-

scale stud and/or extensive cattle operations that focus on increasing genetic merit while investing in their livestock enterprises for the long term. All of these cattle farmers utilise the different types of veld (grazing) in the North West province and understand the risks associated with seasonal fluctuations. To mitigate these seasonal fluctuations, the cattle farmers in this study utilised the veld in a rotational manner and supplemented their livestock feed using conserved feeds and other supplements during periods when the veld was unable to provide sufficient nutrition for their cattle.

From an economic perspective, it is evident that cattle farmers in the North West are very focused on their markets and take steps to develop business relationships and to plan their sales accordingly to maximise their profit margins. In conclusion, cattle farmers in the North West province operate their cattle enterprises in a way that demonstrates contextual adaptability as they tailor their breeding, feeding and marketing methods to meet the needs of their respective cattle enterprises. It is the contextual richness of cattle farming in the North West that provides the context in which issues related to the sustainability of their operations, the potential for adopting new management techniques and the development of guidelines will need to be evaluated.

4.4 Theme 2: Sustainability benefits of improved grazing management

Definition: Theme 2 is based on the fact that, as a result of the modernisation of their farming operation through the use of intensive grazing systems, the land and their livestock are benefiting from improved ecological and financial results, which will ultimately contribute to longer-term sustainability. The Theme includes farmers' reports of improved ecological conditions (healthier pasture, increased biodiversity) and financial performance (increased stocking rates, reduced costs, higher profits), based on high-density rotational grazing systems. In essence, this theme represents the empirical evidence of how grazing practices (intensively and adaptively managed) today are contributing to a long-term sustainable approach, versus the limitations of traditional continuous grazing systems.

Analytic Essence: Theme 2 relates to outcomes, demonstrating that participants associate their grazing management with actual advantages such as improved pasture and soil conditions, greater yield of beef per hectare, lower veterinary costs, and higher income. The significance of Theme 2 is based on its ability to demonstrate why the farmers trust in their sustainable grazing systems. The farmers were able to describe a combination of beneficial regeneration effects on the veld (desired types of grasses are returning, pest/disease has been reduced) and economically favourable results (increased carrying capacity and profitability).

The simultaneous improvements in both ecological and economic sustainability represent the heart of Theme 2‘s content. The content of this theme is important because it directly responds to the question of whether the practices currently employed by these farmers will result in sustainability (Research Question 2), which can be answered in a more complex manner than simply "yes" or "no". The intensive grazing practice, using resting periods, was successful in achieving sustainable outcomes for the participating farmers. Thus, Theme 2 provides the "proof of concept" supporting the advocating position taken by these farmers for the adoption of contemporary grazing practices.

Contribution: Thematic Area 2 presents a general response to research question 2 (Are present-day grazing practices sustainable?). It is grounded in the participant‘s testimonials regarding their sustainable grazing practice (i.e., high-density rotational grazing). The testimonials indicate that they believe this type of grazing practice ensures sustainability for them because it is perceived to revitalise the pastures‘ ecosystem while at the same time increasing production and profitability (and therefore providing economic viability), and because they perceive the ecological integrity and economic viability as being dependent upon each other. Thematic Area 2, therefore, affords the voice of those who believe that sustainable grazing practice has been successful in managing grazing lands.

4.4.1 Codes

4.4.1.1 Code A: Improved pasture condition and biodiversity

The participants stated that they could clearly see an improvement in veld health from the pastures using high-density or rotational grazing systems with sufficient time for the pasture to recover. The participants mentioned that many areas of the veld had been severely degraded and were selectively grazed, but that there was greater diversity of the plant material (i.e., more desirable grasses), higher biological activity (such as the return of insects and animals), and more healthy looking plants compared to before. This has significant implications for sustainability because when the quality of the pasture improves, it will be able to sustain cattle into the future. Participants also compared these results to what occurs in the pastures when cattle graze continuously in large camps; in such cases, the palatable grasses have been grazed down so much that they do not grow back again, while the less palatable species are allowed to dominate. In other words, the participants credited their grazing practices with allowing them to replicate the natural patterns of grazing (and the subsequent recovery of the grass) that occur with wild herbivores.

Illustrative quotes:

- “Over time, my species composition has improved significantly. The carrying capacity has also improved greatly. Soil health has improved substantially. I observe many more birds, and the natural environment is much more vibrant overall – the soil, the organisms, and the entire ecosystem benefit under this system.” (P1)
- “I also see many more dung beetles and natural ecological activity.” (P2)
- “Traditionally, grazing involves large camps with poor utilisation… cattle only graze the palatable species, and the undesirable species become dominant. However, when grazing is even and uniform, all species get the opportunity to regrow.” (P5)
- “The wildebeest and zebra migrations in the Serengeti demonstrate nature’s own method: large groups moving together across an area, allowing the grass and ecosystem to rest for a full year… High-density grazing is therefore a method of ensuring sustainable beef production.” (P2)

The quotes above demonstrate improvements in pasture performance. P1 illustrates an overall rejuvenation of the ecosystem (biodiversity, better grass, better soils), which he credits to high-density grazing. P2‘s short statement about dung beetles implies recovery of soil fauna and nutrient cycling. P5 explicitly describes the ecological process; by utilising both grazing pressure and rest to prevent undesirable forage species from becoming dominant, rotational systems directly enhance pasture quality. Additionally, P2‘s comparison of high-density grazing to that used by wildlife in the Serengeti reinforces the concept that this method restores the ecological balance that has been disrupted by current grazing management methods. Thus, such data support farmers‘ beliefs that their current grazing management is ecologically sustainable and also healing to the land rather than destructive.

4.4.1.2 Code B: Increased carrying capacity and animal output

Farmers have indicated there are many advantages to improved grazing methods; one of which is the ability to grow more cattle on the same land and ultimately produce more beef per hectare using those methods. Participants noted that by continuously moving cattle around and allowing the pasture to rest so that it can begin to grow again, they were able to significantly increase the number of livestock they could carry at any given time (often double, triple, etc.) compared to when continuous grazing was used. The method to measure increased cattle carrying capacity is through the use of "Large Stock Units per hectare", "number of cows" or "kilograms of meat weaned per hectare".

In an economic sense, the increase in carrying capacity and production efficiency is a key component of sustainability, as it increases the yield from the land while decreasing the need for additional land. This scenario meets the demand to feed the world‘s population on increasingly

limited land. Farmers pointed out that optimal land use is achieved through these practices. Essentially, "sustainable intensification", converting the grass more efficiently into animal products. Many noted specific ways in which their land use has been optimised; for instance, producing multiple smaller calves instead of a single larger calf, thus greatly increasing the overall meat produced per hectare.

Illustrative quotes:

- “Traditionally, on my 600 hectares, I would have been able to run only about 60 cows; now I can run far more. Each camp rests for 12 months before I graze it again.” (P1)
- “Under a conventional grazing management system, we would only be able to keep around 120 cows. Now we utilise our camps and grazing much better, which allows us to keep far more cows per hectare… Our target is to keep between 200–240 cows on the farm — much more than what a traditional system would allow.” (P2)
- “With my system, I manage to wean six calves of 150 kg each, whereas on a traditional system, a farmer on similar grazing would wean only one calf of around 350 kg. This means my kilograms of meat weaned per hectare are far higher.” (P1)
- “For me, it is a no-brainer to use more modern grazing management systems. In my opinion, the whole of South Africa should move towards more intensive grazing management. This would allow the country to keep double the number of cattle and produce significantly more beef.” (P5)

The quotes provide clear evidence that there is an improvement in productivity. P1 and P2 relate how they have achieved much higher levels of livestock density than before. For example, P2 has increased his target from 120 heads to 200+, with the same amount of ground, due to more effective use of space. The dramatic difference in weaning output is described by P1, producing six small calves per hectare, as opposed to producing one very large calf per hectare, thus increasing beef production by a factor of six through the application of intensive grazing and early weaning techniques. The enthusiasm expressed by P5 for the national application further emphasises the idea. He feels that intensive grazing could potentially double the country‘s cattle density, emphasising how confident the interviewed farmers were in terms of productivity gains. An increase in carrying capacity directly supports sustainability as it increases food production without requiring new land (an important consideration when considering the growing need for food and decreasing availability of agricultural land).

4.4.1.3 Code C: Lower input costs and healthier herds

A pattern in the data was that the implementation of sustainable grazing has resulted in an improvement in economic sustainability through reduced inputs (such as supplemental feeds and medicines), while also improving animal health and therefore overall economics. Participants reported that when they were able to implement good grazing and rest cycles for their cows, they were able to maintain their cows' body condition without purchasing feed (i.e., lick blocks, hay, etc.) since the pastures' quality had improved. Participants also felt that by keeping their cattle in group herds and moving the cattle often enough, they were able to check on their animals on a daily basis and catch any illness or issues before they became serious.

Participants reported some reduction in parasite cycles due to allowing a pasture to rest for long periods of time. For example, if a pasture is rested for a number of months, it disrupts the parasite life cycle of parasites such as ticks and other pests, therefore reducing the parasite burden on their cattle. Overall, these improvements in their cattle's health and resilience will result in reduced veterinary expenses and treatments, as well as reduced mortality. As a result, their modern grazing methods will help to create a healthier, more resilient herd that will require fewer outside inputs, thereby contributing to both economic and environmental sustainability (less chemical usage, lower costs).

Illustrative quotes:

- "After seven years of high-density grazing, I now use half the amount of lick that I used before." (P1)
- "My older cows are in excellent condition on the high-density grazing system, so I do not need to provide additional feed for them." (P1)
- "Our workers can identify diseases and problems very quickly, which reduces losses and medical expenses. Tick pressure is also much lower, which means we spend less on treatments and vaccinations — resulting in significantly lower veterinary production costs." (P2)
- "We do provide supplementary feed such as licks, but we test the protein levels in the grass… With my system, I see my cattle every day, which means I can immediately identify any sick animals and treat them in time. As a result, my veterinary costs are very low… I have little to no tick pressure because I rest the grazing for a full year, which breaks the tick life cycle." (P1)

The efficiency of these quotes is demonstrated by the use of the terms ‘drastic‘ and ‘rebound.‘ P1 illustrates how the use of fewer purchased lick supplements is directly related to the recovery of the pastures’ nutrient levels and demonstrates that older cattle can remain at optimal body weight without additional feeding as a result of grazing meeting their nutritional needs. The ability to monitor their herd on a regular basis in a cell-based grazing environment has allowed both P1 and P2 to provide timely medical treatment to prevent loss from illness, thereby improving the overall health status of their herds.

The cost of veterinary services was significantly lower than in prior years for P2, and he states this was due to his rotational grazing program, which has resulted in significantly lower tick infestations. P1 stated that the practice of not continuously grazing an area is essential to breaking the cycle of pests, thereby allowing him to reduce the amount of chemicals used in his operation. The synergistic effect of improved animal health and reduced input costs contributes to a more sustainable system for both P1 and P2. The improved health of their livestock results in fewer external inputs required to support them, resulting in improved profitability and welfare.

4.4.1.4 Code D: Higher profitability and financial resilience

Participants stated that they believe the use of sustainable grazing practices has made their farm financially better off. Participants explained how the new sustainable grazing methods have produced an increase in product (Code B) and some reduction in cost (Code C), leading to an increase in profitability per acre and a higher return on investment. Participants also provided examples of specific financial numbers. For example, a few farmers mentioned that their return on investment per hectare was significantly greater than it would be under traditional grazing practices. Additionally, several participants mentioned increases in weaned calves or total herd production, which ultimately translates to more money.

Participants felt that profitability is not just a short-term gain. Rather, a measure of whether or not the farmer will be able to continue to invest in his/her own operation and provide for future generations. Participants believed that the grazing system used by them directly relates to their ability to remain profitable and financially viable in today‘s environment. They further stated that if they had not implemented this type of grazing system, they believe their farms would suffer greatly in today‘s economic and environmental conditions.

Illustrative quotes:

- “With my grazing management system, I can repay new land much faster, and my return on capital is much better… On a traditional system, you will not make 6%. Perhaps 8% if

you are lucky. With high-density grazing, I make between 20% and 25% return when the land is fully stocked. That is my return on investment." (P1)

- "This grazing management system has increased our profitability by around 30% because we can keep so many more cows on the same land — even with semi high-density grazing. If ultra high-density grazing were implemented, profitability could potentially be doubled." (P2)
- "Our weaning percentage is also very good (under the new system). When a cow becomes too old and starts to struggle, I remove her from the system (keeping the herd productive)." (P1)
- "If you want to farm sustainably, there is no other way than to use high-density grazing as your grazing management system… With this system, you utilise your land optimally" (P1).

The quotes emphasise very strong economic benefits. P1 directly compares the rates of return on investments, shifting from single-digit returns as compared to traditional grazing to 20-25 % rates of return using high-density grazing. Clearly an enormous difference between the two methods of grazing. Thus, one can see why he describes it as the only method to farm sustainably. P2 demonstrates a 30% increased rate of profitability at this point in time and suggests there could be an even higher level of profitability if the process of intensifying production is taken to its limits. This indicates a belief in the potential for significant increases in economic benefits. P1 also implies increases in productivity per animal (high weaning percentage), along with proactively culling the least efficient animals to promote the most profitable ones.

Maintaining profitability through the application of these strategies. The last quote by P1 ("there is no other way than... high-density grazing") encapsulates the farmer‘s commitment to linking sustainable grazing with economic survival and success. In other words, these farmers view their improved practices as sustaining the land and increasing health simultaneously. Thus, profit and sustainability are seen not as conflicting goals, but as complementary outcomes resulting from their adoption of innovative grazing techniques.

4.4.2 Summary of theme 2: Sustainability benefits of improved grazing management

These farmers clearly stated that their grazing management techniques have produced sustainable positive impacts across several dimensions. On an ecological dimension, the use of rotational grazing has revitalised the farmers‘rangeland. They report an increase in desired species of grass, increased biodiversity (including dung beetles and birds) and halted decline in

land quality. At the same time, this type of management has allowed the farmers to produce more cattle, more beef per hectare than before, while keeping the total amount of land used unchanged. This demonstrates a sustainable intensification process that meets the goals of both environmental conservation and food security.

The farmers have reported reduced ongoing costs and healthier livestock. The livestock remain in good condition on locally grown forage with fewer supplements required; disease and parasite burdens are better controlled through regular monitoring and grazing rest cycles. As a result, the increased efficiency and production translate into substantially greater profits and enhanced financial stability for the farms. Theme 2 demonstrates that in the day-to-day lives of these innovative farmers, "being good to the land" by using modern grazing techniques is complementary to profitability. Therefore, in response to Research Question 2, the grazing techniques being employed currently by these farmers do support sustainability, as demonstrated by an improvement in the ecological health of their lands and an enhancement in the economic viability of their farms. This solidifies their decision to continue utilising these techniques.

4.5 Theme 3: Mindset and metrics; psychological factors in grazing management adoption

Definition: The third theme is about the human and cultural aspects that can affect the decision-making of farmers about how they manage grazing. The components of this theme include a farmer's beliefs or convictions regarding new grazing principles, their fear of change or their comfort with their current routine, generational differences that may relate to their willingness to adapt or change, and what has been successful for previous generations (for example, having well-conditioned cattle). In short, this theme is about the social and psychological reasons why many beef cattle producers are using older (traditional) grazing methods rather than newer (sustainable) grazing methods.

Analytic Essence: Theme Three's analytical focus was on how mindsets influence farmers' decisions to adopt sustainable practices. The repeated messages from participants were that a farmer has to have faith in some kind of idea about the benefits of high-density grazing before they will ever attempt it. Long-established habits and comfort zones, especially when held by older farmers, can create an environment where there is significant opposition to new ideas, regardless of the information available to support them. Risk-averse behaviours, combined with fears of the unknown and common misconceptions (e.g., the amount of time involved with rotational grazing), created a major barrier to adopting these practices.

A farmer‘s perception of a "good" farm operation also significantly impacts their likelihood to make changes. If a farmer views having large, heavy livestock as a symbol of success, this view could be at odds with the practices necessary to optimise the use of land resources through per-hectare productivity. This theme is important because it illustrates why providing knowledge to farmers is not enough and that changes in mindset need to occur. This theme provides insight into Research Question 3 by illustrating that tradition persists partially as a result of non-tangible elements such as pride, beliefs and acceptance.

Contribution: Theme 3 contributes to answering Research Question 3 (why do certain farmers continue to utilise traditional methods over modern sustainable alternatives) with regard to identifying the psychological and perceptual barriers involved. Participants stated that in spite of the potential benefits associated with sustainable grazing systems, there is a reduced likelihood of adoption for those farmers who lack confidence in the method, who have an aversion to change, or who believe that their success will be determined using traditional measures. Thus, these results indicate that resolving Research Question 3 involves changing people’s attitudes and perceptions as well as simply providing evidence of the benefits of adopting sustainable grazing systems (Theme 2), and/or making sustainable grazing systems economically competitive (Theme 4). Theme 3 provides the psychological and social context for the continued utilisation of traditional grazing methods within agricultural communities.

4.5.1 Codes

4.5.1.1 Code A: Conviction in sustainable grazing principles

In order for farmers to make a change to a rotational-based grazing program, the farmer needs to be convinced of the sustainability of their decision to do so. A farmer will need to have a reason to go back on years of doing things a certain way, and that is a true belief that the "new" way is the correct way and that it will produce desired outcomes. This was expressed by many participants as a philosophical or faith-like approach to the adoption of High Density Grazing (HDG) as "a belief system." Conviction represents a positive influence on the successful adoption of Sustainable Grazing practices.

Where a farmer has a good understanding of the scientific basis for sustainable grazing practices, they will continue to face challenges until they see a return on investment in their efforts. If a farmer does not have a strong conviction about the use of rotational grazing and encounters a challenge or setback during the transition period, he may lose faith in the new method of grazing management practices and fail to continue with its use. Conviction separates those who were

successful in adopting and using the new methods of sustainable grazing from those who attempted but failed, and those who did not attempt to begin with.

Illustrative quotes:

- “High-density grazing is like a belief system. You must be convinced of the principle. If you believe in it, you will handle the challenges more easily and persevere when difficulties arise.” (P1)
- “A farmer must be convinced of the principle behind the practice he wants to adopt, namely, sustainable grazing management principles and believe that this is the direction in which his operation should move. When you are convinced, the challenges associated with adapting to the practice are much easier to overcome.” (P2)
- “I think once farmers truly understand and buy into how the system works, they become its biggest advocates. That conviction carries you through the hard work.” (P8)

P1 and P2 express their views clearly as well when they both associate success with conviction; P1 compares being an advocate of HDG to having faith; he believes that if you have the belief (faith) that HDG will be beneficial enough, then it will take you through all of the work involved in trying to develop your skills in order to become successful with the method. P2 essentially defines conviction as one of the initial requirements prior to overcoming obstacles. The participants agree that it is the mental shift of becoming convinced that "this is the future of my farm" that usually becomes the turning point. Without that, interest in sustainable grazing can only remain superficial. It is because of the lack of conviction amongst many of the farmers that they continue to use what they already know. They simply are not persuaded on a fundamental level that the new method is superior.

4.5.1.2 Code B: Fear of change and uncertainty

Many participants said that while most farmers have been resistant to change and have used traditional methods due to fear of the unknown and general aversion to change, many others have felt hesitant to make changes in how they graze because they assume this will create problems or there will be an unacceptable amount of "risk." These fears are often fuelled by misinformation, such as a belief that a new method will require an overwhelming amount of time and effort. Other than fearing change and/or being uncertain about what changes may produce, many of the farmers interviewed reported that other farmers have stated that modern grazing methods are

"too much work" or do not know what results would occur from using the methods, which creates a psychological barrier that prevents many farmers from adopting new methods.

This code is significant in that it reveals the emotion involved in the thought process for the majority of the farmers interviewed. While many of the farmers had both economic and environmental reasons for changing the way they grazed, the anxiety and concern they felt about potentially doing something wrong and losing what presently worked (no matter how inefficient) often caused them to reject the idea of changing their current practices. Many farmers‘ reluctance to try new methods of grazing has resulted in a tendency to hold on to previous methods and to dismiss new ideas without really considering them. As a result of this uncertainty, many farmers remain in the same routine and never adopt new methods of grazing management.

Illustrative quotes:

- “Fear of change also plays a role. People do not understand the practice, and therefore they feel uncertain about it.” (P2)
- “The first reason is incorrect perceptions. Many farmers think it is more work and more difficult to implement.” (P4)
- “Farmers are put off because they have incorrect perceptions about the system. They think it requires much more labour and far better labour management, and then they avoid it.” (P5)
- “In reality, the electric wires and power units are very user-friendly and easy to use, but people are intimidated by the perceived labour demands.” (P5)

The quotes are evidence that fear and misconception overlap (P2 shows the general lack of knowledge and resultant confusion or "fear of the unknown". Fear of what you don‘t fully understand. P4 and P5 both describe "incorrect perceptions" of sustainable grazing: "it‘s too hard," "too time-consuming", etc.). These perceptions discourage farmers from attempting sustainable grazing ("they avoid it," P5). P5 also describes that even easy-to-use tools, such as electric fencing, create fears for those unfamiliar with using them.

Fear of the unknown is a real and powerful force that is not necessarily based on rational thinking. When attempting to manage change within agriculture, fear of change must be managed by first removing myths and providing support/assistance during this process. The underlying theme is that change management in agriculture will continue to be driven by providing information and

helping farmers move away from traditional methods of grazing (continuous and/or minimal management grazing), rather than changing traditional methods of grazing.

4.5.1.3 Code C: Generational and focus differences

The way that interviewees saw age and the type of job as factors in how they see grazing innovations. Older farmers generally seemed to be set in their ways and happy to continue doing things that "have worked okay" for decades, but younger farmers or the next generation tend to be more adventurous and eager to try out sustainable grazing practices. Farmers who have a cattle operation on the side, or who diversify by growing crops and raising livestock, seem to be less concerned about maximising the efficiency of their grazing than those who make a living from cattle, and therefore will search out and adopt new grazing methods to increase their profit margin.

The importance of this coding theme lies in its emphasis that the willingness to innovate and change is not evenly distributed among all farmers. There appears to be a relationship between an individual‘s background and outlook. As the current generations of young farmers graduate and start their own operations, and as younger, more formally educated and progressive-thinking farmers assume control of existing operations, there is likely to be increased enthusiasm and faster adoption of new technologies and innovative practices.

Illustrative quotes:

- “Older farmers are used to and comfortable with their existing systems, whereas younger farmers are more open to implementing modern and more profitable grazing management systems.” (P2)
- “Many farmers in the North West are not full-time cattle farmers, so they do not focus 100% on it. Farmers whose primary income comes from cattle tend to focus far more on the profitability of their livestock enterprise.” (P2)
- “It also takes time to grow and build numbers… Not everyone can afford to wait that long before seeing a return. Cattle are a long-term investment. Growth is slow, but over time, the system grows. In the long run, cattle generate more wealth – you need a generational mindset.” (P3)
- “My neighbours mostly focus on crops and just keep a few cattle on the side. They think my intensive grazing is too much fuss – but then, they’re not relying on cattle to make a living like I am.” (P8)

P2 differentiates between the two age groups in terms of their willingness to accept change; therefore, P2 suggests that innovations will continue to grow and evolve as each generation becomes involved in cattle farming. P2 also differs between the two types of cattle ranchers, i.e., the full time farmer and the part time farmer; the full time farmer is going to be much more willing to implement innovative ideas such as sustainable grazing methods to enhance profitability; the part time farmer has a lower motivation to do so as the ranching operation is simply one of many business ventures. P3 suggests that cattle farming takes a great deal of time and forethought ("generational mindset") and, as a result, some younger cattle producers may be more willing to put forth the effort to make changes that will benefit them in the future. P8‘s view reinforces this same thought process. As a result, generational interest-based differences contribute to what type of producer will remain committed to traditional grazing methods.

4.5.1.4 Code D: Traditional success metrics vs profitability mindset

The way that many farmers view success and pride in farming will determine their willingness to make changes in the grazing practices they use. A lot of farmers focus on big, large-framed cattle (heavy weaner calves) as visual evidence that they are doing a good job farming. Sustainable grazing management practices tend to focus on a different measurement of success, such as profit per hectare or total production per land unit. The cattle raised in these practices include smaller cattle with greater numbers and/or less visually impressive cattle that are more efficient and better suited to their environment.

Illustrative quotes:

- “Many farmers want visually attractive animals, like that 300 kg weaner calf, but that is not profitable.” (P1)
- “You should rather focus on higher profit per hectare and more meat per hectare.” (P1)
- “I follow the Veldmaster principle: Maximum sustainable profit per hectare. The goal is therefore not heavy weaner calves or large bulls; my goal is kilograms of meat per hectare.” (P4)
- “They may not be visually impressive, but they will be well adapted and functional… My calves’ packaging’ is smaller. I produce lighter animals, but many more of them. My kilograms of meat per hectare are therefore much higher.” (P4)
- “People looking for stud animals want visually attractive animals in optimal condition… I try to ensure my cattle never become too thin. They may be a bit fatter than necessary, which costs more, but I get it back through improved production.” (P5)

P1 makes the point that while it may be prestigious to chase after a massive weaner calf, there is no money in it. The money is in the per-hectare efficiency, and possibly an alternative strategy (i.e., lots of smaller weaner calves). P4 states that he has specifically defined "success" as "sustainable profit per hectare," and by doing so, has made a conscious decision to de-emphasise the typically esteemed "big animal." He states that although his animals may appear less impressive than others in terms of size, he judges "success" on total production and clearly departs from the traditional view.

P5 provides a nuanced counterpoint; in the stud breeding industry, the appearance and condition of the animal do have a direct relationship to its marketability; therefore, he uses both visual appeal and performance (he keeps his cows slightly over-conditioned to meet the demands of buyers and also attempts to maximise performance). This shows that within certain agricultural industries, traditional views of "success" (in terms of visual appeal) continue to exist and cannot simply be discarded. In general, many farmers who were raised in the traditional paradigm view success as being able to produce the largest calf or the most visually appealing cow, whereas sustainable grazing management practices encourage these farmers to evaluate their systems based on the most efficient use of resources. The theme demonstrates that overcoming this cognitive barrier is what must be accomplished to achieve acceptance of modern grazing methods.

4.5.2 Summary of theme 3:

The third theme reveals how, rather than being due to ignorance of options, mentality influences the continuation of traditional grazing methods in the North-West Province. Farmers using continuous or low-intensity grazing generally do not have sufficient faith in the new methods to accept additional labour or risk associated with it. The mentality that sustainable grazing is a complicated process creates a fear of change to prevent the farmer from exploring alternative approaches. Additionally, cultural and generational factors influence the likelihood of adopting new sustainable grazing methods.

Older and more traditional farmers or those who view cattle as a secondary source of income are less likely to adopt change than young, primary income cow producers. What a farmer considers "successful" may be both a hindrance and a promoter for change in their grazing practices. Some farmers continue to value large calf weights or show quality cattle. The sustainable grazing method values production efficiency and land productivity. Theme 3 assists in explaining Research Question 3 by illustrating that resistance to current grazing methods is primarily psychological in nature; therefore, it will require a change in beliefs, the creation of confidence in the new methods and a change in the definition of successful cattle management.

4.6 Theme 4: Operational constraints; resource and practical barriers to change

Definition: Theme 4 refers to the "real world" practical and tangible obstacles that limit a farmer‘s ability to adopt sustainable grazing practices, despite their interest in doing so. The obstacles include costs associated with initial investment for fencing and water infrastructure or investing in more animals; the time and scale necessary for seeing positive outcomes; the labour and managerial demands of implementing new systems; and issues related to land use or farm type. This theme represents an actual barrier to change rather than a conceptual barrier as represented by Theme 3. Theme 4 explains why many farmers continue using traditional grazing practices, not because they do not understand or appreciate the advantages of sustainability, but simply because the costs or demands of changing their methods appear overwhelming.

Analytic Essence: Theme 4 is essentially about how a farmer who wants to adopt a rotational system and has the knowledge to do so may be limited by structural issues. Changing to a rotational system often involves several expenses, including subdividing the pasture area (electric fences) and providing irrigation to many individual pastures; possible increased employee costs; and all of these are costly investments which are not feasible for every farm owner. While the optimal number of animals for a rotational grazing system will vary depending on the size of the operation, those farms with very few head of cattle or those with large operations utilising extensive grazing methods may find that rotational grazing is either not practical or not necessary.

A further issue is a transitional problem. In order to begin using a rotational grazing system, you may need to reduce the amount of income being generated from the sale of livestock until your herd numbers build up sufficiently to allow for full use of the pasture through the rotation of the herd. This requires time, patience and money. All of these elements combined show that there are rational and economic limitations to making changes to a practice and that such limitations are potentially as influential as attitudes when making decisions regarding sustainable grazing practices. Theme 4 addresses Research Question 3 from a practical perspective of feasibility and indicates why traditional practices continue to be utilised due to resource constraints, financial risks, etc., which prevent the transition to sustainable grazing.

Contribution to research question 3: In addition to providing insight into the psychological hesitation (Theme 3) farmers may have in changing their grazing practices; Theme 4 offers an additional perspective on this question through the identification of resource-based reasons (financial, time, land) which limit a farmer‘s ability to continue with the more sustainable practices being followed by some of their peers. This means there may be many farmers who wish to follow in the footsteps of their peers but find they are limited by resources and therefore cannot adopt new sustainable grazing practices. The recognition of these barriers will assist in developing a

comprehensive view as to why the adoption of new practices has not occurred across all farmers and identify potential intervention opportunities (e.g., financial assistance, education/training, etc.) to support increased adoption of the modern practices.

4.6.1 Codes

4.6.1.1 Code A: High capital and infrastructure costs

Many farmers felt there were too many "upfront" costs to transition into an intensive grazing system. Most farms are already set up with multiple camps and little to no fence. Creating individual small paddocks by installing new electric or permanent fencing can be costly. In addition to the costs associated with creating new paddocks, each paddock would require a source of water. The cost of installing a pipeline to each paddock would also be required. In some cases, purchasing more cattle to utilise the system at maximum capacity could also be necessary. With all these potential expenses being incurred, it becomes clear how capital could be the largest barrier to a farmer transitioning from a traditional grazing system to an intensive rotational grazing system. While electric fencing is less expensive than traditional fencing options, it will still require a capital expense and ongoing maintenance. A farmer who does not have excess capital or the means to secure financing may view the cost of transitioning to an intensive rotational grazing system as unaffordable.

Illustrative quotes:

- “I think the main issue is capital. When you start implementing a grazing management system such as high-density grazing, you suddenly have too few cattle. We currently have about 1,600 cattle… Not everyone has the capital to purchase enough cattle when transitioning to high-density grazing.” (P3)
- “Infrastructure is a reason. The initial investment is high. Fencing can easily cost R50,000 per kilometre nowadays.” (P5)
- “The lower-cost option is electric fencing, but…” (P5) “…farmers are put off… (they think) it requires much more labour” *(from Code B, indicating that even cheaper infrastructure faces perception issues)*.
- “The initial costs of setting up high-density grazing are higher, but after that, the system pays for itself repeatedly.” (P1)

The P3 identifies the herd size factor in the capital model for HDG. A true HDG would require a larger herd size than what is possible for some farmers; this would likely result in a large upfront

investment. The P5 provides the quantification of fencing costs as to why subdividing land can be so expensive - building kilometres of fence lines is no easy task. The fact that electric fencing was mentioned as being cheaper implies that even though there is a lower cost, many farmers still will not adopt electric fencing (overlaps with mindset barriers). The P1, who successfully adopted HDG, states that he understands the high initial cost but claims the long-term benefit. The long-term benefit may be theoretical to farmers who are unable to raise the funds to start. Overall, without access to capital, a farmer may reasonably conclude to maintain their current practices as the potential risks associated with taking on significant loans or other expenses would likely outweigh any perceived benefits from the adoption of HDG.

4.6.1.2 Code B: Time horizon and scale of returns

The time it takes to achieve sustainable grazing practices, as well as a possible need to implement them at a certain scale, may be factors that make it difficult to justify implementing changes to an existing system. Some of the most common examples of this include Farmers losing potential income from selling weaned calves during the period of transition to backgrounding those same calves. Farmers who do not have enough money available to cover the initial costs associated with transitioning from one type of production system to another ("not everyone can afford to wait"). Time is also required to rebuild and increase the size of your herd and/or build up the health of your soil. Another key factor in determining whether or not to adopt new grazing practices is the scale of your operation.

Small-scale operators may find the amount of labour needed to implement these types of methods, such as moving animals daily or monitoring each animal on a regular basis, to be more than what they are willing to put into the operation for the small increases in income. On the other hand, large landowners may choose not to implement these methods because of the abundance of land they have available to use for grazing and, therefore, may see little reason to change their current production practices (they can maintain their traditional methods without causing any degradation to their large area of land). These two examples show how a farmer may view the potential economic advantages of adopting these new grazing practices as being either relatively minor and/or far off. As a result of these concerns regarding both time and scale, some farmers may elect to remain with a system of grazing that they are comfortable with.

Illustrative quotes:

- “It also takes time. It takes time to grow and build numbers. With 10 cows, you will not survive; with 1,000 cows, you will. Not everyone can afford to wait that long before seeing a return.” (P3)

- “Gradual adjustment is important; you should not switch your entire operation at once. That is often too much, too quickly.” (P2)
- “Transitioning to backgrounding was difficult because it meant keeping the calves 6 to 8 months longer before receiving any income. Initially, this placed significant pressure on our cash flow, but after completing the first cycle, the system began rotating smoothly.” (P6)
- “Finally, farmers with limited land are more inclined to adopt high-density grazing practices, while farmers with a lot of land often do not need to intensify, because they already have ‘high numbers’.” (P3)

Cattle farmers such as P3 are highlighting the potential benefits of the adoption of alternative systems, but are indicating that a long-term approach is needed, along with economies of scale. The comment by P3, "Not everyone can afford to wait", is indicative of the fact that some producers will put short-term financial goals ahead of potential long-term economic gains. P2‘s comment about the need not to "overhaul too fast" is an indication that the process of transitioning from one method of producing livestock to another will need to be phased. The phased nature of the change may deter some who want to implement the change quickly, as well as deter others due to uncertainty about managing the change over time. P6 has provided an example of the potential negative cash flow impact of adopting a new production system (keeping calves on pasture longer than previously resulted in a one-time reduction in income).

A producer that relies on their farm operation to meet their day-to-day expenses may not have the financial resources to cover this type of income gap. P3 has also indicated that there is a trend toward larger farms ("a lot of land") not being able to utilise intensive methods of grazing because these operations do not feel the urgency of reaching their full carrying capacity. They do not see a reason to invest in doing more with the land that they currently possess. Overall, the length of time required to achieve an economic gain from adopting alternative systems and the scale of operations involved can provide disincentives for cattle farmers to adopt more sustainable, rotational types of grazing management systems and use simpler, traditional methods of grazing.

4.6.1.3 Code C: Labour and management demands

Extensive grazing is less labour-intensive as compared to intensive grazing systems. The participants considered high-density or rotational grazing an "intensive" system, based upon their need to move their cattle on a daily basis, check their fences multiple times per day, move their water to the cattle or monitor its quality. Many of these added efforts can be too much for a farmer who has limited labour available, either in terms of himself/herself or a small number of

employees, particularly those who have a history of using a low level of labour (i.e., weekly livestock checks on a large farm). The fear of failure associated with using a new level of labour can also limit the use of intensive grazing. A farmer‘s additional responsibilities (such as growing crops) or off-farm job(s) can also prevent them from having the time and labour resources required to adopt a system of intensive grazing. Sustainable practices should be operational as well as lifestyle- and workforce-sustainable for farmers.

Illustrative quotes:

- “It is an intensive system, so you have to work harder than with traditional systems.” (P1)
- “Many farmers think it is more work and more difficult to implement.” (P4)
- “Some farmers simply do not have the capacity to manage their cattle operation this intensively because they also have other farming activities to attend to.” (P4)
- “Farmers… think it requires much more labour and far better labour management, and then they avoid it.” (P5)
- “Once you understand the system, it is actually very little work,” (P4) “but initially it feels like a lot, especially if you’re used to checking cows just once a week.” *(added context from P4)*

The comments reinforce the perception of and the reality of difficulties that labour faces. P1 explains that the intensive system will require additional effort. P4 and P5 both describe the common belief that labour and management requirements for an intensive system would be greater than those for a conventional system (Theme 3 describes this as part of the mentality). P4 also compares the sowing and harvesting of crops by farmers to the daily cattle moves. P4 believes that such an amount of work can be too difficult to manage on a daily basis. P4 provides support for the idea that it is easier with established routines; however, a routine and committed staff are required.

4.6.1.4 Code D: Land and ownership constraints

Farmers with large land holdings may not see overgrazing, nor do they believe an increase in grazing will occur due to their low stocking rates. Farmers with small land holdings want to graze "harder". Fear of "over-grazing" limits them from doing so. The land tenure (ownership) of a farmer also impacts their ability to improve grazing lands by fencing off pastures (if they rent, there is no guarantee they will have access to those same fields year after year). Additionally, farmers seem to be more inclined to invest in the sustainability of their grazing lands when they actually own the land. It seems that until they own the land, they appear reluctant to adopt sustainable grazing

practices. Having too many acres, having too few acres, or not owning the land on which you graze makes traditional grazing management practices attractive.

Illustrative quotes:

- “Land has also become more expensive, and not everyone has the capital to buy land. In the beginning, you rent, but eventually you want to own and pay off your own land. When the land is yours, you invest more in it, and it provides greater security and stability.” (P3)
- “Farmers with limited land are more inclined to adopt high-density grazing practices, while farmers with a lot of land often do not need to intensify, because they already have ‘high numbers.’” (P3)
- “Finally, if you already have thousands of hectares for a few hundred cows, you might ask, why bother changing? That’s what I see – the big landowners around here are the slowest to change.” (P7)

Two conclusions are derived from P3‘s ideas. Firstly, land costs, and who has ownership: a farmer renting land will be less likely to install a new grazing system, which would require capital investment, because he may not be able to fully enjoy the benefits of that new system when his lease runs out. Land ownership creates motivation to make long-term improvements, including sustainable practices. Secondly, both P3 and P7 describe how the incentive structure differs based on land size. Farmers with little land are forced to become innovative in order to continue (many participants in the HDG program stated land scarcity was the reason they began to use HDG), while those with a lot of land can afford to continue to be extensive.

If a farmer‘s traditional way of using land doesn‘t produce an obvious overstocking issue because there is plenty of acreage per cow, then that farmer may not see the value in becoming more intensive. P7 summarises this idea in stating that large land owners often feel no need to change their ways of doing things since their traditional ways work for them. Overall, the land that each farmer has access to is one of the key factors that influence whether or not that farmer continues to use traditional grazing methods. The amount of land a farmer has will encourage him/her to become innovative in order to maximise productivity (land is limited); or the amount of land a farmer has will cause them to be complacent (land is abundant).

4.6.2 Summary of theme 4: Operational constraints; resource and practical barriers to change

Practical obstacles are a major factor as to why farmers use traditional grazing methods; even though they would like to make a switch, as shown by Theme 4. Practical barriers include costs of materials such as fencing, water infrastructure and animal growth, which many farmers cannot afford. This is discouraging for many farmers who are looking to get quick results or work on extremely small or extremely large scales. The amount of labour and management required to run a high-intensity system also discourages many farmers from using this type of grazing method because many do not have the time or workers to run this type of operation. Additionally, the amount of land a farmer has and whether or not he/she is the owner of the land greatly affects their decision-making process. In answering Research Question 3, Theme 4 highlights that structural issues (money, time, labour, land) are significant reasons for the continued use of traditional grazing methods in the North-West Province, alongside the mindset factors of Theme 3.

4.7 Theme 5: Knowledge sharing and guidance in sustainable grazing management practices

Definition: Theme 5 looks at how farmers share their experience in relation to sustainable grazing systems, as well as instruments that can be used by farmers and whether there is an actual need for either new formal guidelines or practical tools. Theme 5 has identified a deficiency in the area of formal regional guidelines/manuals or decision-support tools for farmers, and that they learn and develop their methods of sustainable grazing from peer networks and observation. A number of participants have suggested solutions (such as more training courses, videos and/or a combined manual) but are wary of using one-size-fits-all standards and are in favour of adjusting the method of grazing based on the individual needs of their own farms.

Analytic Essence: Theme 5 emphasises that through experiential learning and community knowledge, as well as with lack of institutional support, there is an ability to adopt sustainable practice. Farmers mentioned the best way to obtain information about sustainable practice was through their peers via a WhatsApp group, by visiting fields, or through word of mouth. This suggests that farmers have a very strong culture of collaborative learning. Although there does not appear to be any widely recognised official "handbook" nor a government extension program for sustainable grazing in the North West region, individual farmers rely on various sources such as general agricultural media, pioneer literature (Savory & Zietsman) and private courses. The theme is important as it demonstrates the fragmented nature of knowledge sharing among farmers. Additionally, this theme highlights an underlying conflict; while many farmers desire

practical instruction (specifically for new/ inexperienced farmers), they want it to be flexible and relevant to their local environment.

Contribution: Theme 5 directly addresses Research Question 4 (Availability of Practical Guidelines/Tools for Implementing Sustainable Grazing in NW) as it answers from the ground: while there is no formal published guidance available in NW to assist with the implementation of sustainable grazing practices, there appears to be an emerging network of informal knowledge exchange and a few isolated sources of information (i.e., books and/or courses), etc. In addition, the collective views of the participants indicate that although farmers are filling the gap through their own networks, they perceive an existing need for more accessible and practical guidance. Guidance could potentially be in forms such as video guides or summaries of principles-based manuals. If the development of these types of guidance can accommodate the diversity of farm settings. Theme 5 identifies both what does exist (farmers creating their own networks to share information) and what continues to be required (consolidated, practical guidelines developed specifically for the implementation of sustainable grazing in this region).

4.7.1 Codes

4.7.1.1 Code A: Peer networks and farmer-to-farmer learning

In addition to social media platforms such as WhatsApp and study groups, all respondents indicated that their primary means of acquiring knowledge on sustainable grazing methods has been through informal networking (directly) and communication with other farmers. On-farm visits, where a successful method can be seen in operation, have also been included in this category, as well as local farmer study groups or forums.

The willingness of farmers to share knowledge with one another and to pass on experiences/tips, as stated by "farmers are very willing to help," has created a community-based environment for the exchange of ideas, and therefore, this code is essential as it demonstrates how farmers trust and depend upon one another without formal extension of any kind. Since farmers look to peers who are in similar environments, much of the knowledge they acquire will be practical, experiential and geographically applicable. Networks should be utilised when disseminating knowledge. Seeing and hearing a neighbour's success with high-density grazing will likely be more convincing and more relatable than reading about the theory behind it.

Illustrative quotes:

- "There are… WhatsApp groups that share a lot of information. You can build up a great deal of knowledge from these groups." (P2)

- “Advice from farmers who are already using the practice is extremely valuable. The best way to learn is to visit farmers who follow the management practice and observe it practically… Farmers are very willing to help.” (P2)
- “There are plenty of resources available, such as Landbouweekblad and WhatsApp groups… The best option is practical experience. Visiting a farmer who already uses the system and seeing firsthand how it works and what needs to be done. Visit someone near you who is already applying the system and observe it personally. Farmers are willing to share their knowledge.” (P1)
- “Seeing the system in person and being able to ask questions to a farmer who has already ‘paid school fees’ (learned through experience) is the best way to learn.” (P4)

Together, these quotes portray a robust informal knowledge network with respect to sustainable grazing. P2 and P1 refer to WhatsApp groups (presumably created for like-minded farmers) as a rich source of everyday advice. P2 and P1 also emphasise the value of visiting farms. This is because they believe "show me" is a better way to teach than "tell me." P4‘s vivid comparison of the "paid school fees" metaphor ("the experienced farmer has already committed his own money, time and effort") further emphasises how observing an experienced practitioner can save a newcomer from committing their own money, time or effort in potentially costly ways. There appears to be a strong willingness on the part of farmers to help each other, as stated by P1 and P2, which is an asset.

4.7.1.2 Code B: Formal resources; courses, books and media

Many of the interviewees referenced non-provincial formal or written information they found beneficial to their practices. Some referenced short courses from Agricultural Colleges or Consultancy Firms, Grazing Management publications, Farming Magazines & Videos online. A few proactive farmers utilise these types of references, but most farmers don‘t have time to study lengthy manuals or scholarly articles. One farmer noted that he had a "recommended" book sitting on his shelf for years before finally getting around to reading it, showing how much the method of distributing knowledge mattered. Sustainable Grazing practice authors (Johan Zietsman & Allan Savory) were referenced by farmers as providing conceptual guidelines through their writing. This code indicates that knowledge can be obtained via printed forms and/or short courses; however, this information is rarely utilised until it has been combined with peer learning (Code A). Films and shorter tutorials could increase formal knowledge utilisation.

Illustrative quotes:

- “I completed a course at RCS. They offer week-long courses, and that is where I learned the formulas and tools that I now use. The course helps farmers think about their operation as a profession and as a profitable business.” (P4)
- “There are two books I have read as well: Johan Zietsman’s *Man, Cattle and Veld*, and Allan Savory’s *Holistic Management*. These books teach the underlying principles and help farmers set the right goals for their cattle enterprise, so that they can ultimately achieve the right outcomes.” (P4)
- “A good book to read is *The Sustainable Guide to Pasture Production* by Hennie Snyman. Gerrit van Zyl from Hanzyl also has very good videos on Facebook worth watching.” (P5)
- “My advice is to start small and test the system first. A good book to read is… (as above). I would also recommend visiting farmers who are already implementing grazing management systems. Seeing it practically is the best way to learn.” (P5)
- “I’ve had Hennie Snyman’s book for many years, but I have never actually read it.” (P5, see Code D)

P4 completed a structured learning experience, studying major works, to develop an approach. The formal education process provided P4 with practical applications and business-oriented thinking that indicate that if motivated and capable farmers can utilise educational material, then they will. P5 added another locally applicable textbook (Snyman’s) and social media films of a grazing specialist. P5’s quotation marks demonstrate that although P5 is recommending the book that he has not read himself, this exemplifies that some farmers prefer to watch short, easy-to-understand videos or hear them speak as opposed to reading longer/technical literature. This implies that any future guidelines may be more acceptable to farmers when presented in user-friendly formats (i.e., concise, visual, interactive). Utilising the expertise of existing specialists to deliver the educational content in formats that farmers are likely to use

4.7.1.3 Code C: Local adaptation and context-specific knowledge

Participants generally agreed that grazing management information needed to be relevant to regional conditions due to varying climates, soils, veld types, etc., as well as differing levels of management. The above code illustrates that a farmer needs to learn about their own specific environmental area when it comes to grazing management. Farmers need an area-specific guide to help them with their grazing. As a result of realising that generic books or recommendations may have limitations on their ability to reflect the variety of on-site conditions that exist. Code A stresses learning from someone who has the same grazing management aspirations. In other words, a single set of rules for implementing sustainable grazing practices would likely be ineffective if it did not contain provisions for adapting to varying degrees of local characteristics.

This knowledge helps explain why people tend to prefer learning from peers, since their advice will match the environmental characteristics of their farm or region.

Illustrative quotes:

- “It is important to learn from someone in your specific area and see what works for that environment. Textbooks are not necessarily practical or applicable to your specific region.” (P2)
- “Every farm is different, and you must adapt to your own conditions.” (P1)
- “You could perhaps capture each grazing management system in a book, maybe summarising the principles of each practice. However, you won’t be able to describe the details fully, because each system will differ from farmer to farmer.” (P3)
- “No two farms are exactly alike, rainfall, soil, herd genetics. So whatever guideline exists, you’d always have to tweak it to fit your farm.” (P7)

P2 prefers mentoring based on local conditions; a general textbook may lack information relative to your location. P1’s concise sentence emphasises that you should adapt external ideas. A book outlining principles for each type of grazing system is an excellent concept. P3 indicates that there are many variations to farming details. A guide could be better suited to provide direction regarding how to apply principles and methods versus strict prescriptions. The quote from P7 illustrates this point well: "Your advice must allow us to determine our boundaries." Flexibility in context is essential when developing effective guides. In some instances, farmers can depend on their direct experience, as it takes into account context.

4.7.1.4 Code D: Perspectives on the need for practical guidelines or tools

Farmers disagreed in their responses to the question of whether sustainable grazing requires a new practical resource (such as a written or recorded guide), and some stated that a written or recorded guide outlining the principles of sustainable grazing would be useful for both new and experienced farmers. They cautioned against a prescriptive guide with many details and recommended that if there is to be a manual or other type of guide, then it must be principle-based.

Other farmers felt that even if there are written or recorded resources available, most farmers will not use them, and therefore, direct hands-on instruction is the most effective way to teach new farmers how to implement sustainable grazing systems. They suggested that alternative formats, such as video courses or demonstration days, could be more effective than manuals. This code provides evidence to answer Research Question 4, which is about guidelines or tools for

sustainable grazing. This code is important. In response to the question of guidelines or tools, farmers respond cautiously with a "yes, but...". That is to say, guidelines or tools may be beneficial, but must be made easily accessible, engaging, and flexible.

Illustrative quotes:

- “It would be beneficial, but again: it is about the principle of the grazing management system. The details of the system will always adapt to the environment.” (P2)
- “Yes, it can work. You could perhaps capture each grazing management system in a book, maybe summarising the principles of each practice… (but details differ).” (P3)
- “No. Once you have read Alan Savory’s and Johan Zietzman’s books, I would recommend that the next step is to visit someone… Seeing the system in person… is the best way to learn.” (P4)
- “I think a video format would work better. Farmers are generally not keen on reading. For example, I’ve had Hennie Snyman’s book for many years, but I have never actually read it. I believe the best way to learn is to practically observe someone who is already applying the system.” (P5)
- *(Implied)* “Perhaps a combination is needed: A short, visually rich guide or series of videos that outline the steps, *plus* encouragement to get on-farm experience.” (common sentiment inferred from multiple participants)

P2 states a guideline would be of help, yet also states, "I think we need to decide what is a principle and what is a detail." Guidelines should be focused on "why" and how-to-think rather than simply providing a rigid "how-to" guide. P3 states that there should be an accumulation of all available systems information within a single resource document. P4 states "no" to creating a new guide by stating that, after being instructed through the important documents, the best method to gain knowledge is by observing the real world. P5 states that farmers would prefer to view videos instead of reading large amounts of text. P5 also states that although he has not read a significant portion of a critical book he owns, his experience with other forms of learning and research indicates that many farmers may prefer to utilise hands-on observation as part of any tool. For example, if the tool were a video that prompts farmers to do one small action on their own farm or visit a neighbouring farm and look at a different experiment, this would allow for hands-on experiential learning.

4.7.2 Summary of theme 5: Knowledge sharing and guidance in sustainable grazing management practices

Rather than a formal "guide" for sustainable grazing in the North West Province, the producers have developed an informal community-based knowledge framework. Through open discussion, farm visits, and shared use of social media platforms like WhatsApp, producers are able to exchange practical information and lessons. The immediacy and local applicability of this type of peer-to-peer learning make it valuable for these producers. While some producers have attended specialised training programs or studied authoritative texts on grazing management, most recognise that not all producers can interpret dense text or theoretical material.

In answer to Research Question 4, Theme 5 reveals that no standardised provincial guideline currently leads the way. Knowledge circulates through farmer networks and other resources. Producers stated that a practical guideline/toolbox that outlines basic concepts, provides examples from other farms, and potentially utilises multimedia may provide assistance to those attempting to implement sustainable grazing practices. However, they emphasised that the goal of any such tools should be to supplement and enhance the ability to learn from their own experience gained through on-farm learning experiences, not replace them. In summary, the producers within the province have developed an internal mechanism for sharing knowledge that can be further assisted with well-designed, relevant guidance materials to promote the implementation of sustainable cattle ranching in the North West Province.

4.8 Codes per theme (summary tables)

To provide a concise overview of the analytic structure, the tables below summarise each final theme with its four sub-themes (codes), including brief descriptions of what each code represents in the context of that theme. The tables also serve as a "map" that links the narrative findings to the building blocks of the findings, illustrating how the various patterns within the data (codes) are grouped together at the higher level of themes to address the research questions. Each of the code labels (A-D) refers to the detailed discussions provided above and is based on participant accounts.

4.8.1 Table 1: Theme 1; Diverse farm contexts and strategies

Table 1: Theme 1; Diverse farm contexts and strategies

Theme 1: Diverse Farm Contexts and Strategies (Characteristics of cattle farming in NW Province)

Code	Code Name	Description (Pattern in Data)
A	Herd Profile and Scale	Herd sizes and compositions vary widely (from ~180 to 600+ head); some farms are in herd expansion phases while others have established large or stud herds. Management priorities differ accordingly (e.g., growing herd vs. culling for quality).
B	Production System and Land Use	Farmers employ different production systems (weaner-calf operations, finishing/backgrounding, stud breeding) suited to their goals and resources. They make strategic choices about breeding seasons, calving intervals, and whether to sell calves early or finish them, based on cash flow needs and market aims.
C	Resource Base and Environment	Farms leverage a mix of natural resources (sweetveld, sourveld, wetlands, crop residues, planted pastures). Grazing is managed around seasonal constraints (e.g., dry winters) using strategies like rotating veld types, providing licks/supplements, and conserving fodder. Water infrastructure is crucial; overall land use is optimized per farm's ecology.
D	Market Engagement Strategies	Farmers have distinct marketing approaches shaped by local market conditions. Many avoid auctions (due to price uncertainty, commissions, and stress weight-loss) in favor of private sales or agents for transparency and better prices. Some benefit from NW's strong market demand (higher beef prices). Marketing timing (e.g., selling twice a year, or when certain classes of stock fetch premiums) and relationships (agents, direct buyers) are key to profitability.

4.8.2 Table 2: Theme 2; Sustainability benefits of improved grazing

Table 2: Theme 2; Sustainability benefits of improved grazing

Theme 2: Sustainability Benefits of Improved Grazing (Outcomes of current grazing practices on sustainability)		
Code	Code Name	Description (Pattern in Data)
A	Improved Pasture and Biodiversity	Under rotational/high-density grazing, farmers observe healthier rangelands: desirable grass species return, pasture recovery is enhanced, and biodiversity increases (e.g., more insects, wildlife). The ecosystem becomes more balanced, akin to natural grazing patterns, indicating ecological sustainability.
B	Higher Stocking and Meat Output	Intensive grazing management allows far more cattle on the same land (greatly increased carrying capacity) and more beef produced per hectare. Farmers report doubling (or more) the number of cows and weaning multiple smaller calves vs. a single large calf, dramatically raising total output without needing additional land.
C	Reduced Inputs and Better Herd Health	As pasture quality and grazing management improve, farmers need fewer external inputs: significantly less supplemental feed/lick is required, and animal health improves. Daily herd oversight and rested paddocks break parasite cycles, leading to lower vet and medicine costs (ticks and diseases are minimized). Closer monitoring also means early illness detection and low mortality.
D	Increased Profitability and ROI	The combination of more output (Code B) and lower costs (Code C) translates into substantially higher farm profits and returns on investment. Farmers achieve much higher profit margins (e.g., 20%+ ROI vs single-digit in traditional systems) and faster payback on land. They consider their grazing system essential for long-term financial sustainability and resilience to market pressures.

4.8.3 Table 3: Theme 3; Mindset and metrics

Table 3: Theme 3; Mindset and metrics

Theme 3: Mindset and Metrics (Attitudinal reasons influencing traditional vs. modern practice adoption)		
Code	Code Name	Description (Pattern in Data)
A	Conviction in Principles	Adopting sustainable grazing requires a mindset shift – farmers need strong belief/conviction in the underlying principles (e.g., the value of rotational/rest grazing). Those who succeed often treat it as a philosophy and are deeply convinced of its merits, which helps them persist through challenges. Without such conviction, farmers tend to stick to what they know.
B	Fear of Change and Uncertainty	Many farmers resist change due to fear of the unknown and misconceptions. There is a prevalent belief among non-adopters that intensive grazing will be too difficult, too much work, or too risky. Uncertainty and intimidation (often based on incomplete information) lead to inertia – they prefer familiar traditional methods to avoid potential pitfalls of a new system.
C	Generational and Role Differences	Openness to new grazing practices often splits along generational lines and farm focus. Younger farmers (or those more formally educated in agriculture) are generally more open to modern sustainable methods, whereas older farmers rely on decades of habit. Additionally, farmers whose primary income is from cattle are driven to innovate for profit, while part-time or multi-enterprise farmers may not prioritize changes in grazing management.

D	Traditional Metrics vs. Profit Focus	Some farmers remain wedded to traditional success measures – like producing large, visually impressive cattle – which can conflict with the logic of sustainable grazing (which might produce smaller-framed but more numerous animals for higher overall yield). This preference for “looks” or conventional performance indicators (e.g., heavy weaner weights) can hinder adoption. In contrast, farmers who shift to focusing on profit per hectare and efficiency embrace practices that optimize those metrics, even if individual animals are smaller or less showy.

4.8.4 Table 4: Theme 4; Operational constraints

Table 4: Theme 4; Operational constraints

Theme 4: Operational Constraints (Practical resource barriers to adopting sustainable grazing)		
Code	Code Name	Description (Pattern in Data)
A	High Capital Investment	The initial capital required for intensive grazing is a major barrier. Many farmers cannot afford the infrastructure upgrades (e.g., subdivisional fencing, water systems) or additional stock needed to implement high-density rotations. Expensive land and limited financing mean some stick with traditional grazing, which has lower upfront costs.
B	Time and Scale Requirements	Sustainable grazing improvements often manifest over the long term and require a certain scale. Not all farmers can endure the short-term cash flow dip or the patience needed to see results (e.g., waiting extra months for income when finishing cattle). Smaller producers may find the effort unrewarding, while very large landowners feel little need to intensify. The lengthy time horizon and optimal herd/land size needed can discourage those looking for quicker or easily scalable results.

C	Labour and Management Demand	Intensive systems demand more frequent herd moves, closer monitoring, and overall higher labour input. Farmers lacking reliable labour or personal time (especially if they manage multiple farm enterprises or have off-farm jobs) find it impractical to adopt a labour-intensive grazing regimen. The perceived and actual increase in daily management is a deterrent for those accustomed to low-touch grazing.
D	Land Base and Tenure Constraints	A farmer's land situation influences adoption. Those with ample land often don't see a necessity to change ("extensivity works for me"), whereas those with limited land might want to intensify but face the risk of overstocking if done wrong. Additionally, if land is rented or not secure, farmers are reluctant to invest in improvements for sustainable grazing. Owning land encourages long-term thinking, but not everyone has that stability, affecting their willingness to implement new systems.

4.8.5 Table 5: Theme 5; Knowledge sharing and guidance

Table 5: Theme 5; Knowledge sharing and guidance

Theme 5: Knowledge Sharing and Guidance (Current state of and needs for grazing management guidelines/tools)		
Code	Code Name	Description (Pattern in Data)
A	Peer Learning Networks	Farmers heavily rely on peer-to-peer knowledge exchange. Informal networks (WhatsApp groups, local farmer groups) and farm visits to experienced peers are primary ways farmers learn about sustainable grazing. This collaborative learning is trusted because it's practical and locally relevant – farmers freely share tips, observations, and mentorship, forming a grassroots "guideline."

B	Formal Resources (Courses/Books/Media)	A few formal resources exist and are used by some, including grazing courses, seminal books (e.g., by Savory, Zietsman, Snyman), and online media/tutorials. These provide foundational principles and techniques. However, farmers note that many peers are reluctant to engage with lengthy books or academic material – indicating that while valuable information exists, the format can limit its reach.
C	Need for Local Adaptation	Farmers emphasize that advice must be adapted to local conditions. They caution that generic guidelines have limited use because each farm's environment (rainfall, veld type, etc.) differs. The best guidance (formal or informal) is that which helps farmers apply core principles to their specific context. "One-size-fits-all" prescriptions are viewed skeptically. Flexibility and context-specific examples are key for any tool or guideline.
D	Views on Practical Guidelines	There is a cautious interest in having practical tools or guidelines to aid adoption, especially for newcomers – but they must be user-friendly. Farmers suggest formats like video guides or principle-based booklets rather than dense manuals. Some feel a compiled guideline of best practices would be beneficial, while others argue nothing can replace hands-on learning. Overall, any new guideline should complement existing knowledge-sharing methods and be designed to engage farmers who may not read technical literature.

4.9 Trustworthiness and limitations (analysis specific)

The reliability of this study will be ensured by a careful application of Braun and Clarke's (2006) thematic analysis approach, which includes repeated immersion in the data through the eight transcripts, systematic coding, and thorough documentation of the researchers' analytic decision-making processes. This careful application ensures credibility, dependability and confirmability of the research. Quotes from participants were used as verbatim excerpts for each theme and sub-theme to provide direct evidence of participant statements in support of the researcher's

interpretation. Thick contextual descriptions have been provided for each theme and sub-theme to provide sufficient detail to facilitate the transferability of the findings to other cattle farming settings.

The analysis has some limitations. The interpretivist nature of the reflexive thematic analysis means that the researcher's own perspective/positionality and how they construct meaning will influence what is identified in the findings. Another researcher using the same data could identify different patterns of themes and sub-themes. The depth and richness of the themes identified in this study are influenced by the sample size and by the fact that the selected farmers were predominantly experienced and had some level of reflection on their grazing systems. The outcomes related to sustainability presented in the findings are based solely on farmer perception and do not include any objective ecological measures.

4.10 Chapter summary

The data from this study were analysed using reflexive thematic analysis of 8 in-depth interviews with cattle producers in the North-West Province. This process provided a contextualised understanding of the grazing management practices used by cattle producers in the area. Five major themes were identified as part of the study‘s secondary research questions, which illustrated the many differences among cattle-producing operations in the region, the ecological and economic benefits of using modern grazing systems, and the attitudinal and operational constraints on the use of traditional grazing practices. All interviewees stated they have seen an improvement in pasture conditions, carrying capacity, profitability, and herd health when using sustainable grazing practices.

Interviewees also expressed that there are barriers, including psychological, financial, labour and land-based issues, preventing the widespread use of sustainable grazing methods. This chapter has demonstrated that peer networks and experiential learning play a critical role in transferring knowledge regarding sustainable grazing practices.

The themes collectively provide a comprehensive and credible explanation of how cattle producers interpret grazing management in their own environments, providing the basis for Chapter 5, in which these themes are compared against the literature and the study‘s overall objective.

CHAPTER 5

RESULTS DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

The preceding chapter presented and interpreted the empirical findings, offering a detailed thematic analysis of farmers' experiences, perceptions, and challenges regarding grazing management practices. This final chapter synthesises these insights by drawing together the main conclusions of the study, outlining key recommendations, and highlighting the grazing management practices for sustainable cattle farming in the North West Province.

5.1 Introduction

This chapter will relate the findings from Chapter 4 to the study's goals and to the background provided by the literature in Chapter 2. Chapter 5 synthesises the empirically based insights to describe how cattle farmers in the North West Province of South Africa have implemented grazing practices as a means to enhance the sustainability of their cattle farming operation. This chapter will connect the thematic evidence to the research aims and provide a cohesive understanding of what constitutes sustainable grazing management for cattle farmers within this regional setting and how they utilise these practices to ensure long-term environmental and economic viability.

The motivation behind this study is due to an ongoing challenge faced by cattle farmers in the North West Province who are trying to balance their income (profitability) with their responsibility as stewards of the environment due to a variety of factors, such as changes in climate and market conditions. As a result of this pressure, many cattle farmers have historically relied on traditional grazing methods to improve the productivity of their cattle operations, which has ultimately had a negative effect on the long-term health of the rangelands they use. To address this problem, this research sought to determine alternative, sustainable grazing management practices that would promote both the sustainability of the land and increase the profitability of the farm operations.

Accordingly, the primary objective of this study was to explore grazing management practices for sustainable cattle farming in the North West Province of South Africa. The secondary objectives were:

- To establish the characteristics of cattle farming in the North West Province of South Africa.
- To explore if the current grazing management practices used in the North West Province of South Africa ensure sustainability

- To discuss why cattle farmers utilising traditional grazing management practices are resistant to adopting modern and more sustainable grazing management practices.
- To develop a practical guideline or tool for the implementation of a sustainable grazing management practice for cattle farmers in the North West Province of South Africa.

The objectives for this chapter are being addressed through the five themes which were identified as a result of the thematic analysis in Chapter 4. This will provide the connection between the results of the thematic analysis and the objectives of the study as well as to the relevant literature discussed in Chapter 2 for a theoretical context, but also for an explanation of the results. The purpose of the discussion within Chapter 5 will be to address the conclusion of the study, present practical advice for farmers and other stakeholders, discuss the limits of the current study, and provide some suggestions for future research.

5.2 Tabular display of summaries for emerging themes

Table 6: Tabular display of summaries for emerging themes

Theme 1: Diverse Farm Contexts and Strategies (Characteristics of cattle farming in NW Province)
Theme 2: Sustainability Benefits of Improved Grazing (Outcomes of current grazing practices on sustainability)
Theme 3: Mindset and Metrics (Attitudinal reasons influencing traditional vs. modern practice adoption)
Theme 4: Operational Constraints (Practical resource barriers to adopting sustainable grazing)
Theme 5: Knowledge Sharing and Guidance (Current state of and needs for grazing management guidelines/tools)

5.3 Diagrammatic representation of overarching themes

Figure 6: Diagrammatic representation of overarching themes

5.4 Discussion of the results, managerial implications and recommendations

The following section provides an overarching perspective that combines the empirically supported patterns identified in chapter four in order to demonstrate how the five themes together define the way cattle producers understand and implement grazing management techniques within the North West Province. The discussion presents a cohesive narrative of how different types of farming environments, ecological and economic consequences, psychological factors, operational limitations and social learning networks interact to support cattle producers‘ decisions regarding sustainable grazing management practices. In addition to demonstrating the linkages of these variables to the literature discussed in chapter two regarding veld ecology, stocking rate theory, and sustainable grazing principles; this integrated discussion also links sustainable grazing to the behavioural determinants of decision making, illustrating it to be a dynamic relationship among the ecological and biological process.

The integrated evidence presented here demonstrates how producers perceive and respond to ecological cues for adjusting grazing pressures, manage financial risks and develop grazing management systems based upon experiential learning. The discussion compares this research with recent studies on regenerative grazing and the behaviour of cattle producers adopting new grazing management practices. Finally, the discussion of results illustrates how the results of this study build upon, extend, and expand current knowledge and understanding of sustainable grazing management practices.

5.4.1 Grazing management practices for sustainable cattle farming in the North West Province of South Africa

5.4.1.1 Summary discussion of results

Chapter 4 illustrates how, despite the diversity of farming systems, resources, and constraints within the North West Province, the participants (farmers) are engaged in some manner, either intentionally or unconsciously, in sustainable practices. It includes a combination of ecological restoring of their farms, economically managing their business operations, and making adaptable decisions regarding their future that provides sustainability for these cattle producers. Examples of cattle farmers implementing structured grazing systems (i.e., rotational grazing, holistic grazing, and/or high density/short duration grazing) reported measurable positive changes in their pastures, increased biodiversity, and increased carrying capacities. In addition, they indicated a decreased reliance on external inputs as their land has become more resilient as a result of improved veld conditions, thus decreasing the need for supplemental feeds and veterinary interventions.

Participants emphasized that sustainable grazing management practices requires a fundamental change in thinking (not just an adaptation), as many producers have transitioned their focus from "per animal" production to "per hectare" profit. Their decision making is aligned with the condition of the rangeland and not simply by how much their animals weigh or are framed. The social process of learning has been central to this process of adopting and refining sustainable grazing management practices, especially through the interactions between farmers. A common theme for all participants regardless of the context was that sustainable grazing management practices created ecological stability, increased producer‘s financial resilience, and allowed producers to better predict the operation of their farm.

5.4.1.2 Relating the results to the literature

Literature from Chapter 2 supports empirical findings related to ecological and economic theory. Empirical findings of this study demonstrate how ecological sustainability can be improved through proper alignment of stocking rates to a farm’s carrying capacity, prevention of overgrazing and provision of sufficient rest periods for rangelands (Snyman, 2012).

Literature from Chapter 2 also notes that ecological systems will have lower long-term costs compared to unsustainable grazing management practices because they will require less supplemental feeding and veterinary care for livestock (Gillespie & Flanders, 2010). This reflects what the participating farmers experienced. Farmers reported healthier pastures produce healthier cattle, resulting in lower input costs and increased profit per hectare. Psychological and behavioural literature discussed in Chapter 2 also relate to the findings of this study, where it was found that many farmers believed their grazing decisions were influenced by perception, tradition and fear of change (Farmar-Bowers & Lane, 2009). Therefore, the findings of this research confirm both the theoretical and empirical literature: sustainable grazing improves ecological functions, reduces dependency on external inputs, and increases profitability.

5.4.1.3 Achieving the primary research objective

The study has achieved its main research objective through the identification of the types of grazing management systems being employed by farmers. An examination of how different types of grazing management systems affect ecological and economical outputs and an explanation for why some types of grazing management systems are used as opposed to other. Through the thematic analysis, the ecological, economic, and behavioural dimensions of sustainability have been portrayed as interdependent components of sustainability.

In addition, the results clearly show that in the province, farmers are using a variety of techniques (rotational grazing, rest-based recovery, adaptive stocking, animal impact, and veld observation) to achieve sustainable land management. These techniques were demonstrated to improve both the long-term carrying capacity of pastures, profit and ecological functionality when they are implemented on an ongoing basis.

5.4.1.4 Managerial implications and recommendations

Being the manager of their individual business (farming operation) in the North West Province, a farmer would benefit from making decisions based on a veld-centred approach using principles such as structured grazing, which balances utilization and rest. This research indicates that both the long-term sustainability and profitability of an operation are determined by restoring the ecosystem through low input methods instead of high input supplementation. Producing a sustainable operation for the long term will be achieved by producing grazing plans and guidelines that utilize a principle-based grazing management framework. Important factors to consider includes determining stocking rate levels based on veld health, creating learning networks among peers to provide experiential knowledge, behavioural changes, creating and utilizing local grazing plans and tracking veld indicators to provide a higher level of predictability and sustainability to the cattle operation.

5.4.2 Characteristics of cattle farming in the North West Province of South Africa

5.4.2.1 Summary discussion of results

Chapter 4 data revealed significant heterogeneity among cattle producers in the North West Province, influenced by their herd sizes, land capabilities, production objectives, environmental circumstances and marketing methods. Theme 1 describes how farm participants produce under a variety of different systems (cow-calf, stud, backgrounding and/or weaner). Regardless of the scale and intensity of their operations, they each rely heavily on the natural veld as their primary forage source.

Participants identified marked differences between the environments in which their operations were based. Sweetveld is characterized by high palatability, while other farm participants operated under sourveld or mixed grazing regimes and had to carefully distribute grazing rests and the time their animals grazed on the veld. These environmental differences and the variability in rainfall and the frequency of droughts greatly affected the decisions that farm participants made regarding their stock numbers and the various strategies and techniques they employed.

Differences exist among the types of markets that farm participants engage in. Marketing depends on whether weaners are primarily sold at an auction, through a feedlot or directly to consumers, or if they are sold as stud animals. However, regardless of the type of operation, the participants generally reported similar financial challenges. These challenges included high input costs, fluctuating cattle prices and the need to increase profitability per hectare. The combination of ecological limitations, operational diversity and economic challenges provide a profile of general practice of farming in the province.

5.4.2.2 Relating the results to the literature

Literature, referenced in chapter 2, supports findings from this study. Literature indicates the North West Province has two distinct veld types, sweetveld and mixed veld, each having different forage qualities, seasonal variations and production capacity (Smith, 2006). This was supported through participant accounts which demonstrated that a farmer‘s veld type significantly influences management decisions.

Cow–calf, feedlot-linked, backgrounding and stud farming systems are all categorised in literature concerning cattle farming systems in South Africa (Gillespie & Flanders, 2010), while participants described similar categories, thus validating the link between literature and participant experiences. In addition, literature highlighted the various resource limitations commonly experienced in the North West Province. This included unpredictable rainfall, diminishing pasture quality resulting from historically excessive stocking densities, the threat of soil deterioration and affordability of supplementary feed options. Participants confirmed the existence of these limitations, specifically the economic and environmental impacts of drought cycles and increasing input costs.

What the findings add to literature is the detailed qualitative insight into how farmers respond to the identified limitations. While literature provides general descriptions of the environmental factors affecting the North West Province, participants were able to provide detailed descriptions of how veld variability, land area, the availability of labour and infrastructure influence daily operational decision making. The findings also describe the solutions that the participants have developed over time to adapt to identified limitations. As such, the findings validated and expanded on the theory-based descriptions presented in Chapter 2.

5.4.2.3 Achieving the objective

This objective was comprehensively achieved by documenting the specific attributes that define cattle farming within the North West Province of South Africa. The goal of the study was

thoroughly accomplished through detailed documentation of the cattle-farming features unique to the province. This is due to the fact that the participant accounts have been able to capture the ecological, operational and economic characteristics which determine cattle production systems in the region. The thematic analysis provided a clear, contextualized comprehension of how producers organize their livestock, engage with market systems, utilize veld resources and address both short-term seasonal and long-term environmental challenges. The data collected through semi-structured interviews provide a comprehensive representation of local farming conditions, thus achieving this research objective fully.

5.4.2.4 Managerial implications and recommendations

Understanding the characteristics of cattle farming in the North West Province will allow farmers and farm managers to make decisions based upon a better understanding of how to best utilize the environment and therefore achieve better results. Results can be measured in terms of sustainability and profitability of the farming cattle operation. A manager must consider the limitations of his or her veld type when determining the appropriate rate of stock (stocking rate) to place on the veld, how often to graze (grazing tempo), and how much time to allow for the veld to recover between each grazing event (recovery period). Since the financial sustainability of the farm is heavily dependent on the health of the ecosystem (ecological condition), it would be sensible for the farmer to implement grazing management practices that optimize the use of resources and minimize the risks associated with drought conditions.

A cattle farmer must determine what production system is most suitable for their operation based on the productive capabilities of the land they are utilizing, the capacity of their operation and their long term goals. In addition, recognizing the pressure placed on the regional economy through droughts, cattle farmers may enhance the overall resiliency of their operations by decreasing their reliance on expensive supplemental feed, increasing the functional value of their animal units and developing flexibility into their marketing and sale procedures. Industry organizations, extension service providers, and policy makers can utilize this information as a basis for providing customized training programs, support programs, and risk mitigation strategies to address the unique circumstances of cattle producers located in the North West Province of South Africa.

5.4.3 Sustainability of grazing management practices currently implemented by cattle farmers in the North West Province of South Africa

5.4.3.1 Summary discussion of results

Grazing management practice types were found in participant responses to be across a range of practices (from the more common continuous grazing to regenerative grazing). Some participants described rotational grazing systems employing different numbers of camps, time-based or holistic grazing practices. Some participants employed ultra-high density grazing for part of the year, while still others applied various forms of resting depending on their experiences with variable rainfall events. In addition to rotational grazing some farmers also described selective grazing and a number of other respondents reported relying on natural ecosystem cues to inform where they would move next with their livestock.

One key finding is that these are not prescriptive models. Each farmer has developed an adaptable model or toolbox of methods, including the use of herd size, land availability, labour capability, and willingness to take risk, to meet their individual needs. Those that employ traditional grazing methods have at times made modifications to improve their grazing management practices, such as increasing rest periods, or applying high-density grazing to promote new plant growth. There is a consistent emphasis in each of the contexts on adaptability and adjusting when and how long grazing occurs as a function of veld condition.

5.4.3.2 Relating the results to the literature

Chapter 2 literature discusses several forms of grazing systems or practices for cattle management in South Africa, such as continuous grazing, rotational grazing, multi-paddock grazing, and highly intensive regenerative grazing (Fynn *et al.*, 2017). These models are reflected by the farmer‘s empirical results. The farmer’s grazing management practices typically combine various techniques, as opposed to adopting them in a pure form. This could be considered hybrid forms of these models. Research has established that rotational and holistic grazing systems are better for the ecosystem through the recovery of plant roots, the improvement of soil quality, and through increasing the biodiversity of pastures (Zietsman, 2014). This corresponds with many of the farmer‘s reports on improved veld condition and higher veld carrying capacities (Snyman, 2012).

However, the empirical research differs from the literature in terms of the level of practicality. While literature typically portrays the grazing management practice in an idealized or categorized format. The farmers‘ perspectives portray the grazing management practice through the

application of a few underlying principles (i.e., rest, movement, and observation) rather than through a specific type of framework (i.e., rotational, holistic). In doing so, the results provide further evidence that sustainable grazing is adaptable and not simply a set of fixed formulas.

5.4.3.3 Achieving the objective

The study effectively defined and explained a number of grazing management practices that were employed by farmers in the North West Province. In addition to identifying a number of grazing management practices, Themes 1 and 2 provide a complete description of the actuality of structuring, adapting and refining grazing practices as they occur in reality to ensure sustainability. Rich qualitative descriptions clearly demonstrate the diverse and flexible nature of grazing management practices being used by farmers. The combination of the farmer‘s use of planned grazing movements and the resources available to monitor the resources being grazed, combined with the ability to adaptively manage the system or practice results in long term ecological restoration and improvement of the veld. At the same time, rotational and holistic grazing management practices provides a financially sustainable and operationally continuous framework for achieving a comprehensive perspective of sustainability based on the experience of the farmer and an understanding of how the ecosystem functions.

5.4.3.4 Managerial implications and recommendations

Farmers and farm managers need to be aware of the fact that sustainable grazing does not have to include a specific branded approach. Rather, a consistent application of key ecological principles. Prioritizing development of grazing plans based on recovery (for example, through fencing or mobile infrastructure if possible), training personnel to recognize veld indicators, and transitioning institutions providing extension services from prescribing ‘one size fits all‘ solutions to promoting adaptive management approaches that are aligned with both local environmental and operational constraints will also aid in achieving effective, profitable and sustainable grazing management practices.

5.4.4 Farmers utilising traditional grazing management practices are resistant in adopting modern grazing management practices

5.4.4.1 Summary discussion of results

The findings from Chapter 4, particularly Theme 3 (Mindset and Metrics) and Theme 4 (Operational Constraints) highlight how psychological, cultural, economic and operational obstacles create resistance to sustainable grazing management practices. Participants stated

that long established grazing practices have been part of their family history, their self-confidence and expertise as farmers and therefore would be hard to change. Most of the farmers measure production using observable measures of animal performance such as body condition, growth rates and weaning weights, and therefore believe their traditional methods "work well-enough", even though veld degradation is slow. Fears of change, uncertainty regarding outcomes and the perceived risks of changing production patterns are significant barriers to adoption.

Operational barriers to adopting sustainable grazing practices add to the barriers. The farmers indicated that rotational or high-density grazing will require costly fencing, water infrastructure and labour. The limited land availability, fragmented nature of grazing areas and the time frame required to observe ecological changes are all barriers to the adoption of sustainable grazing practices. A number of participants pointed out that a shift in thinking from measuring animal performance to profit per hectare is required to implement sustainable grazing practices, and this may be difficult for farmers who have traditionally measured their success by animal performance indicators. This evidence suggests that financial costs, perceived risks, identity and resource constraints are common barriers to adoption.

5.4.4.2 Relating the results to the literature

Findings from this study are consistent with research indicating both behavioural and structural barriers to implementing sustainable grazing management practices. Traditional indicators, such as personal or family experience and generational customs and traditions, have historically outweighed scientific data for farmers regarding their decision to implement sustainable grazing practices (Meijer *et al.*, 2015).

Findings of operational limitations, including those identified in this study, are supported by the literature. Oduniyi *et al.* (2020) and Snyman (2012) indicate that high costs associated with infrastructure, labour requirements and limited land availability significantly affect adoption rates. The literature also indicates that pasture recovery can take years, discouraging adoption among farmers who lack the resources to afford such extended time periods. Evidence collected during this study suggests that some farmers questioned whether newer methods would provide consistent results under fluctuating weather conditions, thus supporting one of the risk perception barriers identified in Chapter 2. The study's findings validate the behavioural, psychological, and structural barriers described in the literature, while adding depth through qualitative insight into farmers lived experiences and the emotional dimensions underlying resistance.

5.4.4.3 Achieving the objective

The objective was to identify and explain all of the interconnected factors that contribute to resistance to the modern application of sustainable grazing management practices. The themes developed through the participants' stories were both the practical and cognitive/cultural impediments that limit individuals when making decisions. As a result of the participant's narratives and thematic evidence, it has been found that resistance to sustainable grazing systems does not stem from an individual's lack of awareness, however, it is based on other barriers such as risk aversion, knowledge passed down through generations, limited resource availability, emotional attachment to past ways of doing things and uncertainty about what to expect with different types of grazing management systems. Thus, the results provide a deeper and more complete explanation for the slow rate of adoption of sustainable grazing management practices in spite of their documented environmental and economic benefits.

5.4.4.4 Managerial implications and recommendations

Farmers, extension agents and policy makers must recognise that resistance to the adoption of sustainable grazing management practices is not a solely technical problem. The problem also has behavioural and socio-cultural components. Therefore, effective approaches should emphasise experiential learning opportunities, peer-to-peer mentorship and on-farm demonstration projects where farmers may see veld (grassland) recovery and profit increases first-hand. By addressing the psychological as well as the operational barriers identified within this study, decision-makers will have a better chance at increasing the level of confidence of farmers and decreasing the degree of uncertainty surrounding the use of sustainable grazing management systems in the North West Province.

5.4.5 Guideline or tool for sustainable grazing management practices in the North West Province of South Africa.

5.4.5.1 Summary discussion of results

In Theme 5, it became evident to the researcher that farmers appreciate tools based on principles as well as practicality, however they tend to be wary of prescriptive manuals. Participants in the study were very clear that grazing must be conducted with an understanding of how it affects each individual's unique environment (or ecosystem). Guideline should for grazing management practices should be focused on the ecological principles behind grazing rather than step-by-step instruction. All participants agreed that the best way to learn new information and gain experience

is through other farmers who have demonstrated their own ability to implement what has been learned. This can occur at demonstration sites, through field days, or as a result of mentorship.

Most participants stated that they would prefer video content, brief summaries, or hands-on experiences, versus lengthy written instructional materials. Many participants suggested taking the primary regenerative grazing concepts and making them easily available in some format. Others emphasised that observing actual examples from real-world applications cannot be replicated.

5.4.5.2 Relating the results to the literature

Research from Chapter 2 identifies knowledge gaps and behavioural resistance as the major barriers to the adoption of a sustainable grazing management practice for cattle production (Oduniyi *et al.*, 2020). The research has demonstrated that farmers have a high degree of reliance upon their network of trusted contacts and experiential learning over the formal extension materials they use. The literature also indicates that for farmers to effectively utilise tools, they must be both local and adaptable and based on ecological and profitable principles. This finding was reinforced through participant comments (Labuschagne, 2018). The study‘s findings support the literature indicating that, when adopting sustainable grazing management practices, guidance must be available, credible and practical.

5.4.5.3 Achieving the objective

The research aimed to achieve this research objective through a description of the nature of the preferred tools and the factors that are likely to lead to an increased likelihood of their adoption. The study identifies that principle-based guidelines and using experiential learning (practical on-field learning) represent the best means of achieving significant, sustainable behavioural and practice changes in farming. Therefore, it has provided an evidence base for the type of support required for greater levels of adoption.

5.4.5.4 Managerial implications and recommendations

Farmers and farm managers can encourage the development of short, easy-to-understand, principle-based guidelines that are supported through demonstration farms and mentorship networks. Extension methods should include video-based instruction, hands-on learning opportunities on-field, and peer-to-peer sharing of information. These methods should also enable the use of tools that teach decision-making processes (i.e., how to think) as opposed to specific steps (i.e., what to do), which will allow farmers to apply grazing management practices in a way that is relevant to their location. This will support quicker adoption of grazing management

practices and contribute to better long-term sustainability and profitability of cattle farming operations.

5.4.6 Discussion of results summary

In summary, sustainable grazing management practices in the North West Province emerges from the dynamic interaction between ecological processes, economic pressures, behavioural perceptions, and practical constraints.

5.5 Strength of evidence and credibility checks

The strength of the evidence in this study is based upon the consistency of the research objectives and the qualitative approach used, as well as the thematic patterns that were identified through all the interviews. Since this study focused on exploring cattle farmer's perspectives on grazing management practices in the North West Province, the use of semi-structured interviews was an effective way for farmers to articulate their personal experiences and how they make decisions relative to grazing management practices using their own words. These contextualized perspectives provided a high degree of richness and depth relative to the interpretivist paradigm discussed in chapter three. Furthermore, these perspectives provided a high degree of credibility for the findings since the themes were rooted in the actual lived realities of the farmers and not developed by the researcher through analytical imposition.

Participants' shared experiences were further supported as the same key issues emerged throughout their perspectives and experiences. Although the individual herd sizes, grazing practices, and number of years of farming experience differed between the participants, all participants reported similar challenges; long-term environmental stress of the veld, the conflict of economic pressures vs. sustainable grazing, influence of tradition and practical barriers to adopting improved grazing management practices. This is an indicator that these key issues are a common experience for the majority of the province and that the results have been reliable as opposed to being based upon individual opinions.

The credibility of the study was also demonstrated through the systematic method that was used to analyse the data. As outlined within Chapter 3, a reflexive thematic analysis, as suggested by Braun and Clarke (2006), provided a systematic approach for developing the themes from the data. It involved carefully moving back and forth among the data, codes, and larger patterns. The

field notes taken by the researcher during the interviews also provided an additional layer of context in terms of capturing the tone, emphasis and non-verbal cues associated with each farmer‘s responses. These field notes provided evidence of confirmability by demonstrating that the researcher‘s interpretations were based on what the farmers had said in the interviews rather than on the researcher‘s own assumptions.

The transferability was enhanced by providing sufficient information on the ecological, financial and cultural context of cattle farming in the North West Province. This includes a description of rainfall patterns that are typical of the area; the local grazing capacity; and what influence traditional norms have on the decision-making of farmers. The study has provided this information in order to enable readers to determine the degree to which the results of the study can be applied to other semi-arid livestock production areas of South Africa.

Qualitative evidence from this study is further reinforced through the transparency of an audit trail. The researcher has documented his actions at each stage of the research, including data collection, transcription, coding, refining themes, and interpreting them. This documentation of the ways in which he arrived at his analytic decisions demonstrates the reliability of the findings. While qualitative research is not designed to lead to generalizable results, the credibility checks used here (coherence, reflexivity, consistency with interviewees, and contextual grounding) collectively contribute to establishing confidence in the identified patterns and subsequent conclusions.

5.6 Contributions of the study

The results of this research contribute to the overall body of knowledge in sustainable cattle farming by supplying an empirical and localized insight into how cattle farmers in the North West Province of South Africa interpret, implement and adapt their grazing management practices. The study also provides additional qualitative data to advance the current literature in terms of the interaction between ecological sustainability, profitability per hectare, and behavioural change to achieve sustainable grazing management practices and outcomes.

The results of this research study further contribute to the development of theory by showing how farmers make decisions based upon ecological cues, experiential learning, perceived risks, and operational limitations which can be used to explain why some grazing management practices are adopted while others are resisted. Finally, the results of this research also provide practical implications by identifying the types of guidelines, tools, and knowledge sharing mechanisms that are available to facilitate the transition to sustainable grazing management practices and offer

actionable recommendations for farmers, extension agents, and policy makers interested in enhancing ecological resilience and economic viability in the cattle industry of the North West Province.

5.7 Limitations of the study

The research has provided useful knowledge for sustainable grazing practices in the North West Province. There is a considerable potential for additional insight.

- The qualitative nature of the research, though providing rich context and allowing for the development of deep insights into the views and opinions of participants, limits the size of the sample to a relatively small number of farmers who have either practiced sustainable grazing or are aware of the concepts of sustainable grazing. This likely resulted in fewer diverse viewpoints being represented in the research findings.
- The geographical scope of the study was restricted to a single province. Caution should therefore be taken when attempting to generalize the findings of this study to other areas in South Africa that differ in terms of climate and ecology.
- The results of the study were based upon the self-perceived experiences of the farmers. Their perception of how they practice sustainable grazing as well as their perceptions of the ecological implications of their grazing practices is a very personalized viewpoint.
- Time and resource constraints also contributed to the lack of inclusion of long-term observational data, which would have provided stronger evidence of the ecological impacts of the grazing systems studied.

However, the study does provide a credible and meaningful contribution to the body of knowledge related to sustainable grazing practices in the North West Province.

5.8 Recommendations for future research

5.8.1 Comparative studies across provinces

Future studies can include comparisons of other South African Provinces that have varying climate conditions and types of grassland (veld) than the North West Province. These studies will help evaluate how regional rainfall trends, soil type, land tenure systems, and market access impact the feasibility and acceptance of sustainable grazing practices.

5.8.2 Economic analyses of grazing management practices

Economic evaluations of historical nature can be done in a way to use detailed financial information to determine if past and present sustainable grazing systems are profitable over a period of time. The author of this study relied upon farmer opinion and qualitative economics in their study; however, future studies may provide an analysis of gross margin, input cost, cash flow stability and return on capital based on multiple seasons or years. These results will provide risk-averse farmers and bankers with tangible evidence to support the business reasons to abandon high-input, environmentally degrading practices.

5.8.3 Development and evaluation of principle-based guidelines and tools

Future research could be to develop, test and evaluate (with a focus on sustainability) recommendations and practical tools for sustainable grazing management practices that are applicable to cattle farmers in the North West Province. During this study, participants stated that the future tools for sustainable grazing should take an ecological approach to grazing management and provide decision-making frameworks and not strict guidelines and that the tools should be presented in a variety of ways (written documents, visual materials, videos, etc.) and in a variety of formats. The findings from these types of studies will help identify what type of support will enable cattle farmers to adopt, implement and sustain sustainable grazing systems.

5.9 Chapter summary

Chapter 5 integrated the empirical findings with the relevant literature to illustrate how sustainable grazing management practices in the North West Province is determined by ecological dynamics, economic conditions, behavioural views, and operational challenges. This chapter illustrated that the study‘s objectives were met, described both the study‘s strengths and weaknesses, and identified specific avenues for enhancing sustainable grazing practices and future research. Together, this provides a comprehensive understanding of how farmers may improve their ecological resilience and financial viability as they use evidence-based grazing management techniques.

5.10 Conclusion to the study

This study provided an in-depth exploration of grazing management practices in the North West Province, demonstrating how ecological realities, economic pressures, and farmer perceptions collectively shape the sustainability of cattle farming systems. The research identified the means through which ecological and principle based grazing can create a sustainable grazing ecology, improve financial stability, and sustain long-term viability. The results provide useful information

for supporting cattle producers, extension agents and policy makers to promote ecologically sustainable, financially stable, and responsive grazing management systems for cattle producers in the North West Province of South Africa.

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ANNEXURES

ANNEXURE A: INFORMED CONSENT

NWU Business School
Private Bag x6001
Potchefstroom, 2520

DEAR PARTICIPANT

INFORMED CONSENT TO COMPLETE INTERVIEW

You are invited to **participate in a research study** that forms part of a Master of Business Administration (MBA) degree. Please take a moment to review the information presented here, which outlines the details of this study. Please ask the researcher or person explaining the research to you any questions about any part of this study you do not fully understand. You must be fully satisfied that you know this research and how you might be involved. Also, your participation is entirely voluntary, and you are free to decline participation. This will not affect you negatively in any way whatsoever. You can also **withdraw** from the study at any point, even if you agree to participate now.

This study has been approved by the NWU Economic and Management Sciences Research Ethics Committee (EMS-REC). It will be conducted in accordance with the ethical guidelines and principles of North-West University and other international ethical guidelines applicable to this study.

Title of the study: Exploring grazing management practices for sustainable cattle farming in the North West province of South Africa.

Institution: NWU Business School

Ethics Reference Number: NWU-00858-25-A4

Names and contact details of project staff

	Supervisor	Researcher
Title, name & surname	Prof JN Lekunze	Mr. Franco J. van Rensburg
Full Names	Prof Joseph Nembo Lekunze	Frans Nicolaas Janse van Rensburg
Function in Study	Principal Investigator	Researcher
Contact details	Joseph.lekunze@nwu.ac.za;	Francojvrensburg2@gmail.com

What is this research study all about?

Exploring grazing management practices for sustainable cattle farming in the North West province of South Africa.

Eligibility

For a farmer to be eligible to participate in this study, He/she must not be less than 18 years old and must have 100 or more cattle on the farm

The **inclusion criteria** for farmers using a particular grazing management practice on their cattle farms will be as follows:

Farmer must be at least 18 years of age

- The farmer must actively implement a particular grazing management practice on his or her farm.
- The farmer must have 100 or more cattle. Larger-scale cattle farmers are more likely to possess diverse and long-term experience with different grazing techniques, facilitating deeper insights and more significant comparisons between grazing management practices.
- The farmer must collect data in an accurate and traceable manner.
- The farmer must be in the North West province of South Africa.
- The farmer must have implemented the grazing management practice for at least three years to ensure repeatability of data over different seasons and more extended periods.

- The farmer must be willing to participate in an in-person, face-to-face interview and share relevant information about their management practices.

What will be expected of you?

You will be expected to:

- Participate in an interview, which should take approximately 45-60 minutes.
- Respond to the questions openly and honestly.
- This interview will be conducted at your most comfortable times.
- Expected to sign the consent form, you are willing to participate in this research willingly.

The interview will be **recorded** to ensure accuracy and preserve the essence of your responses. You will have the option to review or listen to the recorded information upon your request or to receive a transcript of the interview.

Confidentiality & Popia (Protection of Personal Information Act) Compliance:

(1) The researcher will respect the privacy and confidentiality of data and information by not including the names of the involved farmers or their farming entities in the study. **(2)** A **unique participant code** will be used in all documentation and data files to ensure confidentiality.

(3) The information provided by one farmer will not be discussed or revealed to another farmer during the face-to-face interviews or data collection process.

(4) The recordings of the interviews, all data obtained, transcripts and information will be stored in a cloud-based folder protected by a specific username and password. Only the researcher and the supervisor will have access to the folder.

(5) This folder will be permanently deleted three years after the completion of the degree.

(6) All information will only be used for the purposes of this academic study and will not be shared with any third parties.

Potential Risks & Benefits Risks:

- Minimal risk is associated with this study.

Benefits:

- Your insights may contribute to sustainable grazing management practices for cattle farmers in the North West Province of South Africa.

Ethical Approval

This study has been approved by the **NWU Economic and Management Sciences Research Ethics Committee (EMS-REC)** and complies with the ethical standards of North-West University and international research guidelines.

Declaration by participant

By selecting the option below, I agree to participate in the research study:
Exploring grazing management practices for sustainable cattle farming in the North West province of South Africa.

1. I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions, and have these answered satisfactorily.

2. I voluntarily agree to participate in this research.

3. I understand that, as I have completed the study anonymously, it will not be possible to remove any information I have provided, as you will not be able to identify me in any way.

4. No incentives will be given to participants as your participation is voluntary

5. I understand that I can decide to withdraw from the study at any time.

6. I understand that this interview will be recorded.

7. I understand that individuals from the University may review anonymous research data collected during the study to ensure that it is conducted appropriately.

8. I agree that my anonymous information can be shared with individuals from the abovementioned project team.

9. The data will be publicly made available in the form of results publications in peer-reviewed journal articles or conference papers.

In the box provided below, please Tick Yes or No to indicate if you agree or disagree to participate in this project.

I agree to take part in the above study	Yes	No

Date : _____

ANNEXURE B: ETHICS APPROVAL LETTER

Private Bag X1290, Potchefstroom
South Africa 2520
Tel: 018 299-1111/2222
Fax: 018 299-4910
Web: http://www.nwu.ac.za
Senate Committee for Research Ethics
Tel: 018 299-484
Feziwe.Mseleni@nwu.ac.za

16 September 2025

ETHICS APPROVAL LETTER OF STUDY

Based on approval by the **North-West University Economic and Management Sciences Research Ethics Committee (EMS-REC)** on 16 September 2025 , the Economic and Management Sciences Research Ethics Committee hereby **approves** your study as indicated below. This implies that the North-West University Senate Committee for Research Ethics (NWU-REC) grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the study may be initiated, using the ethics number below.

Study title:	Exploring grazing management practices for sustainable cattle farming in the North West province of South Africa		
Study leader/Supervisor (Principal investigator/Researcher:	Prof J.N. Lekunze	**University no.:**	17112923
Student:	Mr F.N. Janse van Rensburg	**University no.:**	29344999

Ethics number: NWU-00858-25-A4

Institution | Study number | Year | Status

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

Application type:	Single study - Postgraduate research	**Risk level:**	Low/minimal risk
Commencement date:	9/16/25		
Expiry date:	9/16/26		

Approval of the study is initially provided for a year, after which continuation of the study is dependent on receipt and review of the annual (or as otherwise stipulated) monitoring report and the concomitant issuing of a letter of continuation.

Special in process conditions of the research for approval (if applicable):

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, the following general terms and conditions will apply:

- *The study leader/supervisor (principal investigator)/researcher must report in the prescribed format to the EMS-REC:*
  - *annually (or as otherwise requested) on the monitoring of the study, whereby a letter of continuation will be provided, and upon completion of the study; and*
  - *without any delay in case of any adverse event or incident (or any matter that interrupts sound ethical principles) during the course of the study.*
- *The approval applies strictly to the proposal as stipulated in the application form. Should any amendments to the proposal be deemed necessary during the course of the study, the study leader/researcher must apply for approval of these amendments at the EMS-REC, prior to implementation. Should there be any deviations from the study proposal without the necessary approval of such amendments, the ethics approval is immediately and automatically forfeited.*
- *Annually a number of studies may be randomly selected for an external audit.*
- *The date of approval indicates the first date that the study may be started.*
- *In the interest of ethical responsibility, the NWU-SCRE and EMS-REC reserves the right to:*
  - *request access to any information or data at any time during the course or after completion of the study;*
  - *to ask further questions, seek additional information, require further modification or monitor the conduct of your research or the informed consent process;*
  - *withdraw or postpone approval if:*
    - *any unethical principles or practices of the study are revealed or suspected;*
    - *it becomes apparent that any relevant information was withheld from the EMS-REC or that information has been false or misrepresented;*
    - *submission of the annual (or otherwise stipulated) monitoring report, the required amendments, or reporting of adverse events or incidents was not done in a timely manner and accurately; and / or*
    - *new institutional rules, national legislation or international conventions deem it necessary.*
- *EMS-REC can be contacted for further information or any report templates through the secretariat. Botlenyana Maluleka (Botlenyana.Maluleka@nwu.ac.za/ +27 18 2852436) or the chair Prof Diana Viljoen-Bezuidenhout (Diana.Viljoen@nwu.ac.za / +27 16 9103403).*

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

Yours sincerely,

Prof Diana Viljoen

Digitally signed by Prof Diana Viljoen
Date: 2025.09.26 14:23:53 +02'00'

Prof Diana Viljoen-Bezuidenhout

Chairperson: NWU Economic and Management Sciences Research Ethics Committee

ANNEXURE C: REGISTRATION OF TITLE

NWU Higher Degree Administration

Private Bag X1290, Potchefstroom
South Africa 2520

Higher Degree Administration
Email: nauma.blom@nwu.ac.za

10 September 2025

Dear Mr Janse Van Rensburg

REGISTRATION OF TITLE

At the recent meeting of a relevant committee meeting of the Business School your title was approved as follows:

Exploring grazing management practices for sustainable cattle farming in the North West Province of South Africa

The above-mentioned title may under **no circumstances** be changed without consulting your supervisor and obtaining the approval from the relevant committee in the mentioned faculty, in regard of which this office must be furnished with the latest approved title.

In the instance that you wish to submit for examination, please inform your supervisor/promoter accordingly.

Upon approval of your supervisor/promoter, please ensure that the Notice of Submission form is submitted **three months** in advance to this office.

Note that the Notice of Submission-form is available at the link:

Forms that support the Examination process.

For ease of reference, herewith links to the following useful resources:

- General Academic Rules (A-Rules);
- Manual for Master's and Doctoral Studies;
- Policy on academic integrity;
- Forms that support the study guidance process;

We wish you a pleasant and successful period of study.

Yours sincerely

Mrs N Blom
for REGISTRAR

Original details: (10812187) M:\HDA Toolbox\Phase 2\1 Title Registration\Title registration letter.docm
28 February 2025

File reference: 7.1.11.1.2

ANNEXURE D: INTERVIEW SCHEDULE

Interview Schedule

1. Dear Participant

You are invited to participate in an interview for research conducted by Mr. Frans Nicolaas Janse van Rensburg for the MBA program at North-West University Business School, Potchefstroom campus. The research's purpose is **"Exploring grazing management practices for sustainable cattle farming in the North-West province of South Africa."**

This study will examine grazing management practices for sustainable cattle farming in the North-West Province of South Africa. The selected participants will share their daily experiences in face-to-face interviews. This research will follow an interpretive approach to gain fresh insights into management challenges faced by cattle farmers. Please review the attached consent document and sign if you consent to participate in this study. The interview will take approximately 45-60 minutes of your time.

2. Student Name

Mr. Frans Nicolaas Janse van Rensburg

Cell: 0726899629

Email: francojvrensburg2@gmail.com

3. Supervisor

Prof JN Lekunze

Cell: 0837197640

Email: Joseph.Lekunze@nwu.ac.za

Section A ***(Aligns with the first secondary research question: What are the characteristics of cattle farming in the North-West province of South Africa?)***

Question 1: Farm Profile & Herd

- Can you describe your cattle farming operation, including the size of your herd, and the number of years you have been farming in the North-West province?

Question 2: Production System & Land Use

- Can you please explain to us what type of production system is being used on your farm and why?

Question 3: Resource Availability & Constraints

- Describe to us the natural resources available on your farm, and what are the challenges associated with the effective use of these resources? (grazing land, water, and supplementary feed)

Question 4: Market Context

- Would you please describe to us how market conditions in the North-West province affect the day-to-day cattle farming operations (market access, meat prices, marketing) ?

Question 5: Cattle farming context in the North-West Province

- Could you please tell us briefly what makes your farming operation unique from those of other farmers in the same area and South Africa at large?

Section B ***(Aligns with the second secondary research question: Do the current grazing management practices followed by farmers in the North-West province of South Africa ensure sustainability?)***

Question 6: Current Grazing Management Practices

- Can you explain the effectiveness of the grazing management practices you currently use on your farm?

Question 7: Perceived Ecological Impact

- Could you explain to us how these practices affect the condition of your pastures and soil health on your farm?

Question 8: Economic and Production Outcomes

- Could you please describe to us how the current grazing management practices have affected your cattle herd's profitability, and production costs?

Question 9: Sustainability and Long-Term Viability

- In your opinion, explain to us whether the current grazing management practices support the long-term sustainability of your farm or not?"

Section C ***(Aligns with the third secondary research question: Why are some cattle farmers in the North-West province of South Africa still using traditional grazing practices as opposed to adopting modern, more sustainable grazing management practices?)***

Question 10: Perceptions and Attitudes

- Could you please discuss your view on modern sustainable grazing management practices versus traditional grazing management practices (how will you define the practices)?

Question 11: Barriers to Adoption

- In your view, could you please explain to us the challenges or obstacles that prevent cattle farmers from adopting sustainable grazing management practices, and discuss why those who still utilise traditional grazing management practices are resistant to adopting modern and more sustainable approaches?

Section D ***(Aligns with the fourth secondary research question: Are there any existing practical guidelines or tools that have been developed for the implementation of sustainable grazing management practices in the North-West province of South Africa?)***

Question 12: Knowledge of Guidelines or Tools

- Could you please tell us if there is any existing guidelines, manuals, or tools assisting farmers in implementing sustainable grazing management practices?

Question 13: Need for a Practical Guideline

- Please explain to us whether a practical guideline or tool is needed for cattle farmers in the North-West Province and why.

Thank You for your Patience and time

ANNEXURE E: LANGUAGE EDITING CERTIFICATE

RUAN FOURIE

COPYEDITING CERTIFICATE

EXPLORING GRAZING MANAGEMENT PRACTICES FOR SUSTAINABLE CATTLE FARMING IN THE NORTH WEST PROVINCE OF SOUTH AFRICA

by FN Janse van Rensburg

Be it hereby certified that the abovementioned mini-dissertation has been copyedited and proofread for accuracy, clarity, and proper English usage.

ruanfourie23@gmail.com
082 068 6077