

AFRICA UNIVERSITY
(A United Methodist-Related Institution)

TURNING SMALL SCALE CATTLE FARMING INTO A
SUSTAINABLE BUSINESS

BY

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF EXECUTIVE MASTER'S IN BUSINESS
ADMINISTRATION IN THE COLLEGE OF BUSINESS, PEACE, LEADERSHIP
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Abstract

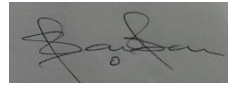
This research aimed to explore the potential for transforming small-scale cattle farming into a sustainable business. The study delved into the challenges faced by small-scale cattle farmers such as limited resources, lack of access to markets, and environmental concerns. Additionally, the research investigated various strategies and best practices that could be adopted to enhance the sustainability of small-scale cattle farming operations. These included implementing improved grazing techniques, integrating renewable energy sources, and adopting innovative business models. The findings of this study contributed to a deeper understanding of the opportunities and barriers associated with transitioning small-scale cattle farming into a sustainable business, thereby providing valuable insights for policymakers, researchers, and practitioners in the agricultural sector. In conclusion, transforming small-scale cattle farming into a sustainable business requires a multifaceted approach that addresses various challenges while capitalizing on opportunities. Through the implementation of efficient resource utilization, adoption of animal welfare practices, access to markets, and commitment to environmental stewardship, small-scale cattle farmers can enhance their viability and resilience in the industry. Additionally, fostering a culture of innovation, diversification, and value-added products can further elevate profitability and sustainability. To foster the transformation of small-scale cattle farming into sustainable businesses, the study recommended to prioritize investment in training and education for farmers, facilitating collaboration and networking among stakeholders, advocating for supportive policies, promoting diversification and value addition, emphasizing environmental conservation practices, and facilitating market access through cooperative marketing initiatives. By implementing these recommendations, policymakers, agricultural organizations, and stakeholders can support the resilience and profitability of small-scale cattle farming enterprises while contributing to rural development and food security.

Keywords: Small Scale Cattle Farming, Sustainable Business, Farming operations,
Agricultural sector

Declaration

I declare that this dissertation is my original work except where sources have been cited and acknowledged. The work has never been submitted, nor will it ever be submitted to another university for the award of a degree.

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Acknowledgement

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Dedication

This dissertation is dedicated to my kids, Rumbie and Tatenda.

List of Acronyms and Abbreviations

AGRITEX	Agricultural Extension
AI	Artificial Insemination
ART	Assisted Reproduction Techniques
AU	Africa University
ET	Embryo Transfer
IVF	In-Vitro Fertilization
SPSS	Statistical Package for Social Sciences
SWOT	Strengths Weaknesses Opportunities and Threats

Definition of Keys Terms

Small-scale cattle farming refers to the practice of raising a relatively small number of cattle on a limited land area, typically by individual farmers or families rather than large-scale commercial operations.

A sustainable business is an enterprise that operates in a manner that meets the needs of the present without compromising the ability of future generations to meet their own needs. It involves integrating economic, social, and environmental considerations into its decision-making processes and practices.

Farming operations refer to the activities involved in managing and maintaining agricultural land for the purpose of producing crops, livestock, or other agricultural products. These operations encompass a wide range of tasks and processes, including land preparation, planting, cultivation, irrigation, pest and disease management, harvesting, and post-harvest handling.

The agricultural sector encompasses all activities related to the cultivation of crops, raising of livestock, and production of other agricultural commodities. It plays a fundamental role in providing food, fiber, and other raw materials essential for human consumption and industrial processes. The agricultural sector includes a diverse range of activities, from traditional small-scale farming to large-scale commercial agriculture, as well as agribusinesses involved in processing, distribution, and marketing of agricultural products.

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CHAPTER 1: INTRODUCTION

1.1 Introduction

Small scale cattle farming is a vital component of the agricultural industry, providing food and livelihoods for countless individuals and communities. However, the sustainability of such enterprises remains a pressing concern. As the demand for livestock products continues to rise, it becomes increasingly important to explore ways in which small scale cattle farming can be transformed into a sustainable business. This research is an investigation of the various strategies, practices, and technologies that can be implemented to enhance the sustainability of small-scale cattle farming, ensuring its long-term viability while minimizing its environmental impact. By examining analyzing existing literature, and conducting interviews with relevant stakeholders, this study provides valuable insights and recommendations to support the transition towards a more sustainable future for small scale cattle farming.

1.2 Background to the study

Cattle farming has been a significant contributor to the global agriculture sector for centuries, providing essential resources such as meat, milk, and leather. In recent years, there has been a growing concern regarding the sustainability of cattle farming practices, particularly on small-scale farms. Small-scale cattle farming refers to operations that typically have limited land, resources, and capacity to generate significant profits. However, these farms often play a crucial role in rural economies, providing livelihoods for many farmers and contributing to local food production.

The sustainability of small-scale cattle farming has become a pressing issue due to various challenges. Firstly, the environmental impact of conventional cattle farming methods, such as overgrazing, soil erosion, and excessive water usage, has raised concerns about long-term ecological damage. Additionally, the intensive use of chemical fertilizers and antibiotics can contribute to water and air pollution, as well as potential health risks for both animals and humans.

Another challenge faced by small-scale cattle farmers is the economic viability of their operations. Limited access to capital, high production costs, and fluctuating market prices can make it difficult for these farmers to sustain their businesses and generate a stable income. This often leads to a cycle of poverty, leaving farmers vulnerable to economic shocks and a lack of alternative livelihood opportunities.

As a result, there is a need to explore strategies and interventions that can help turn small-scale cattle farming into a sustainable business.

Therefore, this study investigated the potential pathways for transforming small-scale cattle farming into a sustainable business model. By examining the challenges faced by small-scale cattle farmers and identifying feasible strategies, this research provides valuable insights and recommendations for small-scale cattle farmers and other relevant stakeholders.

1.3 Statement of the problem

Small-scale cattle farmers in Chimanimani district are faced with challenges in their quest to turn around cattle farming from subsistence farming into sustainable businesses. The researcher made observations that opportunities exist to address such challenges as environmental degradation, lack of resources, lack of technology lack of business management knowledge and poor access to markets contribute to small-scale farmers' struggles to make cattle farming a sustainable business.

This research project assisted to establish key areas of improvement for sustainability of small-scale cattle farming in Chimanimani district in Zimbabwe.

1.4 Research Objectives

The research aims to:

- i. Identify the main challenges faced by small scale cattle farmers in terms of financial resources and access to capital.
- ii. Identify the best management practices that can enhance cattle productivity and profitability.
- iii. Identify the available technologies and techniques that can be adopted by farmers to enhance productivity and efficiency.

1.5 Research Questions

The research intends to answer the following questions:

- i. What are the key challenges faced by small scale cattle farmers in attempting to run a sustainable business?
- ii. What practices can be adopted to improve productivity and profitability?
- iii. How can farmers leverage on technology and techniques?

1.6 Assumptions made

The expectations below are statements that explain the predictions to be tested by the research, (Jansen, 2020). The following are assumed answers to the research questions:

- i. Small scale cattle farmers face various challenges in running a sustainable business, such as limited access to resources and capital, difficulty in managing and maintaining cattle health, and market fluctuations.
- ii. Adopting specific practices, such as improved breeding techniques, optimized feeding practices, or implementing technology-driven systems, can enhance productivity and profitability for small scale cattle farmers.
- iii. There is an assumption that technology and innovative techniques can be beneficial for small scale cattle farmers in terms of improving efficiency, optimizing resource management, and enhancing overall productivity.

1.7 Significance of the study

The significance of the study is to explore the possibility of turning small-scale cattle farming into a sustainable business. Small-scale cattle farming holds great potential for rural communities and individuals as a source of income and food security. The significance of this study lies in the potential benefits it can bring to rural communities. Small-scale cattle farming has the potential to generate income and employment opportunities while also contributing to local food production. By identifying sustainable

practices and recommending effective strategies, this study can help farmers maximize their profit potential and improve their livelihoods.

Understanding the factors that contribute to the success and sustainability of small-scale cattle farming can allow small-scale cattle farmers to develop targeted support programs and initiatives.

1.8 Delimitation

The researcher was unable to study everything under the research topic. The researcher therefore decided to focus this research on small scale cattle farmers in Chimanimani District, Manicaland, Zimbabwe.

In addition:

- i. The researcher included a minimum of 30 small to medium scale cattle farming operations in the research.
- ii. A minimum of 30 respondents were interacted with.
- iii. The research focused on small scale cattle farming in Chimanimani district of Zimbabwe.
- iv. The research focused on small scale cattle farming with a herd size of less than 150.
- v. The research also focused on the use of technology in artificial insemination for small-scale cattle farming.

1.9 Limitations

The following were the limitations in conducting the research:

- i. Lack of standardization: Small-scale cattle farming practices and business models vary greatly, leading to a lack of standardization. This makes it challenging to compare findings across different farms and regions.
- ii. Time and resource constraints: Conducting an in-depth study on turning small-scale cattle farming into a sustainable business required significant time and resources. It was difficult for the researcher to gather sufficient funding and dedicate enough time to collect data, conduct analysis, and present comprehensive findings.
- iii. Subjectivity and bias: Personal beliefs, preferences, or preconceived notions about sustainable business practices may unintentionally influence the study's outcomes.

CHAPTER 2: REVIEW OF RELATED LITERATURE

2.1 Introduction

This topic looks at the material which is relevant to the research question. Literature review is an investigation of past experiences which give a brief background and framework of reference to the research question. By integrating findings and perspectives from many empirical findings, literature review can address questions with a power that no single study has, (Snyder, 2019). Literature review is also an account of what has been published on a topic by accredited scholars and researchers, (Taylor, 2010).

Learning itself is said to start with what is known to the unknown, that is, from concrete to abstract. This implies that human knowledge and understanding relies on existing knowledge. Examining information relevant to the research topic will therefore provide a link between what other researchers have found and what the researcher intends to find and therefore allows researchers to demonstrate the value of the research being conducted, (Valdes, 2020).

2.2 Theoretical framework

The study used the theoretical framework for turning small-scale cattle farming into a sustainable business which combines principles of sustainable agriculture, the triple bottom line approach, resource-based view theory, stakeholder theory, value chain analysis, institutional theory, and learning and innovation theory. This framework integrates economic, social, and environmental considerations, assesses internal resources

and capabilities, engages stakeholders, identifies value chain opportunities, considers institutional contexts, and emphasizes learning and innovation for long-term sustainability and resilience.

2.3 The Emergence of Small-scale Farmers in Zimbabwe

Zimbabwe has experienced land reform since independence in 1980 with the distribution of land to beneficiaries being uneven, resulting in others receiving larger allocations, (Moyo, Three decades of agrarian reform in Zimbabwe, 2011). This influenced the variations in access to farming services and infrastructure.

Small-scale agriculture is the production of crops and or small livestock on a small piece of land without using advanced or expensive technologies. This type of farming is characterized by intensive labor and or animal traction, limited use of agrochemicals, and supply to local or surrounding markets, (Hutchinson, 2016).

The emergence of small-scale farmers in Zimbabwe can be traced back to the early 2000s after the liberalization of the agricultural policy, (Scoones & Murimbarimba, 2022). The government introduced a fast-track land reform program that aimed to address historical inequalities in land ownership and redistribute land to small-scale farmers and landless peasants.

Under this program, large commercial farms owned by white farmers were redistributed to black Zimbabweans who had previously been excluded from land ownership. Many of these new landowners were small-scale farmers who lacked the resources and skills to manage large commercial farms.

Medium-scale farms in Zimbabwe are as defined by the A2 ‘model’, and are mostly sufficiently large that they offer the opportunities for commercialized agriculture, involving mechanization, the employment of a permanent workforce, the use of high levels of ‘modern’ inputs and the generation of substantial market offtake, (Shonhe, Scoones, & Murimbarimba, 2021).

On the other hand, small scale farmers are categorized as A1 settlements largely characterized by peasant farming techniques. Farmers in this category are engaged in subsistence farming activities to provide food and shelter for themselves and their families. Productivity per acre is usually high due to the strong motivation to feed families from small pieces of land, (Aditya, 2022).

2.4 The Impact of Small-scale Farmers on Zimbabwe’s agricultural sector

The fast-track land reform program led to a fundamental restructuring of the agrarian landscape into just physical partitioning into small (A1) and medium (A2) sizes, (Moyo & Chambati, 2013). The emergence of small-scale farmers in Zimbabwe has had both positive and negative impacts on the country's agricultural sector.

Small to medium farmers in Zimbabwe contribute significantly to food production in the country, providing food for local communities and reducing dependency on imported products. This helps to improve food security, reduce hunger in the country and also assist the government in saving scarce foreign currency, (Moyo, 2011).

Employment creation is also another positive impact brought by the emergence of small to medium farmers in Zimbabwe where farmers employ a significant number of people, helping to create jobs and alleviate poverty. Many of these farmers also provide job training for their employees, contributing to the development of local skills and capacity. Agricultural production is a labor-intensive sector and labor productivity is also one of the performance indicators of agricultural production, (Zimstat, 2019).

Small-scale farmers often sell their products in local markets, generating income and thereby creating and boosting the local economy. They also provide support for other small businesses in the community, helping to create a vibrant local economy. This in turn reduces rural poverty and under development, (Shonhe, Scoones, & Murimbarimba, 2021).

Many small to medium farmers in Zimbabwe still use traditional farming methods which are sustainable and preserve the environment. This contributes to the conservation of the country's natural resources and helps to maintain biodiversity. Indigenous knowledge systems created in specific geographical and historical situations are considered compatible and applicable to contemporary life situations including environmental conservation projects, (Mawere, 2013). Therefore, traditional conservation strategies cannot be left out in studies to help ease the damage to the environment caused by modern farming techniques. The Zimbabwean government currently promotes by providing inputs and financial subsidies for small scale farmers to make use of conservative farming techniques like 'Pfumvudza' to preserve and maximize output from small pieces of land, (Simango, 2021).

Small to medium farmers in Zimbabwe are often key custodians of cultural heritage, preserving traditional farming practices and knowledge that has been passed down

through generations. This helps to maintain Zimbabwe's rich cultural heritage and promote cultural tourism in the country, (Mawere, 2013).

2.5 Challenges faced by small to Medium scale Farmers in Zimbabwe

Small-scale farmers remain an important part of Zimbabwe's agricultural sector, and the government has made efforts to support their development through policies such as the Smallholder Irrigation Revitalization Program supported by the Agricultural Development Bank of Zimbabwe.

Limited access to financial services remains a key challenge for small-scale farmers who face difficulties accessing financial services, such as credit, loans, and insurance. This makes it challenging for them to invest in seed, fertilizer, herbicides, pesticides, vaccines and other essential resources for their farms.

Zimbabwe also has an inadequate infrastructure network that makes it challenging to transport goods, especially to remote rural areas. Lack of transportation and storage facilities hinders small to medium scale farmers from selling their produce in markets and negatively impacting their profitability. It also makes farming of perishables a challenge as farmers are pushed to produce products that have a longer shelf life irrespective of profitability.

Climate change resulting in drought, erratic rainfall, and adverse weather conditions are other significant challenges to farming in Zimbabwe. Climate change directly affects crop yields and productivity, making it difficult for farmers to meet their livelihoods. Zimbabwe's agriculture is predominantly rain-fed, making it vulnerable to drought and

other weather conditions, consequently affecting farm outputs. This over reliance on rainfall severely limits growth potential.

Small-scale farmers are also hampered by lack of access to information and technology. This limits access to information about the development of new farming techniques and other technological advancements resulting in reduced abilities to produce to high yields and prevent crop and animal diseases.

Land tenure insecurity often leading to land disputes due to lack of property titles, and uncompetitive land allocation processes are issues farmers face, preventing them from investing in their farms and limiting long-term planning.

Another challenge faced by small to medium scale farmers is limited government support for critical services like dams for irrigation and affordable farm inputs. This makes it difficult for small scale farmers to achieve the desired output from their efforts.

Most small to medium scale farmers have relied on indigenous knowledge practiced over many seasons and derived from local memory, local practice and local science, (Masere & Worth, 2021). Indigenous knowledge has been viewed as an impediment to technology adoption as farmers are generally resistant to change and slow in accepting outside help, including new and modern technology. Furthermore, indigenous knowledge is perceived one of the major reasons why farmers have been stagnant and failing to advance to the next level in the value chain, processing their raw crops into more profitable products. Indigenous knowledge has been applied on a range of subjects, including soil

classification and fertility, weather patterns, and crop protection among others but with limited success.

Mobility of agricultural extension (Agritex) officer has also been a challenge with regards to technical assistance to small and medium scale farmers. Most Agritex officers are responsible for large geographical areas with little or no meaningful transport. Farmers are often required to make transport arrangements and this usually occurs when problems they are faced with have already deteriorated. Limited practical experience on the part of Agritex officers limits their ability to properly advise farmers often resulting in some farmers spurning them. However, the availability of Agritex and its workers play the roles of facilitators and brokers where they assist in disseminating new technologies by acting both as a repository of information regarding technology experts and new technology opportunities and as a conduit between actors. For extension agents to perform this role effectively, they need to possess good communication skills, the ability to empathize, listen and value farmers and other actors' insights, impartial and technically competent.

Poor succession planning for small to medium farmers also affect continuity of operations. The lack of formal business structures often leads to hereditary succession irrespective of skills and competence. Lack of formal business management skills limits the potential for growth and ability to run farming operations as a business. Most have limited or no human resources management skills as well as poor or no marketing skills.

Most small to medium scale farmers operate in silos and are hesitant to share information and learnings. Very few are members of established farmers' organizations or farmers' professional bodies.

2.6 Small to medium cattle farming in Zimbabwe

Small to medium scale cattle farming in Zimbabwe typically involves raising cattle for milk and beef production. Farmers may have between 10 to 150 cattle for small scale and between 150 and 500 cattle for medium scale. All depends on the size of their land, resources, and market demand. Farmers need sufficient land to graze their cattle and grow pasture. They must also manage the pasture to ensure the cattle have enough nutrition and prevent overgrazing. Farmers can also supplement the cattle's diet with hay, silage, and concentrates.

Farmers need to select appropriate breeds of cattle for their specific climate and production goals. They also need to manage their breeding program to ensure the cattle produce healthy offspring with desirable traits. Farmers need to monitor and maintain the health of their cattle. This includes routine vaccinations, deworming, and treating any illnesses or injuries. Farmers need to have a strategy for selling their cattle and beef products. This includes identifying potential markets, negotiating prices, and delivering the products to buyers. Farmers need to invest in infrastructure such as fencing, water sources, housing, and feeding equipment to ensure their cattle are comfortable and safe.

Overall, small-scale cattle farming in Zimbabwe offers opportunities for income generation and contributes to the country's food security. However, it requires careful planning, management, and investment in resources and skills.

2.6.1How small-scale cattle farmers can improve sustainability of their farming operations

Small-scale cattle farmers should start using technology to improve their farming processes. For example, using digital tools to monitor the health of their cattle and track performance metrics can help them make better-informed decisions. To be able to grow and sustain cattle farming as a business, small to medium-scale cattle farmers should focus on breeding high-quality animals. This will involve understanding the genetics of their herd, selecting the best breeding stock, and implementing sound breeding practices.

Efficient management of farming operations is essential for anyone trying to improve their cattle farm. Small to medium scale farmers can take advantage of modern management solutions such as automated feeding, grazing, and milking systems.

Improving feeding practices like implementing balanced feeding programs, providing enough feed and water, and improving grazing pasture quality can improve livestock productivity and health. Farmers can also develop brands and marketing strategies, to communicate the unique benefits of their products to potential customers/markets.

Networking and collaborating by joining forces with other like-minded farmers allow for sharing resources, knowledge, and possible group marketing in their collective efforts to scale up their farming activities.

Small-scale cattle farmers in Zimbabwe should be provided with training on modern cattle farming practices, access to quality breeding stock, regular veterinary visits, and access to quality feeds and pasture.

To commercialize small to medium scale cattle farming in Zimbabwe, the government and other stakeholders should work together to improve market access for the farmers. This can be done by linking them up with potential buyers, processing facilities, and other value-chain stakeholders.

Small to medium scale cattle farmers can also benefit from forming cooperatives as they enable them to pool resources and share costs. Cooperatives will help farmers to access equipment, finance, and markets, among other resources.

Provision of access to finance will enable farmers to expand their operations, buy equipment, and improve their production capacity. This can be done through microfinance institutions or other lending institutions.

To commercialize small scale cattle farming in Zimbabwe, the farmers should be encouraged to focus on value addition. This will help them to increase their profits by processing the cattle into meat, leather, and other by-products. Manure from livestock is also a cost-effective and unlimited source of bio fertilizer for crop farming. To boost the manure's nitrogen content and kill weed seeds, families decompose the manure in a sealed pit for a whole season before applying it to their crop, (Mpofu, 2020).

2.7 Relevance of the Theoretical Frame to the study

The researcher went around reading about the research topic and filed this information related to the research topic. It was established that there were several positive and negative impacts to Zimbabwe's agricultural system due to the emergence of small to

medium scale farmers. Despite several challenges that cattle farmers face, opportunities for improvement exist.

2.8 Conclusion

In conclusion, commercializing small-scale cattle farming in Zimbabwe requires a concerted effort from various stakeholders, including the government, farmers, and other value-chain actors. By providing training, access to markets, finance, and promoting value addition, small scale cattle farmers will be able to improve their livelihoods and make a significant contribution to the country's economy.

CHAPTER 3: METHODOLOGY

3.1 Introduction

The theoretical framework, methods used for data collection, and analysis techniques used to explore and address the research problem are outlined in this topic. The research methods identified in this topic and used in this research, along with rigorous analysis and interpretation of data collected led to reliable and valid results, supporting the conclusions and recommendations. The selected methods assisted to identify, refine, and test the research questions, ensuring the ethical and systematic execution of research.

3.2 The Research Design

Research design involves outlining the research approach, method of data collection, data analysis, interpretation, and how the findings will be reported. The process selected in this research will ensure the validity and reliability of the results obtained.

A mixed research approach was adopted by the author. This is an approach where researchers analyze both quantitative and qualitative data within the same study, (Shorten & Smith, 2017).

Quantitative research focusing on collecting numerical data and its analysis using statistical methods was used to collect numerical data and measure the effect of assumptions made. Questionnaires were used to gather the data required. SPSS was used to identify statistical relationships from the data collected. Quantitative research was used

to find patterns, averages, make predictions, test relationships, and generalize results for a wider population, (Bhandari, 2022).

Qualitative research focuses on exploring subjective experiences and perceptions. This was used to gather the opinions, perceptions, views, and feelings of affected small to medium scale farmers. Qualitative research analyzes data from direct fieldwork observations, (Patton, 2015). Structured interviews with selected participants were conducted and one on one discussions were also held with others. Observations were also made in the field as part of qualitative data collection.

Therefore, both methods were adopted to complement each other. Quantitative data was collected first followed by collecting of qualitative data.

3.3 Population and Sampling

The population under study was all small-scale cattle farmers in Chimanmani district. A sample of minimum of 30 small-scale farmers were targeted and at least 30 participants took part.

Participants were selected with a minimum age requirement of 18years and both male and female participants were given equal opportunities to take part in the research.

No payments were made to participants and the consent of each participant was obtained in writing.

3.4 Data Collection Instruments

The following were used for qualitative data collection instruments:

- i. In-depth interviews were conducted with farmers who had successfully turned their small-scale cattle farming into a sustainable business. This helped gather insights into their experiences, challenges, and strategies.
- ii. Focus group discussions were held with small-scale cattle farmers to understand the current practices and challenges they faced in sustaining their businesses.
- iii. The daily activities of small-scale cattle farmers were observed to identify the farming practices and challenges.

The following were used for quantitative data collection instruments:

- i. Surveys of small-scale cattle farmers were aimed at gathering data on their farming practices, farm size, income, challenges faced, and strategies for sustainable cattle farming.
- ii. Field visits were made to small-scale cattle farms to collect data on the number of animals, breed of animals, production cycle, inputs used, outputs generated, and income levels.

3.5 Data Collection Procedure

Quantitative data was collected from published government reports, and policy documents. Qualitative data was collected through field visits, interviews and surveys conducted with small-scale cattle farmers and other stakeholders.

3.6 Analysis and Organization of Data

Both qualitative and quantitative data were presented in various formats including graphs, pie charts and tables among other formats for analysis purposes. Recommendations were also made from the learnings obtained from the research.

Quantitative data was analyzed using an appropriate software like SPSS. The assumptions made were tested, and conclusions were drawn to confirm or reject assumptions made. Qualitative data was analyzed by scrutinizing trends and traits as well as meanings from the collected data.

3.6.1 Data Analysis Techniques

By identifying the most influential variables and their impact on sustainability and profitability, farmers could have made informed decisions about how to optimize their operations. In general, the use of various analysis models helped farmers make data-driven decisions and optimized their operations for sustainable success.

3.6.1.1 Regression analysis

The relationship between different variables that may have affected the profitability and sustainability of small-scale cattle farming was evaluated using regression analysis.

Several regression formulas were considered applicable for the research topic of turning small-scale cattle farming into a sustainable business.

i. Multiple regression

The Profitability (y) of small-scale cattle farming is given by

$$y = (b_0 + b_1x_1 + b_2x_2 + b_3x_3)$$

Where:

y = profitability of small-scale cattle farming

b₀ = the intercept representing the expected profit per year when all other variables are equal to zero.

b₁-b₃ = coefficients of the independent variables

x₁ = cost of inputs (labor, feed, veterinary care), x₂ = production efficiencies (weight gain and milk yield), x₃ = selling price for products

ii. Logistic regression

To analyze the likelihood of success or failure for small scale cattle farming based on known input variables whose probability of occurrence could be estimated, the logistic regression formula was used. By understanding the probability of success or failure, farmers took proactive measures to mitigate risk and increase their chances of success.

$$\ln P = (b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7)$$

Where:

P = Probability of success in small scale cattle farming

b₀ = the intercept representing the expected profit per year when all other variables are equal to zero.

b₁-b₇ = coefficients of the independent variables

x1 = Land size, x2 = herd size, x3 = access to finance, x4 = marketing strategy, x5 = availability of market, x6 = access to veterinary care, x7 = experience in cattle farming

iii. Poisson regression

The expected calving rate (λ) was obtained using the Poisson regression formula:

$$\lambda = e^{(b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5)}$$

Where:

λ = Calves per year

b_0 = the intercept representing the expected calves per year when all other variables are equal to zero.

b_1 - b_5 = coefficients of the independent variables

x_1 = breed, x_2 = quality of feed, x_3 = disease outbreaks, x_4 = bulls to cows ratio, x_5 = average cow age

3.6.1.2 SWOT Analysis

The strengths, weaknesses, opportunities, and threats related to small scale cattle farming were analyzed using a matrix. SWOT analysis was a business strategy tool used to assess how an organization compared to its competition, (Teoli, 2019). Areas of improvement and development for farmers interested in transitioning to sustainable practices could be easily identified.

3.6.1.3 Trend Analysis

Trends in areas such as the market demand for beef and dairy products as well as consumer preferences were analyzed to help small farmers identify market opportunities to focus on

products that aligned with these trends. Challenges affecting farmers were also identified using trends, and appropriate strategies were formulated to address them.

3.6.1.4 Financial Analysis

Financial ratios or financial metrics analysis were used as tools to evaluate the financial performance of small-scale cattle farming. Financial ratios provided sound information useful for making financial decisions, (Koen & Oberholster, 1999). The business's financial strengths and weaknesses were identified and financial strategies for achieving sustainability created.

Comparisons of performance of small-scale cattle farming with industry standards and best practices, including productivity, efficiency, and profitability were also conducted. The following metrics were used to determine the profitability and sustainability of small-scale cattle farming:

- i. Return on Investment (ROI)
- ii. Net Present Value (NPV)
- iii. Payback period

3.6.1.5 Qualitative Data Analysis

Interviews, field studies and surveys were used to gather qualitative data on the perceptions, experiences, and behaviors of farmers, consumers, and other stakeholders. This led to the identification of challenges and opportunities, understanding consumer demand for sustainable beef and dairy production as well as defining the conditions for successful implementation of sustainable business models.

3.6.1.6 Risk Analysis

A risk analysis was conducted to evaluating the potential risks and uncertainties of small-scale cattle farming, including market risks, production risks, and environmental risks. A risk matrix helps prioritize a project or business risks by ranking the potential impact and likelihood of each risk, (Marker, 2017). Therefore, a risk assessment matrix was used to consider the probability of occurrence and the severity of consequences for all identified risks.

3.7 Ethical Consideration

There are several ethical considerations that the researcher made and these are:

- i. Informed consent was obtained from all individuals, before their participation.
- ii. All participants involved in the research project understood the purpose, methodology, and potential risks and benefits of their involvement.
- iii. The privacy of all participants was respected by ensuring the confidentiality of their personal and business information. All data collected was anonymized and presented in aggregate form, preventing the identification of individual participants.

3.8 Conclusion

The research design, data collection methods, data analysis and data analysis techniques were presented in this topic to further the understanding of the research question to arrive at recommendations to improve sustainability of small-scale cattle farming.

CHAPTER 4: DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This topic outlines crucial steps in understanding and deriving insights from data collected by organizing and visualizing the data in a meaningful way, applying statistical techniques to uncover patterns and trends, and drawing conclusions and making predictions based on the findings.

Various methods were used for data presentation, and these are charts, graphs and tables to effectively communicate the information contained in the data. These visual representations helped to simplify complex data sets and make the information collected more understandable to users.

Once the data was analyzed, interpretation was done to making sense of the findings and draw conclusions or predictions based on the results. It requires domain knowledge and expertise to understand the implications of the data analysis and translate it into actionable insights or recommendations.

Overall, data presentation, analysis, and interpretation are essential components of the data analysis process, enabling users to gain valuable insights and make informed decisions based on the data at hand.

4.2 Data Presentation and Analysis

Data obtained from fieldwork is presented and analyzed in this topic.

The research objectives were to:

- i. Identify the main challenges faced by small scale cattle farmers in terms of financial resources and access to capital.
- ii. Identify the best management practices that can enhance cattle productivity and profitability.
- iii. Identify the available technologies and techniques that can be adopted by farmers to enhance productivity and efficiency.

Various methods were used to collect data during the process and these included use of questionnaires, structured interviews, discussions with selected respondents.

The estimate population of small-scale farmers in Chimanimani district is about 2000. A total of 157 respondents were interacted with during the research.

4.2.1 Questionnaires

Questionnaires were given to adult farmers aged 18years and above. The purpose of the study was explained to them, and they were all asked to sign the consent form before participating in the study.

A total of 130 questionnaires were distributed and 123 were returned and completed by respondents between 17 July 2023 and 13 October 2023.

The questionnaire had two sections as below:

- i. Section A – Personal information
- ii. Section B – Research questions

Table 4.1 Personal Information

This section of the questionnaire covered the respondents' gender, age, highest school qualification, role and experience in cattle farming.

i. What is your gender?

Gender	Frequency	Percentage
Male	86	69.9%
Female	37	30.1%
Other	0	0%
Total	123	100%

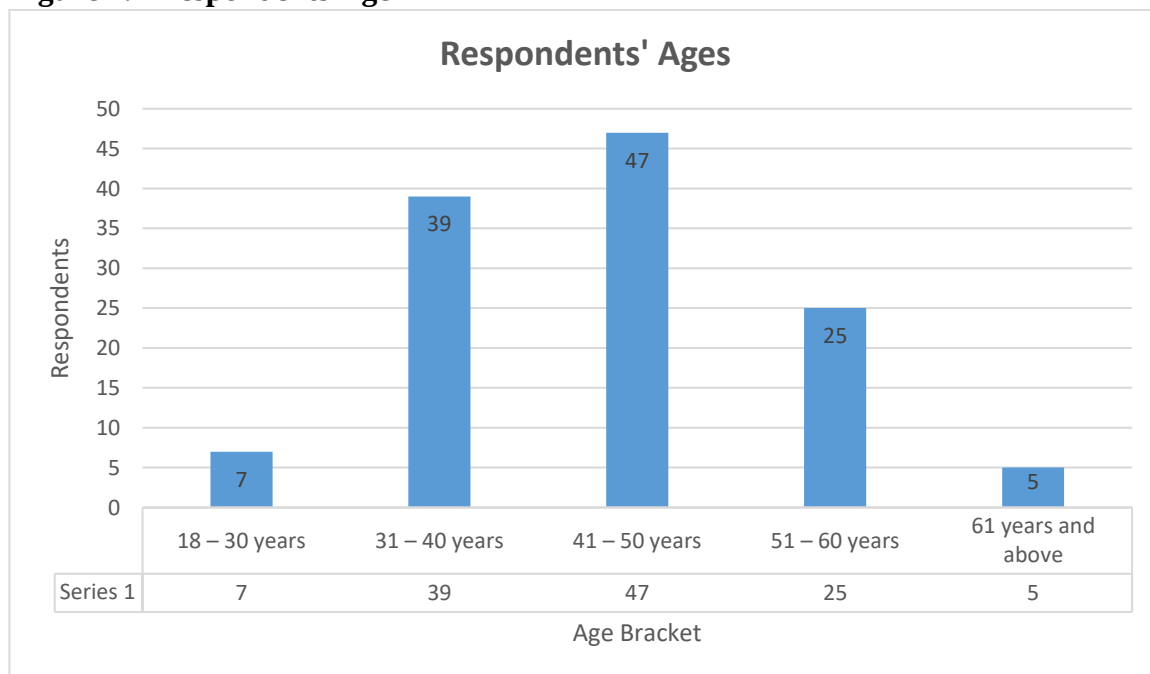
Source 2024

Most of the respondents were men constituting 69.9% with the remainder of 30.1% being women. This reflects the respondents' family and ownership culture where the ownership and inheritance of cattle is given to men. Women who owned cattle were from families headed by women mostly as a result of being widowed, divorced or single by choice.

ii. What is your age?

The respondents were asked about their current age and the results are as below.

Figure 4.1 Respondents Age



The majority of farmers were aged between 31 and 50 years constituting 69.9% of the respondents. Very few farmers are in the lower age bracket of 18 – 30 years (5.5%) and few in the upper age bracket of 61 years and above (4.1%). This gives an indication that few youths are involved with cattle farming, and this is mostly done by middle aged farmers. The elderly are also few cattle owners and indication of succession in the form of middle-aged family members taking ownership and control of livestock.

iii. *What is your highest level of education?*

Table 4.2 Level of Education by Respondents

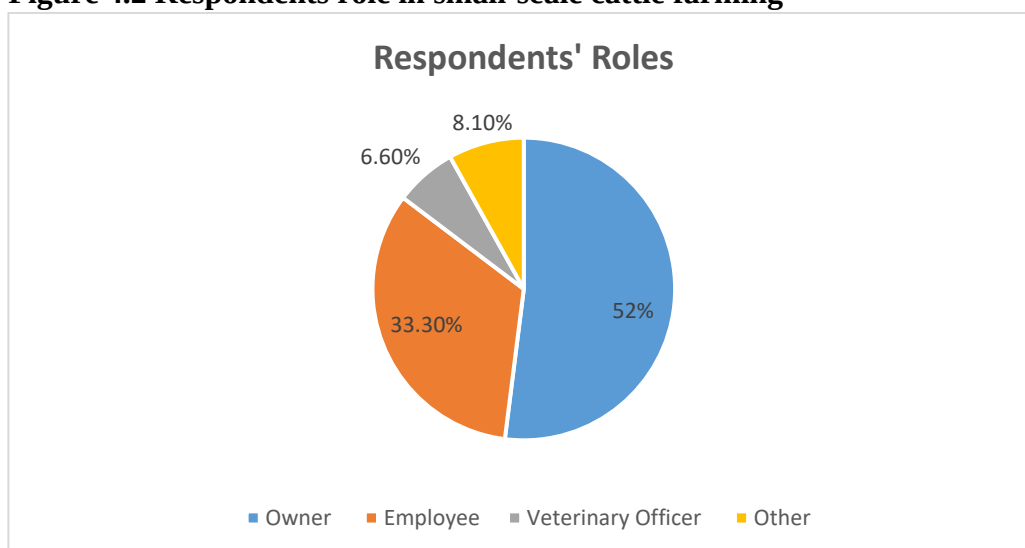
Highest Educational Qualification	Frequency	Percentage
Ordinary Level	73	59.3%
Advanced Level	10	8.1%
Certificate	30	24.4%

Diploma	3	2.4%
Degree	7	5.7%
Total	123	100%

Most of the respondents reached Ordinary Level of education (59.3%). A few of the respondents reached advanced Level of education (8.1%). 24.4% of the respondents had certificate in various disciplines, 2.4% with diplomas and 5.7% were degreed. This is also a reflection of the literacy level in the country.

iv. *What is your role in small-scale cattle farming?*

Figure 4.2 Respondents role in small-scale cattle farming



Source 2024

Out of 123 respondents 64 (52%) were owners, 41(33.3%) were employees on small scale cattle farming operations, 5 (6.5%) were veterinary officers and 10 (8.1%) were previous owners of small-scale cattle farming operations. Part of the previous owners were elderly individuals who had ‘retired’ but had extensive small-scale cattle farming knowledge.

v. *What is the size of your herd or size of herd you previously owned?*

There were no respondents with a herd size more than 150. Out of 123 respondents, 48 of them owned less than 20 cattle representing 39% of the respondents. 55 (44.7%) of the farmers owned between 20 and 50 cattle whilst 16 farmers (13%) owned between 50 and 100 cattle. Only 4 respondents (3.3%) owned cattle between 100 and 150. This indicates that the majority of cattle owners in Chimanimani are small-scale.

vi. *How many years of experience in cattle farming do you have?*

Table 4.3 Respondents years of Experience in cattle farming

Experience in cattle farming	Frequency	Percentage
Less than 1 year	7	5.7%
1 – 5 years	20	16.3%
6 – 10 years	32	26.0%
11 - 20 years	38	30.9%
21years or more	26	21.1%
Total	123	100%

The majority of the respondents had more than 5 years' experience in cattle farming. This represents 80% of the respondents. Therefore, opinions gathered were from individuals with sound understanding of the topic under research.

4.2.1.2 Research Questions

A. Identify the main challenges faced by small scale cattle farmers in terms of financial resources and access to capital.

- i. *What are the financial challenges faced by small-scale cattle farmers in turning their farms into sustainable businesses?*

Table 4.4 Challenges faced by small scale Cattle Farmers

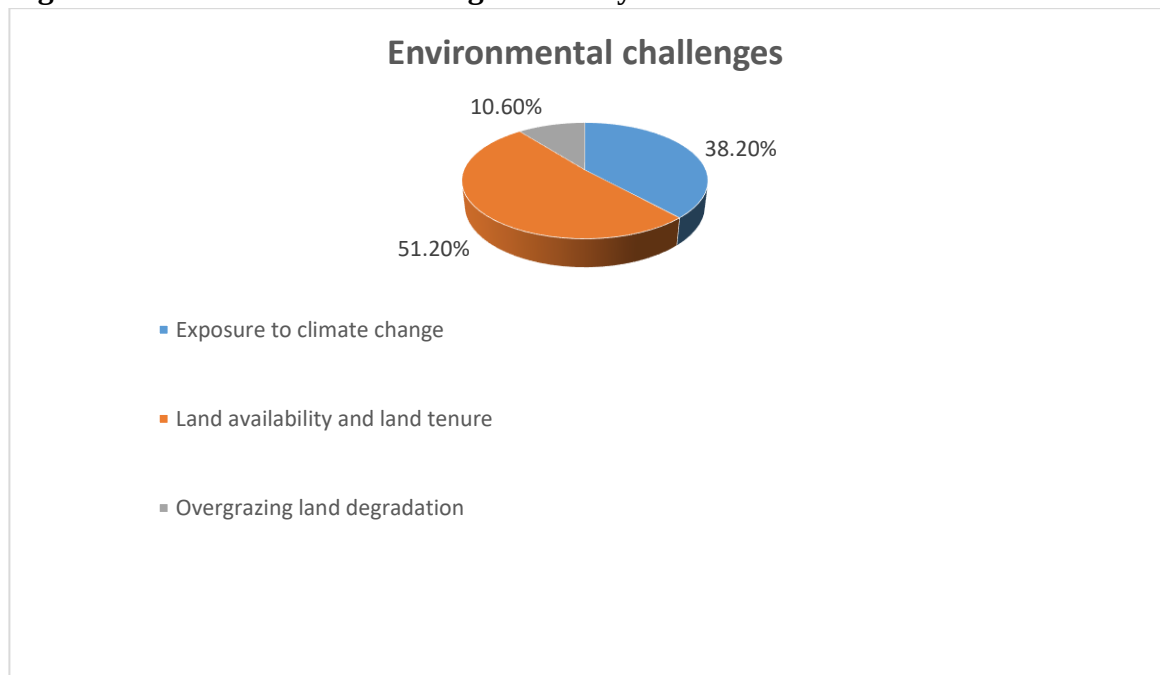
Biggest challenge in cattle farming	Frequency	Percentage
Lack of access to capital	74	60.2%
Low profit margins	29	23.6%
High input costs	15	12.2%
Lack of bargaining power	5	4.1%
Total	123	100%

The biggest challenge in cattle farming, as indicated by the respondents, is the lack of access to capital, which accounts for 60.20% of the responses. This indicates that many cattle farmers face difficulties in obtaining the necessary financial resources for their operations. Small-scale cattle farmers may have ambitious plans to succeed but are limited in terms of capital to do so. Borrowing from lending institutions has also not been a success due to lack of collateral security. Additionally, low profit margins are identified as a significant challenge, with 23.60% of respondents highlighting this issue. High input

costs are also a concern, accounting for 12.20% of the responses. Lastly, a smaller percentage of respondents, 4.10%, mentioned the lack of bargaining power as a challenge in cattle farming.

- ii. *What are the environmental challenges faced by small-scale cattle farmers in implementing sustainable practices on their farms?*

Figure 4.3 Environmental challenges faced by small-scale cattle farmers



Source 2024

The biggest environmental challenge in cattle farming, as indicated by the respondents, is land availability and land tenure, accounting for 51.20% (63) of the responses. This suggests that the availability and ownership of land pose significant challenges for cattle farmers, potentially impacting their ability to sustain their operations.

Exposure to climate change is also identified as a significant environmental challenge, with 38.20% (47) of respondents highlighting this issue. This indicates that the changing

climate patterns and extreme weather events can have adverse effects on cattle farming, such as impacting grazing conditions and overall herd health.

Overgrazing and land degradation are mentioned as challenges by 10.60% (13) of the respondents. This highlights the importance of sustainable land management practices to prevent overgrazing and maintain the long-term productivity of grazing lands.

Overall, these findings emphasize the need for cattle farmers to address environmental challenges such as land availability, climate change, and land degradation to ensure the sustainability and resilience of their operations.

iii. *Are you willing to invest time and resources in making small-scale cattle farming more sustainable?*

It is encouraging to see that a significant majority of respondents, 79.50% (97), expressed a high level of willingness to invest time and resources in making small-scale cattle farming more sustainable. This indicates a positive attitude towards adopting sustainable practices and making efforts to improve the environmental impact of cattle farming.

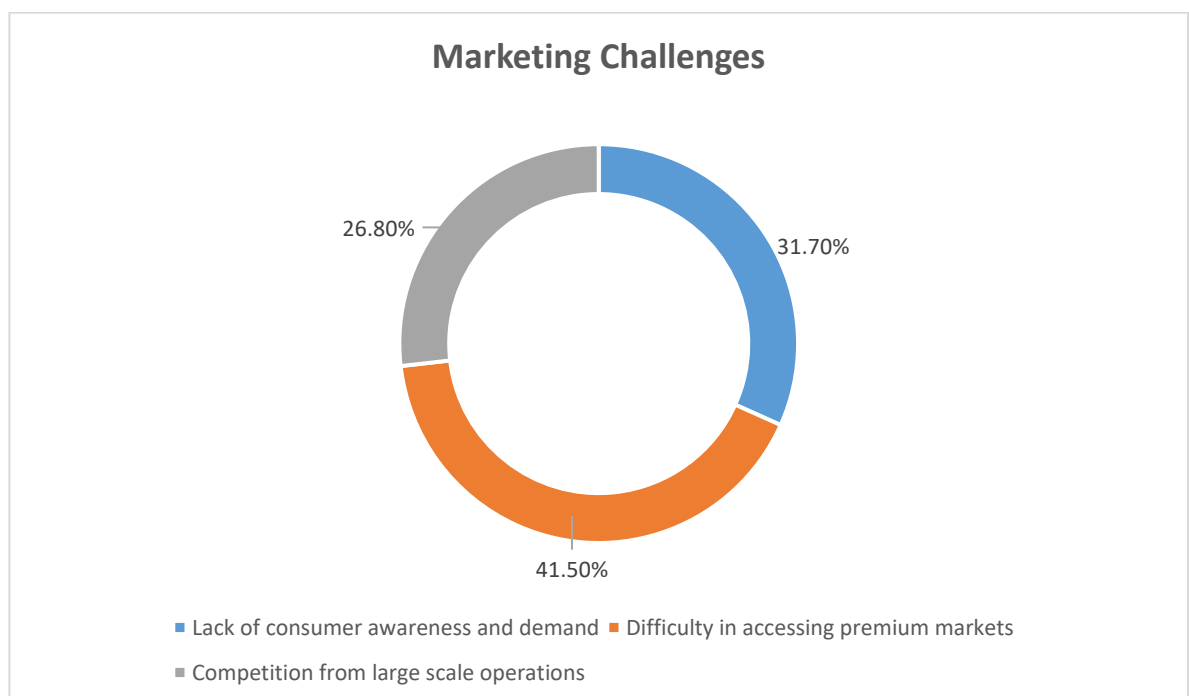
Furthermore, 16.40% (20) of respondents indicate a somewhat willingness to invest time and resources, suggesting that there is still a considerable portion of individuals who are open to exploring sustainable practices but may require further information or incentives to fully commit.

It is worth noting that only a small percentage, 4.10% (5), express a not very willing attitude, indicating some reluctance towards investing time and resources in sustainability efforts. However, it is encouraging that no respondents indicate being not willing at all, suggesting a general openness to considering sustainability in small-scale cattle farming.

These findings highlight the potential for promoting and supporting sustainable practices in small-scale cattle farming, as a significant majority of respondents demonstrate a willingness to invest in sustainability. This presents an opportunity for education, awareness, and incentives to further encourage and facilitate the adoption of sustainable practices in the industry.

- iv. *What are the market challenges faced by small-scale cattle farmers in marketing their products as sustainable?*

Figure 4.4 Market challenges faced by small-scale cattle farmers



Source 2024

Based on the information gathered, the biggest marketing challenge in small-scale cattle farming, as indicated by the respondents, is the difficulty in accessing premium markets, accounting for 41.50% (51) of the responses. This suggests that small-scale cattle farmers face obstacles in reaching high-value markets that offer better prices and opportunities for their products.

Lack of consumer awareness and demand is also identified as a significant challenge, with 31.70% (39) of respondents highlighting this issue. This indicates that small-scale cattle farmers struggle to create awareness and generate sufficient demand for their products among consumers. This challenge may be attributed to limited marketing resources and outreach.

Competition from large-scale operations is mentioned by 26.80% (33) of the respondents. This suggests that small-scale cattle farmers face competition from larger operations, which may have greater resources and market presence. This competition can make it challenging for small-scale farmers to establish their market position and attract customers.

Overall, these findings highlight the importance of addressing marketing challenges in small-scale cattle farming, such as accessing premium markets, creating consumer awareness, and finding strategies to compete with larger operations. Developing effective marketing strategies and exploring alternative marketing channels can help small-scale cattle farmers overcome these challenges and enhance their market opportunities.

- v. *What are the infrastructure challenges faced by small-scale cattle farmers in adopting sustainable technologies and practices?*

From the responses received, the biggest infrastructure challenge in small-scale cattle farming, is the lack of proper handling facilities, accounting for 35.80% (44) of the responses. This suggests that many small-scale cattle farmers face difficulties in having appropriate infrastructure to handle and manage their cattle effectively, which can impact their overall productivity and animal welfare.

The second significant challenge mentioned is the lack of fencing for controlled grazing, with 31.70% (39) of respondents highlighting this issue. This indicates that the absence of proper fencing infrastructure poses challenges in managing grazing areas and controlling the movement of cattle, potentially leading to overgrazing or inefficient land utilization.

The lack of efficient water systems is identified as a challenge by 17.90% (22) of the respondents. This suggests that inadequate access to reliable water sources or inefficient water management systems can hinder small-scale cattle farming operations.

Lastly, poor roads are mentioned as a challenge by 14.60% (18) of the respondents. This indicates that inadequate road infrastructure can impact transportation logistics, making it difficult for small-scale cattle farmers to access markets, veterinary services, or other necessary resources.

These findings highlight the importance of addressing infrastructure challenges such as proper handling facilities, fencing for controlled grazing, water systems, and road infrastructure to support the growth and sustainability of small-scale cattle farming operations.

vi. *What are the knowledge and skills challenges faced by small-scale cattle farmers in implementing sustainable farming methods?*

The biggest skills challenge in small-scale cattle farming, as indicated by the respondents, is limited general education in farming, accounting for 43.90% (54) of the responses. This suggests that a significant portion of small-scale cattle farmers face challenges due to a lack of basic farming education, which can impact their ability to effectively manage their farming operations.

Limited or no formal training in cattle farming is identified as another significant skills challenge, with 26.80% (33) of respondents highlighting this issue. This indicates that many small-scale cattle farmers may not have received specific training or education in the field, which can hinder their ability to implement best practices and optimize their farming techniques.

Lack of technical knowledge about soil and environmental management is mentioned as a challenge by 19.50% (24) of the respondents. This suggests that understanding soil health and environmental factors is crucial for successful cattle farming, and the lack of knowledge in this area can pose challenges for small-scale farmers.

Lastly, 9.80% (12) of respondents mentioned a lack of knowledge about cattle health and breeding management as a skills challenge. This highlights the importance of understanding proper animal care, breeding techniques, and disease management for successful cattle farming.

Overall, these findings emphasize the need for improved education, training, and access to knowledge resources for small-scale cattle farmers to overcome skills challenges and enhance their farming practices.

- vii. *What is your biggest policy or regulatory challenge as a small-scale cattle farmer?*

Table 4.5 Biggest policy or regulatory challenge as a small-scale cattle farmer

Biggest policy or regulatory challenge as a small-scale cattle farmer	Frequency	Percentage
Lack of input subsidies or grants	81	65.9%
Lack of marketing incentives	27	22.0%
Inconsistent regulations favoring large scale operations	15	12.2%
Total	123	100

Source 2024

As shown in Table 4.2 above, the biggest policy or regulatory challenge faced by small-scale cattle farmers is the lack of input subsidies or grants, accounting for 65.90% of the responses. This suggests that small-scale cattle farmers face difficulties in accessing

financial support or assistance for inputs such as feed, equipment, or veterinary services, which can impact their profitability and sustainability.

Lack of marketing incentives is identified as another significant challenge, with 22.00% of respondents highlighting this issue. This indicates that small-scale cattle farmers may struggle to find favorable market opportunities or receive incentives to promote their products, potentially affecting their competitiveness in the industry.

Inconsistent regulations favoring large-scale operations are mentioned as a challenge by 12.20% of the respondents. This suggests that small-scale cattle farmers may face regulatory barriers or policies that disproportionately benefit larger operations, potentially limiting their growth and viability.

These findings highlight the importance of addressing policy and regulatory challenges to support the success of small-scale cattle farmers. Providing input subsidies or grants, creating marketing incentives, and ensuring fair and consistent regulations can help level the playing field and promote the sustainability of small-scale cattle farming operations.

B. Identify the best management practices that can enhance cattle productivity and profitability.

- i. *What recommended feeding practices for small-scale cattle farming do you consider critical?*

Table 4.6 Recommended feeding practices for small-scale cattle farming

Recommended feeding practices in small-scale cattle farming	Frequency	Percentage
Provide adequate clean water	22	17.9%
Actively manage forage quality	56	45.5%
Supplementary feeding	45	36.6%
Total	123	100

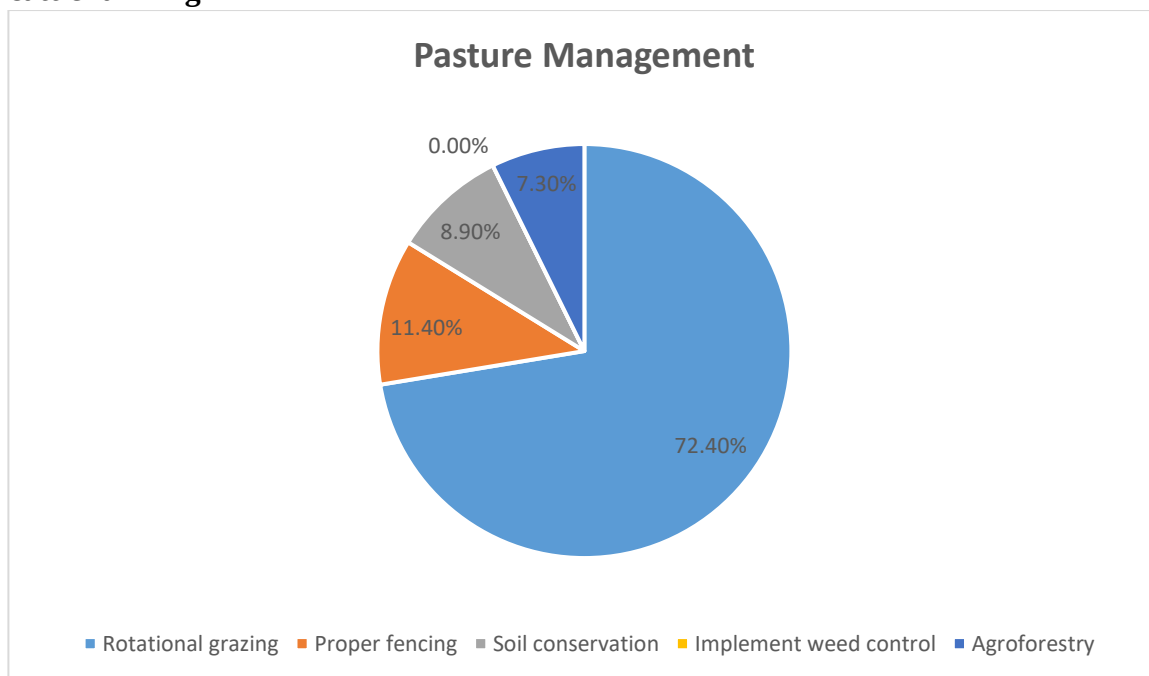
The most recommended feeding practice in small-scale cattle farming, as indicated by the respondents actively managing forage quality, accounting for 45.50% of the responses. This suggests that ensuring the quality of the available forage, such as through proper grazing management and monitoring, is considered crucial for small-scale cattle farming.

Supplementary feeding is also recommended, with 36.60% of respondents highlighting its importance. This indicates that providing additional feed, such as concentrates or supplements, can help meet the nutritional needs of the cattle, especially when the available forage may be insufficient.

Providing adequate clean water is mentioned as a recommended feeding practice by 17.90% of the respondents. This emphasizes the importance of ensuring access to clean and fresh water for cattle, as it is essential for their overall health and well-being.

- ii. *What is the most effective way to manage pasture and grazing systems for small-scale cattle farming?*

Figure 4.5 Effective way to manage pasture and grazing systems for small-scale cattle farming



Source 2024

The most effective way to manage pasture and grazing systems for small-scale cattle farming, as indicated by the respondents, is rotational grazing, with 72.40% (89) of them considering it as the preferred method.

Proper fencing is also recognized as important by 11.40% (14) of the respondents. Soil conservation is mentioned by 8.90% (11) of the respondents, while agroforestry is considered by 7.30% (9).

It is worth noting that no respondents mentioned implementing weed control as an effective method.

- iii. *What are the key considerations for ensuring proper animal health and disease prevention in small-scale cattle farming?*

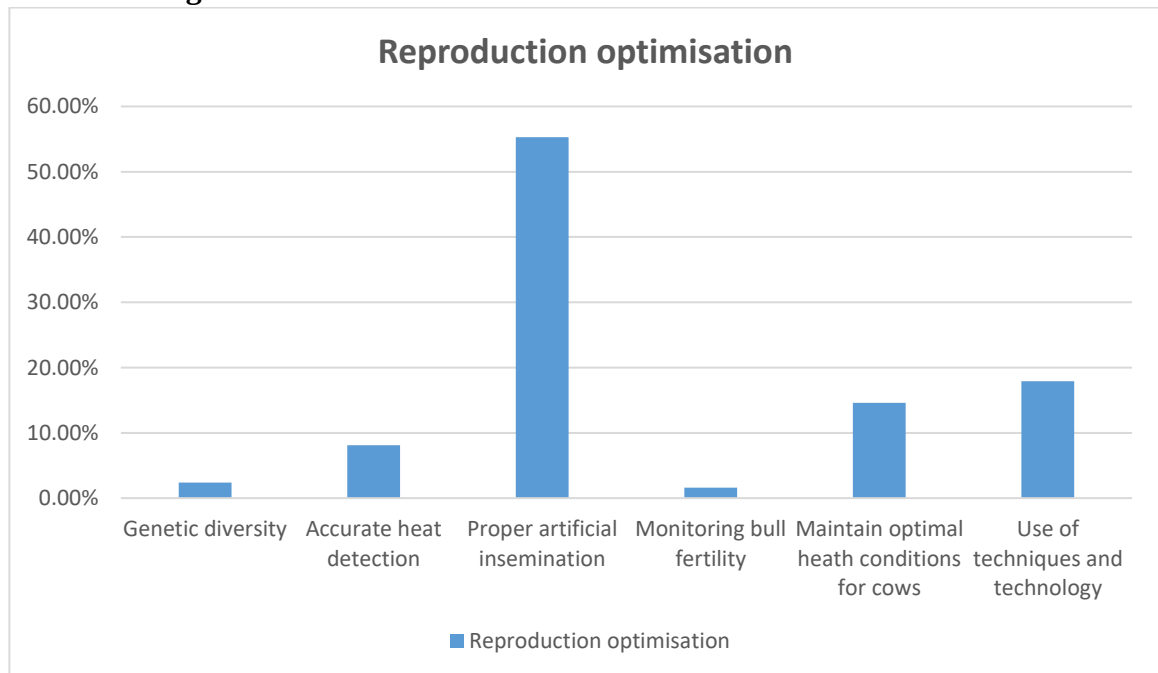
The key considerations for ensuring proper animal health and disease prevention in small-scale cattle farming, as indicated by the respondents, are vaccination and veterinary care, with 56.10% (69) of them recognizing its importance.

Regular parasite control is also considered significant by 34.10% (42) of the respondents. Proper feeding and nutrition are mentioned by 9.80% (12) of the respondents.

These findings highlight the significance of vaccination, veterinary care, and parasite control in maintaining animal health and preventing diseases in small-scale cattle farming operations.

- iv. *What is the most effective strategy to optimize reproduction and breeding in small-scale cattle farming?*

Figure 4.6 Effective strategy to optimize reproduction and breeding in small-scale cattle farming



Source 2024

Based on the information gathers, the most effective strategy to optimize reproduction and breeding in small-scale cattle farming, as indicated by the respondents, is proper artificial insemination, with 55.30% (68) of them considering it as the preferred method.

The use of techniques and technology is also recognized as important by 17.90% (22) of the respondents. Maintaining optimal health conditions for cows is mentioned by 14.60% (18) of the respondents. Accurate heat detection is considered by 8.10% (2) of the respondents, while genetic diversity and monitoring bull fertility are mentioned by 2.40% (3) and 1.60% (2) of the respondents respectively.

These findings highlight the significance of proper artificial insemination and the use of techniques and technology in optimizing reproduction and breeding in small-scale cattle farming operations.

v. *How can small-scale cattle farmers improve animal welfare and handling practices?*

There are several ways in which small-scale cattle farmers can improve animal welfare and handling practices. The respondents highlighted the following practices as explained below.

Proper handling during transportation: This practice was mentioned by 4 respondents, accounting for 3.3% of the total. Ensuring that animals are handled with care and consideration during transportation is crucial for their welfare.

Adequate pen space provision: 14 respondents, representing 11.4% of the total, emphasized the importance of providing sufficient space for cattle in pens. This allows for comfortable movement and reduces stress on the animals.

Proper farm hygiene: 29 respondents, accounting for 23.6% of the total, recognized the significance of maintaining proper farm hygiene. This includes regular cleaning and disinfection of facilities to promote a healthy environment for the animals.

Regular upkeep of infrastructure: 41 respondents, representing 33.3% of the total, highlighted the importance of regularly maintaining and repairing infrastructure such as fences, gates, and housing. This ensures the safety and well-being of the animals.

Collaboration and knowledge sharing: 35 respondents, accounting for 28.5% of the total, emphasized the value of collaboration and knowledge sharing among small-scale cattle farmers. By exchanging information and experiences, farmers can learn from each other and implement best practices for animal welfare.

These findings suggest that small-scale cattle farmers can improve animal welfare and handling practices by focusing on proper handling during transportation, providing adequate pen space, maintaining farm hygiene, regular upkeep of infrastructure, and fostering collaboration and knowledge sharing within the farming community.

vi. *What is most essential for effective farm management and record-keeping in small-scale cattle farming?*

The most essential requirement for effective farm management and record-keeping in small-scale cattle farming, as indicated by the respondents, is the upkeep of detailed records, with 82.10% (101) of them recognizing its importance.

Computer-based record keeping and cloud backups are also considered significant by 15.40% (19) of the respondents. A comprehensive financial management system is mentioned by only 2.40% (3) of the respondents.

These findings emphasize the significance of maintaining detailed records in small-scale cattle farming operations, as it enables farmers to track and analyze important information for effective management and decision-making. Additionally, the use of computer-based

record keeping and cloud backups can provide added convenience and security for data management.

- vii. *What strategies that can be adopted to improve the economic viability for small-scale cattle farmers?*

Table 4.7 Strategies that can be adopted to improve the economic viability for small-scale cattle farmers

The best strategy to improve economic viability for small-scale cattle farmers	Frequency	Percentage
Develop value added products	8	6.5%
Leverage direct marketing channels	9	7.3%
Diversify income channels	56	45.5%
Invest in technology	29	23.6%
Continuous learning and development	21	17.1%
Total	123	100

It is interesting to note the distribution of responses regarding the best strategy to improve economic viability for small-scale cattle farmers. The highest percentage, 45.50%, (56) believe that diversifying income channels is the most effective approach. This suggests that small-scale cattle farmers can enhance their economic viability by exploring various sources of income beyond traditional cattle farming.

Investing in technology is seen as a significant strategy by 23.60% (29) of respondents. This indicates that adopting modern technologies and practices can potentially improve efficiency, productivity, and profitability for small-scale cattle farmers.

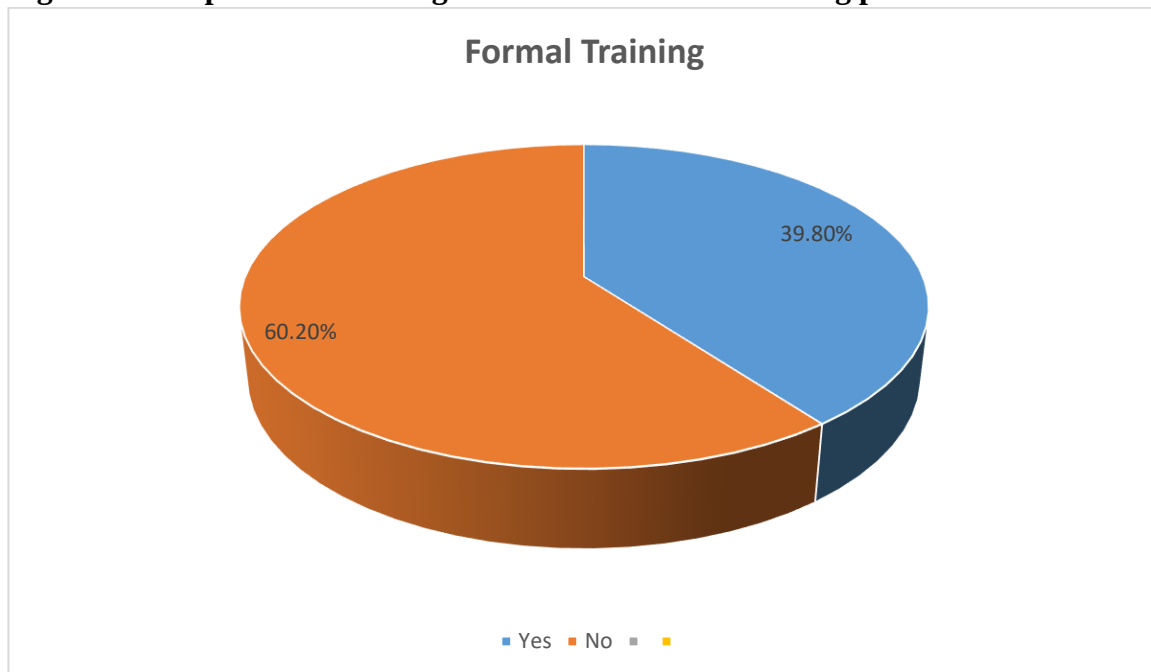
Continuous learning and development are considered important by 17.10% (21) of respondents. This highlights the value of acquiring new knowledge, skills, and staying updated with industry trends to adapt and thrive in a changing agricultural landscape.

Developing value-added products and leveraging direct marketing channels received lower percentages, 6.50% (8) and 7.30% (9) respectively. While these strategies may have their merits, the responses suggest that they may not be as widely recognized as the other approaches mentioned.

Overall, the table reflects a range of perspectives on the best strategies to improve economic viability for small-scale cattle farmers, emphasizing the importance of diversification, technology adoption, and ongoing learning in this sector.

viii. *Have you received formal training on sustainable cattle farming practices?*

Figure 4.7 Respondents training on sustainable cattle farming practices



Source 2024

From the information gathered 60.2% (74) respondents had received formal training in cattle farming and the remaining 39.80% (49) did not receive any formal training.

ix. *If yes, where did you receive your training?*

Table 4.8 Institutions where Respondents received training

Training received from	Frequency	Percentage
Public sector programs (Agritex Officers)	39	66.1
College or university courses	3	21.4
Learning from others (on the job training)	7	12.5
Total	49	100%

It is evident that a majority of respondents, 66.1%, received training from public sector programs, specifically from Agritex Officers. This indicates that government initiatives and programs play a significant role in providing training and knowledge to individuals in the agricultural sector. Additionally, 21.4% of respondents received training through college or university courses, highlighting the importance of formal education in acquiring agricultural skills and knowledge.

Furthermore, 12.5% of respondents mentioned learning from others through on-the-job training. This suggests that practical experience and mentorship within the agricultural industry are valuable sources of learning and skill development.

These findings emphasize the diverse sources of training and knowledge acquisition in the agricultural sector, ranging from government programs to formal education and on-the-job training. It is crucial to have a well-rounded approach to training and development to ensure the continuous improvement and success of individuals in the agricultural field.

x. *What is the impact of small-scale cattle farming on water pollution?*

A majority of respondents, 83.70% (103), believe that small-scale cattle farming can contribute to water pollution through the release of cattle waste. Cattle waste contains nutrients and bacteria that can contaminate water sources if not properly managed.

Additionally, a smaller percentage, 10.60% (13), believe that pollution from fertilizers used in cattle farming can also contribute to water pollution. Fertilizers can contain

chemicals that, if not properly applied or managed, can leach into water bodies and cause pollution.

A further 5.70% (7) of respondents believe that antibiotic overuse in small-scale cattle farming can also have an impact on water pollution. Antibiotics used in livestock can enter water systems through runoff or improper disposal, potentially leading to the development of antibiotic-resistant bacteria and affecting aquatic ecosystems.

These findings highlight the potential sources of water pollution associated with small-scale cattle farming and emphasize the importance of implementing proper waste management practices and sustainable agricultural techniques to mitigate these impacts.

xi. How does small-scale cattle farming affect soil condition?

Information collected show that the majority of respondents, 60.20% (74), believe that small-scale cattle farming can lead to overgrazing, which in turn can result in soil erosion. Overgrazing occurs when livestock consume vegetation faster than it can naturally regenerate, leading to the removal of protective plant cover and increased vulnerability to erosion.

Additionally, a significant percentage, 39.80% (49), believe that deforestation for pasture growth is another way in which small-scale cattle farming can affect soil condition. This involves clearing forests to create more grazing land for cattle, which can lead to soil degradation and loss of important ecosystem services provided by forests.

These findings highlight the potential negative impacts of small-scale cattle farming on soil health and the importance of sustainable land management practices in this industry.

- xii. *Do you agree that cattle farming can lead to a loss of biodiversity as natural habitats are cleared for cattle operations, which disrupts the delicate balance of ecosystems and reduces species diversity?*

A majority of the respondents, 71.50% (88), agree that cattle farming can lead to a loss of biodiversity. This is primarily due to the clearing of natural habitats for cattle operations, which disrupts the delicate balance of ecosystems and reduces species diversity.

However, it is worth noting that a significant percentage, 28.50% (35), disagree with this statement.

This difference in opinion highlights the complexity of the topic and the need for further discussion and research to fully understand the impacts of cattle farming on biodiversity.

- xiii. *Do you agree that farming practices can have various impacts on the local ecosystem, including changes in vegetation composition, altered nutrient cycling, and increased pressure on native plant and animal species?*

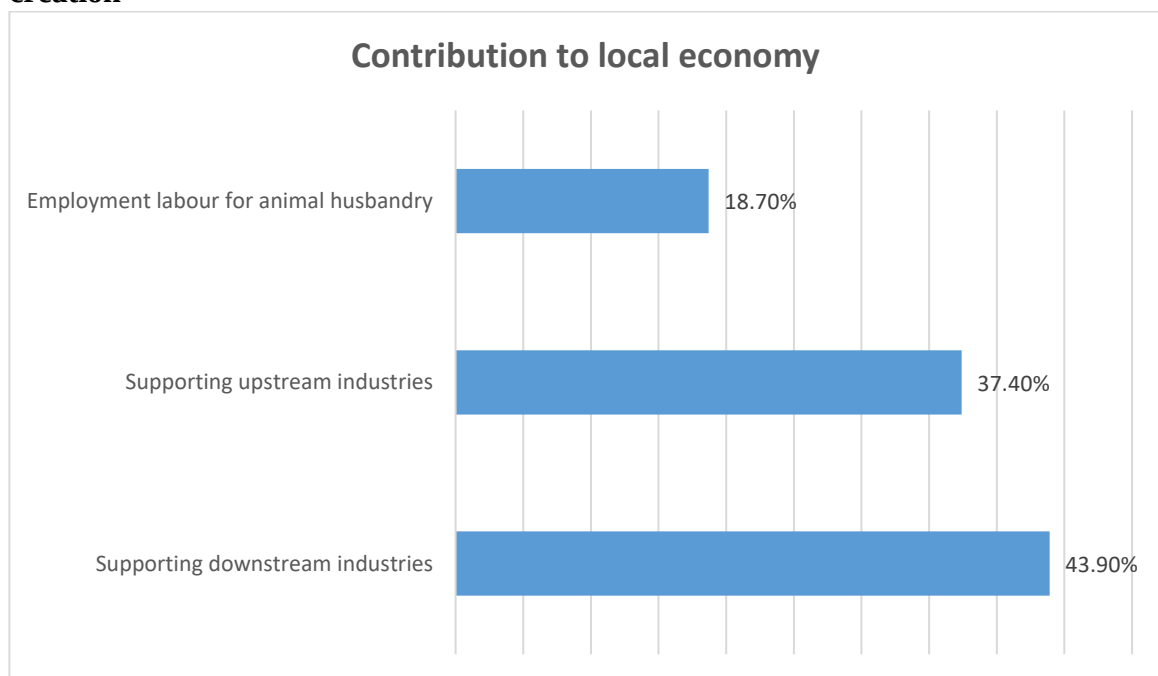
A majority of the respondents, 91.10% (112), agree that farming practices can have various impacts on the local ecosystem. These impacts include changes in vegetation composition, altered nutrient cycling, and increased pressure on native plant and animal species.

A smaller percentage, 8.90% (8.9%), disagree with this statement.

It is important to consider these differing perspectives when discussing the effects of farming practices on the local ecosystem.

xiv. *How do small-scale cattle farmers contribute to local economy and job creation?*

Figure 4.7 Small-scale cattle farmers contributing to local economy and job creation



Source 2024

43.90% (54) of the respondents were of the opinion that small-scale cattle farming plays a significant role in supporting industries that are involved in processing, distribution, and marketing of cattle products. These downstream industries can include meat processing plants, dairy product manufacturers, and leather goods producers. The support provided by small-scale cattle farming helps stimulate economic activity and create additional job opportunities in these sectors.

Other respondents, 37.40% (46) suggested that small-scale cattle farming also contributes to the growth and development of upstream industries. These industries may include suppliers of animal feed, veterinary services, equipment manufacturers, and agricultural input providers. The demand generated by small-scale cattle farming for these goods and services helps sustain and expand these upstream industries, leading to job creation and economic benefits.

Lastly 18.70% (23) of the respondents indicated the direct employment opportunities created by small-scale cattle farming in the field of animal husbandry. Caring for the cattle, managing their health, and ensuring their well-being requires skilled labor. Small-scale cattle farming provides employment opportunities for individuals with expertise in animal husbandry, contributing to local job creation and livelihoods.

Overall, small-scale cattle farming makes significant contributions to the local economy by supporting downstream and upstream industries, as well as providing employment opportunities in the field of animal husbandry. These contributions help stimulate economic growth, create jobs, and enhance the overall well-being of the community.

xv. *What is the biggest positive social benefit of small-scale cattle farming?*

Most of the respondents 35.00% (43) agreed with the suggestion that the positive social benefits of small-scale cattle farming is the provision of draught power for crop farming. This high percentage indicates that small-scale cattle farming plays a significant role in providing draught power for crop farming. Cattle can be used for ploughing fields and transporting agricultural produce, contributing to the overall agricultural productivity of the community.

A significant number of respondents, 22.80% (28) selected cultural heritage preservation (maintaining value of cattle in society). This percentage suggests that small-scale cattle farming helps in preserving cultural heritage by maintaining the value and significance of cattle within society. Cattle may hold cultural and symbolic importance in certain communities.

Reduction of rural to urban migration was selected by 20.30% (25 of the respondents indicating that small-scale cattle farming can serve as a means to reduce rural to urban migration. By providing livelihood opportunities and income sources in rural areas, it can help in retaining population and skills within rural communities.

Traditional farming practices preservation was selected by 10.60% (13) of the respondents indicating that small-scale cattle farming plays a role in preserving traditional farming methods, which can be important for cultural heritage and maintaining sustainable agricultural practices.

5.70% (7) of the respondents identified food security as the greatest benefit. While this percentage may seem relatively low, it still signifies that small-scale cattle farming contributes to ensuring food security within communities. This could be through the production of meat, milk, or other cattle-related products.

Improvement of community cohesion also selected by 5.70% (7) of the respondents also suggests that small-scale cattle farming contributes to community cohesion. It can bring

people together through shared responsibilities, knowledge exchange, and cooperative efforts.

Overall, these percentages highlight the various positive social benefits of small-scale cattle farming, including the preservation of traditional practices, cultural heritage, and community cohesion, as well as its contribution to food security, reduced migration, and support for crop farming through draught power.

xvi. *What are the negative social impacts of small-scale cattle farming?*

Table 4.9 Negative social impacts of small-scale cattle farming

Negative social impacts of small-scale cattle farming	Frequency	Percentage
Conflicts for land and water use	67	54.5%
Environmental degradation	18	14.6%
Giving rise to occupational hazards	8	6.5%
Exposes crops to damage by cattle	30	24.4%
Total	123	100%

A majority of the respondents, 54.5% were of the opinion that conflicts for land and water use can lead to disputes and competition over limited resources such as land and water.

Another 24.4% of the respondents were of the opinion that small-scale cattle farming can result in exposing crops to damage by cattle accounts for 24.40% of the negative social impacts. This suggests that small-scale cattle farming can result in crop damage, potentially affecting the livelihoods of farmers who rely on their crops for income.

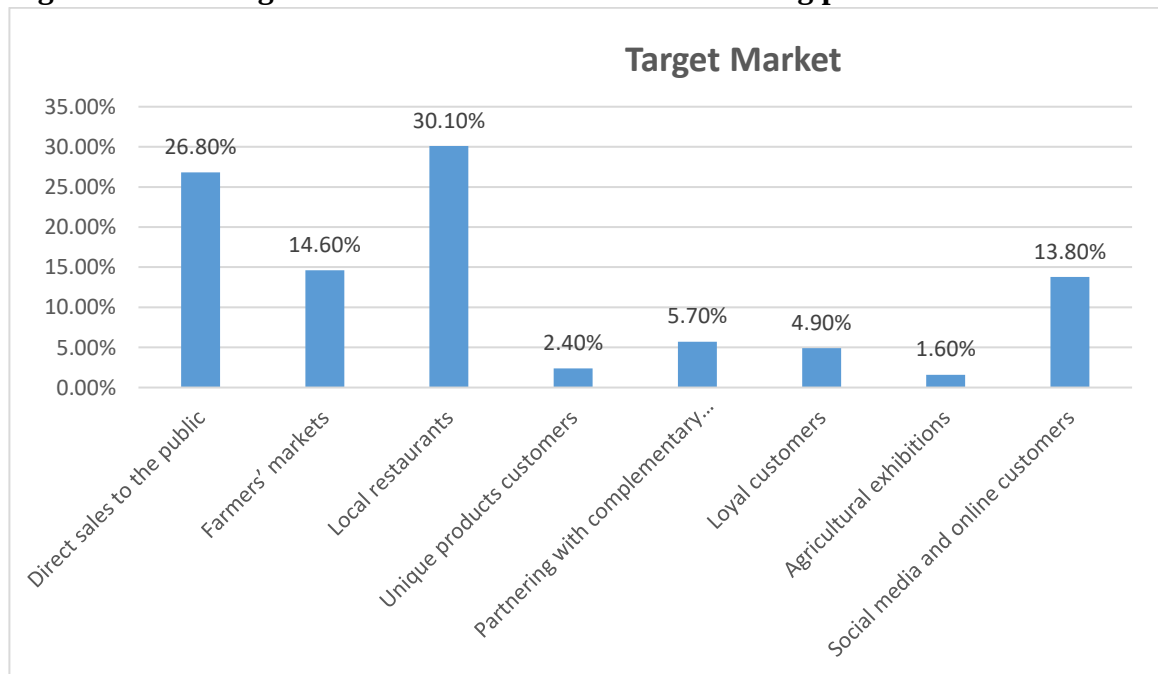
Additionally, another 14.6% of the respondents indicated that small-scale cattle farming can contribute to the deterioration of the environment, potentially through factors such as deforestation, soil erosion, or water pollution.

Occupational hazards as identified by 6.50% of the respondents can pose risks to the health and safety of farmers and workers involved in the industry.

These findings highlight the potential social challenges associated with small-scale cattle farming, including conflicts over resources, environmental degradation, occupational hazards, and crop damage. It is important for farmers and stakeholders to address these issues and implement sustainable practices to mitigate these negative impacts.

xvii. *What is the target market for small-scale cattle farming produce?*

Figure 4.8 The target market for small-scale cattle farming produce



Source 2024

Based on the data obtained, a majority of the respondents, 30.10% (37) suggested that local restaurants are the best target market for small-scale cattle farmers to supply their produce to. This was followed by respondents 26.80% (33), who identified direct sales to the public as the best target market for farmers to establish a personal connection with customers and potentially build long-term relationships.

Farmers' markets were also selected by 14.60% (18) of the respondents as an ideal platform for farmers to directly engage with local consumers and showcase their products in a community setting. Partnering with complementary businesses, although selected by 5.70% (7) of the respondents, can create mutually beneficial relationships and expand the reach of small-scale cattle farming produce.

Social media and online customers were suggested by 13.80% of the respondents. Social media and online platforms provide a convenient way for small-scale cattle farmers to reach a wider audience and engage with customers who prefer online shopping. Fewer respondents identified unique products customers (2.40%) suggesting that there is a niche market interested in unique or specialty cattle farming products, which can be a potential avenue for differentiation and higher value products.

Loyal customers and agricultural exhibitions, with 4.90% and 1.60% respectively are an important to provide consistent support and word-of-mouth recommendations as well offering platforms for farmers to showcase their products, network with industry professionals, and potentially attract new customers.

Overall, there are various channels through which small-scale cattle farmers can target their products to reach different customer segments. By diversifying their sales channels and understanding their target market preferences, farmers can maximize their market reach and potential sales opportunities.

xviii. *What are the competitive advantages for small-scale cattle farming produce?*

The data collected highlights the competitive advantages for small-scale cattle farming produce, based on the responses received. The percentage breakdown is as follows:

- Proximity to wider community consumer base: 56.10%
- Low labor cost: 29.30%

- Government policies promoting local sourcing: 14.60%

The data suggests that the proximity to a wider community consumer base is considered the most significant competitive advantage for small-scale cattle farming produce. This proximity allows for easier access to potential customers, reducing transportation costs and ensuring fresher products.

Another advantage mentioned is the low labor cost, which can contribute to cost-effectiveness and potentially higher profit margins for small-scale cattle farmers.

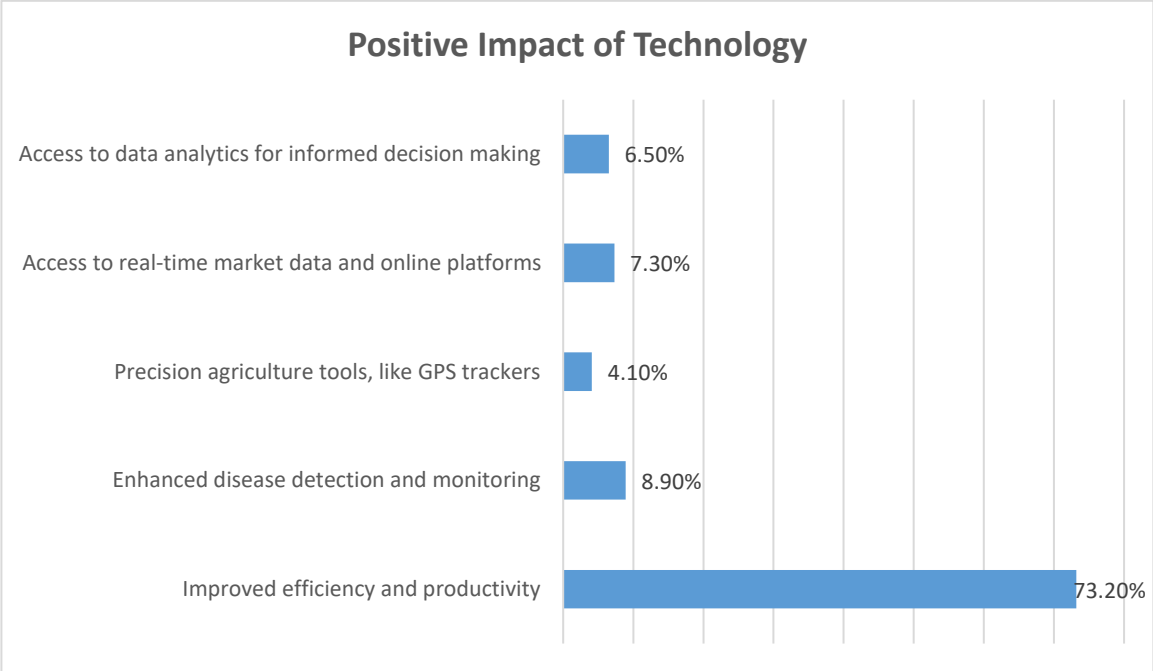
Additionally, government policies promoting local sourcing are seen as a competitive advantage. These policies can create a supportive environment for small-scale farmers by encouraging consumers and businesses to prioritize locally produced goods.

Overall, these competitive advantages can help small-scale cattle farmers establish a strong market presence and differentiate themselves from larger-scale operations.

C. Identify the available technologies and techniques that can be adopted by farmers to enhance productivity and efficiency.

- i. *How has technology positively impacted small-scale cattle farming operations?*

Figure 4.9 Technology positively impacted small-scale cattle farming operations



Source 2024

The bar graph highlights the positive impacts of technology on small-scale cattle farming operations, based on the responses received. The majority of respondents recognize that technology has significantly improved efficiency and productivity in their operations. This could be attributed to the automation of certain tasks, streamlined processes, and the use of advanced equipment.

Furthermore, technology has played a role in enhancing disease detection and monitoring, allowing farmers to identify and address health issues in their cattle more effectively. Precision agriculture tools, such as GPS trackers, have also contributed to optimizing farming practices and resource management.

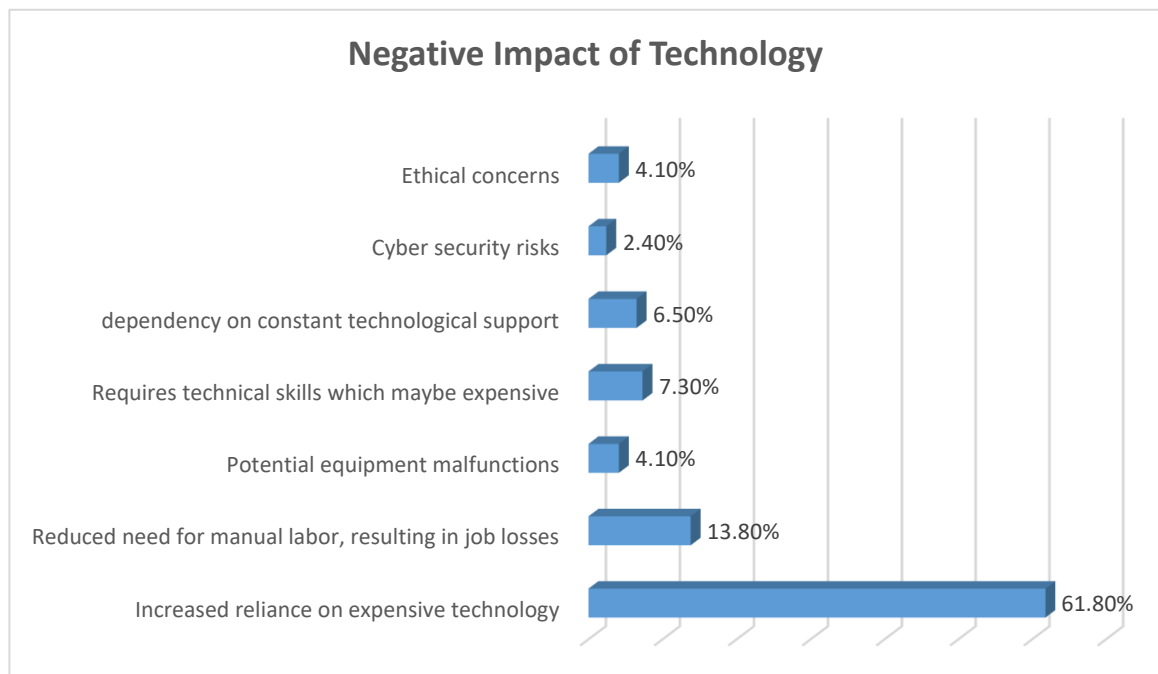
Access to real-time market data and online platforms has provided small-scale cattle farmers with valuable information and opportunities to reach a wider customer base.

Additionally, the availability of data analytics has empowered farmers to make informed decisions based on insights derived from collected data.

Overall, technology has proven to be a valuable asset for small-scale cattle farming operations, improving efficiency, disease management, market access, and decision-making capabilities.

- ii. *What are the negative impacts of technology on small-scale cattle farming operations?*

Figure 4.10 The negative impacts of technology on small-scale cattle farming operations



Source 2024

The bar graph gives insights into the negative impacts of technology on small-scale cattle farming operations, based on respondents' percentages. The primary concern expressed by respondents is the increased reliance on expensive technology. This suggests that

small-scale cattle farmers may face financial challenges due to the high costs associated with adopting and maintaining advanced technologies.

Additionally, the reduced need for manual labor may lead to job losses within the industry. This implies that the automation and mechanization brought by technology may lead to a decrease in employment opportunities for manual laborers in the industry.

Other concerns include potential equipment malfunctions, the need for technical skills that may come at a cost, dependency on constant technological support, cybersecurity risks, and ethical concerns.

It is important for small-scale cattle farmers to carefully consider these potential negative impacts and find ways to mitigate them, such as investing in cost-effective technology solutions, providing training for technical skills, and implementing cybersecurity measures to protect their operations.

iii. What is the mostly used assisted reproductive technique in cattle farming?

Table 4.10 Used assisted reproductive technique in cattle farming

Mostly used Assisted Reproductive Technique in cattle farming	Frequency	Percentage
Artificial insemination (AI)	97	78.9%
Embryo transfer (ET)	6	4.9%
In vitro fertilization (IVF)	5	4.1%

Synchronization protocols for better heat detection	15	12.2%
Total	123	100%

According to the respondents, artificial insemination (AI) is the most commonly used ART in cattle farming, accounting for 78.90% of the responses. This technique involves the introduction of semen into the reproductive tract of the female cattle to achieve fertilization. Embryo transfer (ET) and in vitro fertilization (IVF) are also utilized, albeit to a lesser extent, with 4.90% and 4.10% of respondents using these techniques, respectively. These methods involve the transfer of embryos or fertilization outside the body, respectively.

Additionally, synchronization protocols for better heat detection are employed by 12.20% of respondents. These protocols help farmers identify and optimize the timing of breeding to increase the chances of successful reproduction.

The data suggests that artificial insemination is the most prevalent ART in cattle farming, likely due to its relative ease of implementation and cost-effectiveness. However, it is important to note that the choice of ART may vary depending on factors such as farm size, breeding goals, and available resources.

iv. *How can artificial insemination benefit small scale cattle farmers?*

Table 4.11 Artificial insemination on small scale cattle farmers

How artificial insemination benefits small scale cattle farmers	Frequency	Percentage
Access to superior genetics without owning expensive high-quality bulls	104	84.6%
Increased genetic diversity within the herd	16	13.0%
Reduced risk of injury by circumventing natural bull mating	3	2.4%
Total	123	100%

The data provided highlights the benefits of artificial insemination for small-scale cattle farmers. These findings emphasize the advantages that artificial insemination brings to small-scale cattle farming. By utilizing this technique, farmers can access superior genetics without the need to invest in expensive high-quality bulls. This allows them to improve the quality of their herd without incurring significant costs.

Additionally, artificial insemination contributes to increased genetic diversity within the herd, which can enhance overall herd health and productivity. Moreover, by avoiding natural bull mating, the risk of injuries to both animals and farmers is reduced.

Overall, artificial insemination offers small-scale cattle farmers a cost-effective and safer method to improve their herd's genetics and overall performance.

- v. *What are the advantages of embryo transfer for small scale cattle farmers?*

Table 4.12 The advantages of embryo transfer for small scale cattle farmers

Advantages of embryo transfer for small scale cattle farmers	Frequency	Percentage
Allows farmers to reproduce from their most productive and genetically superior cows	77	62.6%
Increases the number of offspring from genetically superior females	34	27.6%
Facilitates genetic advancement by producing multiple offspring simultaneously	12	9.8%
Total	123	100%

The table highlights the advantages of embryo transfer for small-scale cattle farmers, based on the respondents' percentage breakdown. These percentages indicate the perceived benefits of embryo transfer for small-scale cattle farmers. The majority of respondents recognize that embryo transfer enables them to reproduce from their most productive and genetically superior cows, which can help maintain and improve the quality of their cattle herd.

Additionally, embryo transfer allows for an increased number of offspring from genetically superior females, which can contribute to the expansion and enhancement of the herd.

Furthermore, the technique facilitates genetic advancement by producing multiple offspring simultaneously, which can accelerate the progress of breeding programs. These

advantages demonstrate the potential value of embryo transfer for small-scale cattle farmers in terms of genetic improvement and herd management.

- vi. *How can In-Vitro Fertilization (IVF) improve productivity for small scale cattle farmers?*

Table 4.13 IVF on productivity for small scale cattle farmers

How In-Vitro Fertilization (IVF) improves productivity for small scale cattle farmers	Frequency	Percentage
Increases the number of genetically superior calves produced per donor cow	72	58.5%
Shortens the generation interval, accelerating genetic progress	43	35.0%
Enables the use of sexed semen for gender selection, optimizing the breeding program	8	6.5%
Total	123	100%

In-Vitro Fertilization (IVF) improves productivity for small scale cattle farmers.

According to the data, IVF increases the number of genetically superior calves produced per donor cow, as indicated by 58.50% (72) of the respondents. This means that IVF allows for a higher production of calves with desirable genetic traits.

35.00%. (43) of the respondents indicated that they consider IVF to shorten the generation interval, accelerating genetic progress by This implies that IVF helps in achieving genetic improvements at a faster rate by reducing the time between generations.

IVF enables the use of sexed semen for gender selection, optimizing the breeding program. This was selected by 6.50% (8) of the respondents. This suggests that IVF allows

farmers to selectively breed for desired genders, which can be beneficial for their specific breeding goals.

Overall, these findings indicate that IVF can significantly enhance productivity for small scale cattle farmers by increasing the number of genetically superior calves, accelerating genetic progress, and optimizing breeding programs through gender selection.

4.2.2 Verbal Interview Structured Questions

Structured questions were used to obtain responses from selected adult farmers aged 18 years and above. The purpose of the study was explained to them, and they were all asked to sign the consent form before participating in the study.

A total of 40 farmers were approached and 34 gave their consent. These 34 farmers were engaged between 17 July 2023 and 13 October 2023.

The questions were in two sections as below:

- i. Section A – Personal data
- ii. Section B – Research questions

4.2.2.1 Personal Data

This section of the questionnaire covered the respondents' gender, age, highest school qualification, role and experience in cattle farming.

a) What is your gender?

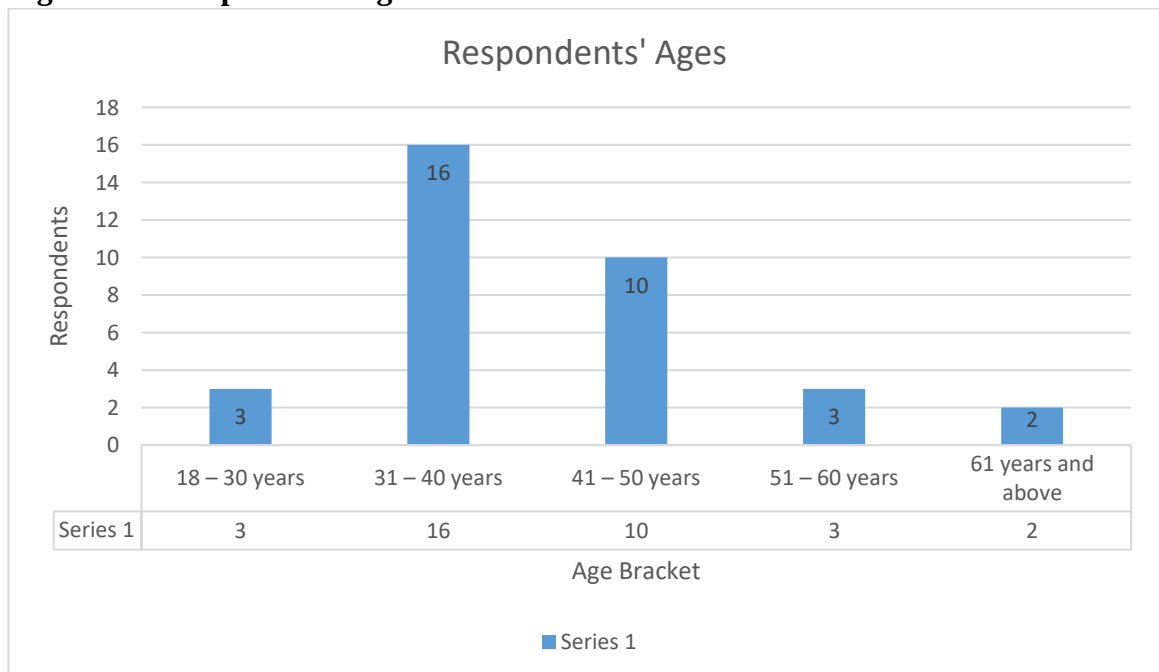
Table 4.14 Respondents Gender

Gender	Frequency	Percentage
Male	23	67.6%
Female	11	32.4%
Other	0	0%
Total	34	100%

Most of the respondents were men constituting 67.6% with the remainder of 32.4% being women. This correlates with the ratio of men and women for questionnaires where most respondents were also men.

b) What is your age?

The respondents were asked about their current age and the results are as below.

Figure 4.11 Respondents Ages

Source 2024

The majority of farmers were aged between 31 and 50years constituting 76.5% of the respondents. Very few farmers are in the lower age bracket of 18 – 30years (8.8%) and few in the upper age bracket of 61years and above (5.9%).

c) What is your highest level of education?

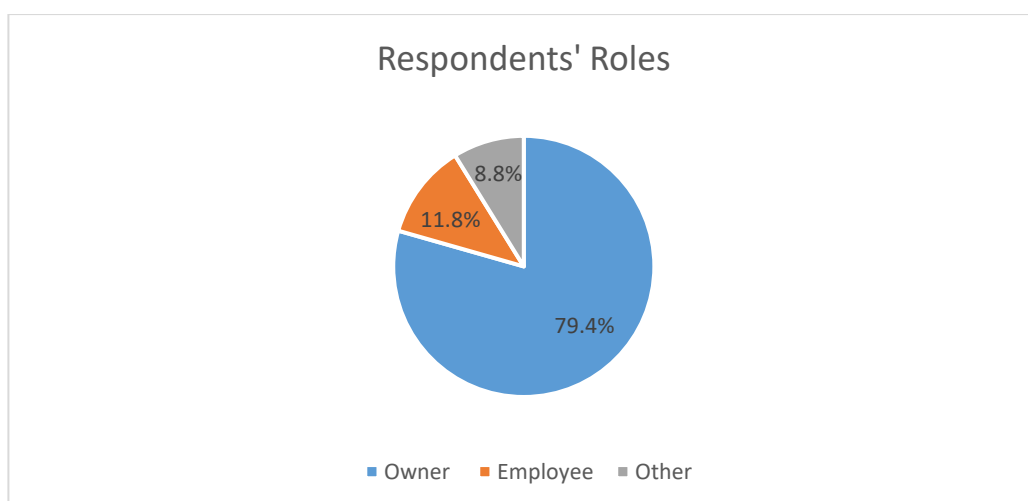
Table 4.15 Respondents Level of education

Highest Educational Qualification	Frequency	Percentage
Ordinary Level	23	67.6%
Advanced Level	2	5.9%
Certificate	7	20.6%
Diploma	2	5.9%
Degree	0	0.0%
Total	34	100%

Most of the respondents reached Ordinary Level of education (67.6%). A few of the respondents reached advanced Level of education (5.9%). Certificate holders were 20.6% of the respondents and 5.9% had diplomas. None were degreed.

d) What is your role in small-scale cattle farming?

Figure 4.12 Respondents Roles in Small-scale cattle farming



Source 2024

Out of 34 respondents 27 (79.4%) were owners, 4(11.8%) were employees on small scale cattle farming operations, and 3 (8.8%) were previous owners of small-scale cattle farming operations.

e) What is the size of your herd or size of herd you previously owned?

There were no respondents with a herd size more than 150. Out of 34 respondents, 17 of them owned less than 20 cattle representing 50% of the respondents. 11 (32.4%) of the farmers owned between 20 and 50 cattle whilst 4 farmers (11.9%) owned between 50 and 100 cattle. Only 2 respondents (5.9%) owned cattle between 100 and 150. This indicates that the majority of cattle owners in Chimanimani are small-scale.

f) How many years of experience in cattle farming do you have?

Table 4.16 Years of experience in cattle farming

Experience in cattle farming	Frequency	Percentage
Less than 1 year	2	5.9%

1 – 5 years	6	17.6%
6 – 10 years	7	20.6%
11 - 20 years	13	38.2%
21years or more	6	17.6%
Total	34	100%

Most of the respondents had more than 5 years' experience in cattle farming. This represents 80% of the respondents. This correlates with ideas gathered during the engagements which were quite fruitful.

4.2.2.2 Research Questions

A. Identify the available technologies and techniques that can be adopted by farmers to enhance productivity and efficiency.

- i. *How can small scale cattle farmers improve their use of Assisted Reproductive Techniques (ART)?*

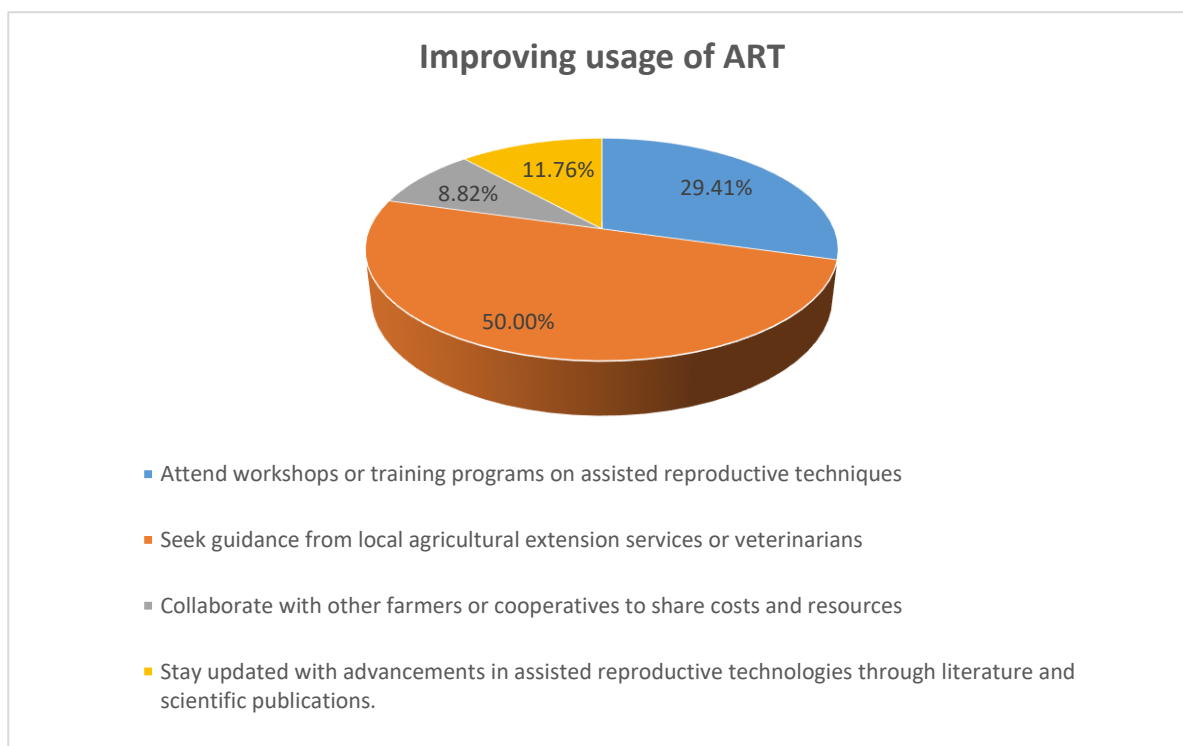


Figure 4.13 Ways small scale cattle farmers can improve their use of ART

Source 2024

Small-scale cattle farmers improve their use of ART through various methods. The majority, 50.00% (17) of respondents, seek guidance from local agricultural extension services or veterinarians, indicating the importance of professional expertise in this area.

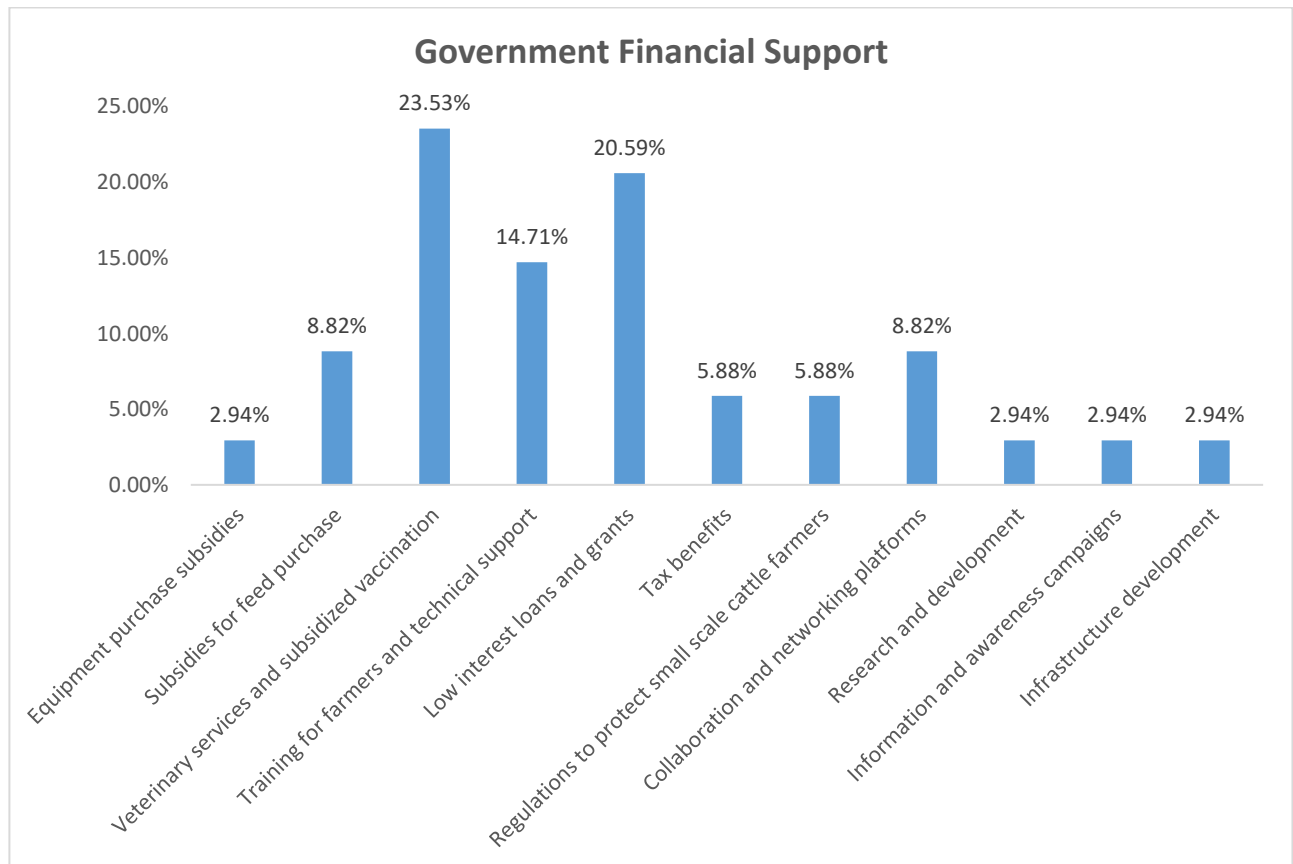
Additionally, attending workshops or training programs on ART was mentioned by 29.4% (10) of respondents, highlighting the value of hands-on learning and knowledge sharing. Staying updated with advancements in assisted reproductive technologies through literature and scientific publications is mentioned by 11.8% (4) of respondents, indicating the importance of staying informed about the latest research and developments.

Lastly, collaborating with other farmers or cooperatives to share costs and resources is mentioned by 8.8% (3) of respondents, emphasizing the benefits of collective efforts.

These findings suggest that small-scale cattle farmers employ a combination of learning opportunities, professional guidance, staying informed, and collaboration to improve their use of ART.

ii. *What financial support can the government provide to small-scale cattle farmers?*

Figure 4.14 Financial support that government can provide to small-scale cattle farmers



Source 2024

There are various financial support options that the government can provide to small-scale cattle farmers, as indicated by the respondents. The most popular options are low interest

loans and grants, with 20.60% of the respondents considering it as a beneficial form of support. Veterinary services and subsidized vaccination are recognized as important by 23.50% of the respondents, while training for farmers and technical support is mentioned by 14.7% of the respondents.

Other notable options include subsidies for feed purchase (8.80%), equipment purchase subsidies (2.9%), and regulations to protect small-scale cattle farmers (5.9%). Collaboration and networking platforms, information and awareness campaigns, and research and development are mentioned by smaller percentages of respondents.

These findings highlight the importance of financial support options such as low interest loans, grants, veterinary services, and training in assisting small-scale cattle farmers. It also emphasizes the need for collaboration, research, and infrastructure development to support the growth and sustainability of the industry.

- iii. *What measures can the government take to improve access to veterinary care and disease prevention for small-scale cattle farmers?*

Table 4.17 Measures that government can take to improve access to veterinary care and disease prevention for small-scale cattle farmers

Measures the government can take to improve access to veterinary care and disease prevention for small-scale cattle farmers?	Frequency	Percentage
Mandatory vaccination	11	32.4%

Mandatory dipping	19	55.9%
Permitting system to control cattle movement between regions	4	11.8%
Total	34	100%

The measures that respondents believe the government can take to improve access to veterinary care and disease prevention for small-scale cattle farmers are diverse.

Mandatory dipping: This measure is considered important by 55.90% (19) of the respondents. Dipping is a method used to control external parasites in cattle and making it mandatory can help ensure that farmers are actively taking steps to prevent and manage diseases.

Permitting system to control cattle movement between regions: This measure is mentioned by 11.80% (4) of the respondents. Implementing a permitting system can help regulate the movement of cattle between regions, which can be crucial in preventing the spread of diseases and ensuring biosecurity measures are followed.

Mandatory vaccination: This measure is recognized as significant by 32.40% (11) of the respondents. Making vaccinations mandatory can help ensure that cattle are protected against common diseases, reducing the risk of outbreaks and improving overall herd health.

These findings suggest that respondents believe mandatory dipping, implementing a permitting system for cattle movement, and mandatory vaccination are important

measures that the government can take to improve access to veterinary care and disease prevention for small-scale cattle farmers.

iv. *What major role is played by the community and industry in supporting small-scale farmers?*

The community and industry play a major role in supporting small-scale farmers, as indicated by the respondents. Market access is considered the most significant factor, with 44.1% (15) of the respondents recognizing its importance. Collaboration and knowledge sharing are also recognized as important by 29.40% (10) of the respondents.

Financial support is mentioned by 14.7% (5) of the respondents, while access to resources is considered by 5.9% (2) of the respondents. Awareness and education are mentioned by 5.90% (2) of the respondents.

These findings highlight the importance of market access, collaboration, and knowledge sharing in supporting small-scale farmers, along with the need for financial support and access to resources.

v. *What is your view on collaboration of small-scale cattle farmers?*

Table 4.18 Respondents views on collaboration of small-scale cattle farmers

View on collaboration of small-scale cattle farmers	Frequency	Percentage
Better productivity from pooling resources and expertise	6	17.6%

Collective bargaining with suppliers for better prices	14	41.2%
Detrimental due to rise in conflicts due ineffective leadership and poor communication	12	35.3%
No continuous improvement due to lack of competition	2	5.9%
Total	34	100%

According to the information gathered, the view on collaboration among small-scale cattle farmers is varied. 41.20% (14) of the respondents believe that collaboration through collective bargaining with suppliers can lead to better prices, indicating a positive perspective on collaboration. However, 35.30% (12) of the respondents' view collaboration as detrimental due to conflicts arising from ineffective leadership and poor communication. This suggests that there are challenges to be addressed in terms of managing collaboration effectively.

These findings highlight the diverse opinions on collaboration among small-scale cattle farmers, with both positive and negative perspectives being expressed.

4.3 Discussion and Interpretation

The findings for each objective are discussed in this section. The discussions were done objective by objective.

i. Identify the main challenges faced by small scale cattle farmers in terms of financial resources and access to capital.

The research findings suggest that small-scale cattle farmers face several challenges in turning their farms into sustainable businesses. One of the primary challenges is the lack of access to capital. Small-scale farmers often struggle to secure financial resources for purchasing cattle, improving infrastructure, and investing in technology. This hinders their ability to expand their operations and make necessary improvements to achieve long-term sustainability.

Another major challenge is the inadequate knowledge and skills among small-scale cattle farmers. Many of them lack proper training and education on modern farming techniques, breeding, and healthcare practices. This limits their productivity and efficiency, leading to lower profits and difficulty in establishing sustainable businesses.

Limited access to markets is another significant challenge. Small-scale cattle farmers often face difficulties in finding reliable and profitable markets for their products. This may be due to a lack of market knowledge, limited networks, or strict market requirements. This hampers their ability to sell their cattle and obtain fair prices, making it harder to sustain their businesses.

High input costs and lack of bargaining power also pose challenges. Small-scale cattle farmers often pay higher prices for inputs such as feed, medicine, and equipment

compared to larger-scale operations. Moreover, their limited bargaining power makes it difficult for them to negotiate better prices, further increasing the overall costs and affecting business sustainability.

Environmental challenges, including soil erosion, water scarcity, and loss of biodiversity, also impact small-scale cattle farming. These challenges can affect livestock health, reduce productivity, and increase resource costs, making it harder for farmers to operate sustainably.

Exposure to climate change is another challenge faced by small-scale cattle farmers. Changing weather patterns, including droughts, floods, and extreme temperatures, can negatively impact grazing lands, animal health, and feed availability. This unpredictability makes it harder for farmers to plan and sustain their businesses effectively.

Moreover, the availability and quality of land also significantly affect small-scale cattle farming. Limited access to suitable land for grazing and forage production restricts the expansion possibilities and productivity of these farms. In addition, land degradation and soil quality issues can further impede their long-term sustainability.

Lastly, the lack of infrastructure and technology negatively impacts small-scale cattle farmers. Insufficient access to adequate roads, storage facilities, and processing infrastructure hinders their ability to transport, store, and market their products effectively. Additionally, limited use of modern farming technologies limits their productivity and efficiency.

The interpretation of the findings is that small-scale cattle farmers face various challenges in turning their farms into sustainable businesses. These challenges include lack of access to capital, inadequate knowledge and skills, limited access to markets, high input costs and lack of bargaining power, environmental challenges, exposure to climate change, land availability and quality, and lack of infrastructure and technology. Addressing these challenges is crucial to support the development and sustainability of small-scale cattle farming.

ii. Identify the best management practices that can enhance cattle productivity and profitability.

The research findings identified several best practices that can be implemented for small-scale cattle farming. These practices can improve the productivity, sustainability, and overall welfare of the cattle.

Rotational grazing is an important practice that involves dividing the pasture into smaller paddocks or sections and regularly moving the cattle to different areas. This helps to prevent overgrazing, promote pasture health, and optimize forage utilization.

Proper waste management is crucial to reduce environmental pollution and maintain a clean and healthy environment. This involves proper disposal of manure and other waste products, such as using composting techniques or anaerobic digesters to generate energy from the waste.

Agroforestry combines the cultivation of trees or shrubs with cattle farming. This practice has numerous benefits, including providing shade and shelter for the animals, improving soil fertility, reducing erosion, and diversifying farm income through the sale of timber or fruit from the trees.

Optimal feed management is essential to ensure the cattle receive a balanced diet that meets their nutritional needs while minimizing waste. This can include using effective storage methods to prevent spoilage, using feed additives or supplements, and monitoring feed intake and conversion rates.

Maintaining genetic diversity is important to improve the resilience and adaptability of the cattle. It helps to reduce the risks of disease outbreaks and increase the overall herd productivity.

Animal welfare is a critical aspect of small-scale cattle farming. Ensuring the animals are provided with appropriate housing, nutrition, healthcare, and handling practices not only improves their well-being but also enhances their productivity and product quality.

Collaboration and knowledge sharing among farmers, researchers, and other stakeholders are essential for small-scale cattle farming. Collaborative networks can facilitate the exchange of experiences, best practices, and innovative techniques, enabling farmers to learn from each other and continuously improve their farming methods.

Lastly, the use of techniques and technologies can greatly enhance the efficiency and effectiveness of small-scale cattle farming. This can include the use of improved breeding techniques, precision agriculture technologies, remote sensing for pasture management, and data-driven decision making.

Overall, implementing these best practices can contribute to a more sustainable, productive, and environmentally friendly small-scale cattle farming industry.

iii. Identify the available technologies and techniques that can be adopted by farmers to enhance productivity and efficiency.

Technology has had several positive impacts on small-scale cattle farming operations. Firstly, it has led to increased productivity. Farmers can now utilize modern equipment, such as automated feeding systems and milking machines, to streamline their operations and increase output. This has helped to meet the growing demand for livestock products.

Technology has also significantly improved record keeping in cattle farming. Farmers can use digital platforms and software to accurately track and manage various aspects of their operations, including breeding records, health records, and financial transactions. This not only saves time but also ensures better organization and accessibility of data.

Precision farming techniques have also been made possible by technology. Through the use of GPS tracking and drones, farmers can accurately monitor their cattle and optimize

grazing patterns. This enables them to minimize waste and maximize the efficient use of resources, consequently reducing costs and improving sustainability.

Moreover, technology has facilitated health monitoring in small-scale cattle farming. Farmers can now access real-time data on the health and well-being of their cattle. This helps in early detection of diseases or abnormalities, enabling prompt intervention and treatment, which ultimately leads to healthier and more productive livestock.

However, there are also negative impacts associated with the use of technology in small-scale cattle farming operations. The initial cost of acquiring advanced technology and systems can be a significant barrier for small-scale farmers. This can limit their access to the potential benefits of technology and hinder their competitiveness in the industry.

Another concern is the cybersecurity risks associated with technology. With increased reliance on digital systems and connectivity, farmers are exposed to potential attacks and breaches of their data. This can have serious consequences, including theft of sensitive information and disruption of operations.

Ethical concerns also arise from the use of technology in cattle farming. There is a debate surrounding the welfare implications of automated systems and whether they fully cater to the natural behaviors and needs of the animals.

There is also a potential risk of system failure. Technology, no matter how advanced, can still experience technical issues, glitches, or power outages. In such cases, farmers may face operational disruptions and losses.

The research findings also focused on identifying assisted reproductive techniques that can be implemented to improve productivity for small scale cattle farmers. Suggestions were made that artificial insemination can significantly improve productivity by increasing conception rates and enhancing genetic diversity within the herd. It allows small farmers to access superior genetics without the need for owning expensive bulls.

The findings further indicate that embryo transfer can enhance the reproductive efficiency of small-scale cattle farmers by allowing them to rapidly multiply the genetics of their best cows. Moreover, it enables them to sell surplus embryos, generating additional income. Synchronization programs can improve reproductive efficiency by increasing conception rates and reducing the labor and costs associated with heat detection.

In conclusion, the research findings highlight several technologies as well as assisted reproductive techniques that can be implemented by small-scale cattle farmers to improve productivity and increased profitability for small-scale farmers.

4.4 Summary

This chapter discussed, analyzed and interpreted data obtained from the field during the research. The main findings of the investigation were summarized in each section. Patterns and trends were uncovered using findings to draw conclusions and make predictions. Chapter 5 concludes the study, discusses its limitations and makes recommendations for practice and further research.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In this topic, a discussion of the key findings, conclusion, and recommendations derived from an in-depth analysis of the topic at hand will be done. By synthesizing the relevant information, this topic aims to provide an overview of the research question, outlining the main takeaways and implications for future action.

In the following sections, the key findings that have emerged will be explored, culminating in a conclusion that encapsulates the core insights gained from the research.

Additionally, a series of actionable recommendations that can guide individuals and organizations in implementing strategies to address the challenges identified will be proposed.

Through this summary, readers will gain a deeper understanding of the topic, as well as the potential pathways for making positive changes based on the evidence presented.

5.2 Discussion of key findings

The key findings from the research are:

- i. Small-scale cattle farmers are challenged with lack of access to capital, inadequate knowledge and skills and limited access to markets with regards to sustainability of their operations.
- ii. Very few small-scale cattle farmers are knowledgeable about best practices like rotational grazing, genetic diversity and use of techniques and technologies
- iii. There are both positive (improved productivity and precision farming) and negative (cost and possible failures) impacts of technology on small-scale cattle farming operations. Assisted reproductive techniques like artificial insemination and synchronization programs can be implemented to improve productivity for small scale cattle farmers.

5.3 Conclusions

In conclusion, the transition of small-scale cattle farming into a sustainable business requires a significant amount of time, effort, and resources.

However, by implementing sustainable practices, such as rotational grazing, water conservation, and feed management, small-scale farmers can significantly reduce their environmental impact while increasing profitability.

This dissertation has provided an overview of the current challenges and opportunities in sustainable cattle farming and highlighted the importance of planning and collaboration for successful implementation. Sustainable cattle farming not only benefits the farmers but also the environment and the community.

Therefore, policymakers, researchers, and stakeholders need to support and encourage sustainable practices in small-scale cattle farming to ensure a more sustainable future for all.

5.4 Implications

Based on the research findings, the following are the implications of the findings:

Implications for the research findings are as follows:

- i. The findings highlight the need for interventions to address the challenges faced by small-scale cattle farmers. This could involve providing access to capital,

offering training programs to improve knowledge and skills, and creating opportunities to access markets.

- ii. Given the low level of knowledge about best practices among small-scale cattle farmers, there is a need for educational programs and outreach efforts to disseminate information about rotational grazing, genetic diversity, and other techniques.
- iii. Technology can have both positive and negative impacts and while it can enhance productivity and precision farming, there may be costs and risks associated with its adoption. Therefore, careful consideration should be given to the potential benefits and drawbacks of technology before its implementation.

Implementing assisted reproductive techniques like artificial insemination and synchronization programs can significantly improve productivity for small-scale cattle farmers. This highlights the potential benefits of these techniques and encourages their adoption in order to enhance productivity and profitability.

5.5 Recommendations

Based on the research findings, the following recommendations can be made:

- i. It is recommended that small-scale cattle farmers have better access to capital through the provision of micro-loans or grants specifically designed for their needs. The government and financial institutions should collaborate to create

financial support programs tailored to the needs of small-scale cattle farmers. Additionally, the government can explore the possibility of introducing specialized training and education programs to enhance the knowledge and skills of small-scale cattle farmers.

- ii. Educational programs and workshops should be developed to increase the knowledge and awareness of small-scale cattle farmers about best practices in cattle farming, such as rotational grazing, genetic diversity, and the use of modern techniques and technologies. This can be achieved by partnering with agricultural universities, research institutes, and extension services to provide training and educational resources.
- iii. Small-scale cattle farmers should carefully assess the impact of adopting technology on their operations before investing. While technology can improve productivity and efficiency, there may be costs and potential failures associated with its adoption. It is recommended that small-scale cattle farmers seek advice from agricultural technology experts, participate in pilot programs, and share experiences and knowledge with other farmers to make informed decisions about technology adoption.

Implementing assisted reproductive techniques, such as artificial insemination and synchronization programs, can significantly improve productivity for small-scale cattle farmers. It is recommended that small-scale cattle farmers receive training and support in implementing these techniques, as well as access to high-quality genetic material.

5.6 Suggestions for Further Research

Based on the research findings further research can still be done as below:

- i. Conduct a study to explore the barriers and potential solutions related to accessing capital for small-scale cattle farmers. This could include investigating different financing models such as microloans, crowdfunding, or cooperative lending.
- ii. Investigate educational programs and training initiatives that can provide small-scale cattle farmers with the knowledge and skills necessary for best practices in rotational grazing, genetic diversity, and technology usage. This research should explore different delivery methods such as workshops, online courses, or mentorship programs.
- iii. Investigate the latest technological advancements in precision farming as well as evaluating the feasibility and potential benefits of implementing assisted reproductive techniques and assess their applicability and affordability for small-scale cattle farmers. Further research should also analyze the potential return on investment and long-term benefits of adopting these technologies.

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List of Appendices

Appendix 1: AUREC Approval letter



Investing in Africa's future

AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

P.O. Box 1320 Mutare, Zimbabwe, Off Nyanga Road, Old Mutare-Tel (+263-20) 60075/60026/61611

Fax:

(+263 20) 61785 website: www.africau.edu

Ref: AU2898/23

12 June, 2023

STANLEY MADIRE
C/O Africa University
Box 1320
MUTARE

RE: TURNING SMALL-SCALE CATTLE FARMING INTO A SUSTAINABLE BUSINESS

Thank you for the above-titled proposal that you submitted to the Africa University Research Ethics Committee for review. Please be advised that AUREC has reviewed and approved your application to conduct the above research.

The approval is based on the following. a) Research proposal

- **APPROVAL NUMBER** AUREC 2898/23
This number should be used on all correspondences, consent forms, and appropriate documents.
- **AUREC MEETING DATE** NA
- **APPROVAL DATE** June 12, 2023
- **EXPIRATION DATE** June 12, 2024
- **TYPE OF MEETING** Expedited

After the expiration date, this research may only continue upon renewal. A progress report on a standard AUREC form should be submitted a month before the expiration date for renewal purposes.

- **SERIOUS ADVERSE EVENTS** All serious problems having to do with subject safety must be reported to AUREC within 3 working days on standard AUREC form.
- **MODIFICATIONS** Prior AUREC approval is required before implementing any changes in the proposal (including changes in the consent documents)
- **TERMINATION OF STUDY** Upon termination of the study a report has to be submitted to AUREC.



Yours Faithfully

MARY CHINZOU
ASSISTANT RESEARCH OFFICER: FOR CHAIRPERSON
AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE

Appendix 2: Informed Consent Guide

My name is Stanley Madire, a final year Executive Masters in Business Administration student from Africa University, Mutare Campus. I am carrying out a study on **‘Turning small-scale cattle farming into a sustainable business.’** I am kindly asking you to participate in this study by answering questions that I will be fielding and filling in the attached questionnaire.

Purpose of the study:

The purpose of this study is to establish key areas of improvement for sustainability of small-scale cattle farming in Chimanimani district in Zimbabwe. You were selected for the study because of your valuable experience and knowledge in cattle farming in this district.

Procedures and duration

If you decide to participate you will be expected to answer verbal questions and to fill the attached questionnaire. It is expected that this will take about 10 minutes with verbal questions and 5 minutes for the written part.

Risks and discomforts

There are no foreseeable risks for you as a participant to take part in this research.

Benefits and/or compensation

This research will benefit small-scale farmers in Chimanimani district and beyond with recommendations on influential variables that can be manipulated to optimize and sustain cattle farming.

Confidentiality

Any information that is obtained in the study that can be identified with you as a participant will not be disclosed to any other party without your written permission. Your name or any other identification is not required in this research.

Voluntary participation

Participation in this study is voluntary. Should you decide not to participate in this study, you are assured that this will not affect your future relationship with the researcher. If you chose to participate, you are free to withdraw your consent or to discontinue participation without penalty at any point.

Offer to answer questions

Before you sign this form, please ask any questions on any aspect of this study that is unclear to you. You may take as much time as necessary to think it over.

Authorization

If you have decided to participate in this study, please sign this form in the space provide below as an indication that you have read and understood the information provided above and have agreed to participate.

Name of Research Participant (please print)

Date

Signature of Research Participant or legally authorized representative

If you have any questions concerning this study or consent form beyond those answered by the researcher including questions about the research, your rights as a research participant, or if you feel that you have been treated unfairly and would like to talk to someone other than the researcher, please feel free to contact the Africa University Research Ethics Committee on telephone (020) 60075 or 60026 extension 1156 email aurec@africau.edu

Name of Researcher: Stanley Madire

Appendix 3: Informed Consent Guide in Shona

CHIZIVISO UYE KUZVIPIRA KUPINDA MUONGORORO

Zita rangu ndi Stanley Madire, ndiri mugore rekupedzisira rechidzidzo che Executive Masters mu Business Administration pa Africa University muguta re Mutare. Ndiri kuita ongororo yemusoro wenyaya unoti 'Varimi vadiki vemombe vangaite sei kushandura bhizimusi iri kuti risimukire pakugona kuzvimirira rega nekupa mugove wemari wakanaka.' Ndiri kukumbira nemutsa kuti mupindewo muongororo iyi nekupindura mibvunzo yandichange ndichikubvunzai uye nekuzadzisa mibvunzo iri pagwaro rakabatanidzwa nerino.

Chinangwa cheongororo:

Chinangwa cheongororo iyi ndechekudzeya musoro wenyaya unoti 'Varimi vadiki vemombe vangaite sei kushandura bhizimusi iri kuti risimukire pakugona kuzvimirira rega nekupa mugove wemari wakanaka' mudunhu reChimanimani muZimbabwe. Iwe wakasarudzwa kuti uve mumwe wevachapa pfungwa dzake muongororo iyi nekuda kweruzivo rwakakosha rwaunarwo uye ruzivo rwako rwenzvimbo yedunhu reChimanimani.

Maitiro uye nguva

Kana ukafunga kuva mumwe wevachapinda muongororo iyi unotarisirwa kupindura mibvunzo yandichange ndichikubvunza uye nekuzadzisa mibvunzo iri pagwaro rakabatanidzwa nerino. Zvinotarisirwa kuti izvi zvinotora anenge maminites gumi nemashanu pamwechete.

Njodzi yekubvunzwa mibvunzo isingafadze kana isinganzwisike

Hapana njodzi dzinoonekwa pakuva kwako mumwe wevachatora chikamu muongororo iyi.

Rubatsiro rweongororo ino

Ongororo iyi ichabatsira varimi vadiki mudunhu reChimanimani nemazano pamusoro pezvinhu zvingaitwe kusimudzira bhizimusi rekuchengeta mombe kuti ripe mugove wakanaka wemari.

Kuchengetwa zvakavanzika kwemashoko muongororo ino

Mashoko ako auchagoverana nemuongorori mutsvakiridzo ino achachengetedzwa uye kana achigozoveranwa nevamwe zita rrako harishambadzirwi pamwe chete kunze kwekunge iwe wapa mvumo nenzira yechinyorwa. Unoziviswa kuti urege kuisa zita rako kana chimwe chingaratidza kuti mutauri wemashoko ndiani pamagwaro ose eongororo ino.

Kuzvipira kupinda muongororo ino

Kupinda muongororo ino isarudzo yako yaunofanira kuita usina kumanikidzwa. Kana ukasarudza kusapinda muongororo ino unovimbiswa kuti izvi hazvikanganisi hukama hwako nemuongorori. Kana wasarudza kutora chikamu muongororo ino, wakasununguka kubvisa mvumo yako kana kurega kutora chikamu pasina mutongo chero nguva.

Kuzvipira kupindura mibvunzo

Musati masaina gwaro rino, ndapota bvunzai mibvunzo ine chekuita neongororo ino pazvikamu zvamusina kujekerwa nazvo. Unogona kutora nguva yakawanda sezvinodiwa kuti ufunge nezvazvo.

Mvumo yekuti upinzwe muongororo ino

Kana wasarudza kutora chikamu muongororo ino unokumbirwa kusaina gwaro rino panzvimbo iri pazasi pagwaro rino sechiratidzo chekuti waverenga nekunzwisisa uye ukava neruzivo pamusoro pechinangwa che ongororo ino.

-

Zita rako

Date

Siginicha yako

Kana muine mibvunzo inechekuita neongororo iyi kana kana yezviri pagwaro rino mune kodzero dzenyu semunhu ari chikamu muongororo ino kuti kana muchiona sokuti hamuna kubatwa zvakanaka uyezve kana muchida kutaura nemumwe munhu asiri muongorori uno, makasununguka kubata Africa University Research Ethics Committee parunhare (020) 60075 kana 60026 pa extension 1156 kana kunyora tsama muchitumira pa email inoti aurec@africau.edu

Zita reMuongorori: Stanley Madire

Appendix 4: QUESTIONNAIRE

Section A – Personal Information

1. What is your gender?

a. Male

b. Female

c. Other (please specify): _____

2. What is your age?

a. 18 - 30 years old

b. 31 - 40 years old

c. 41 - 50 years old

d. 51 - 60 years old

e. 60 years and above

3. What is your highest level of education?

a. Ordinary Level

b. Advanced Level

c. Certificate

d. Diploma

e. Degree

4. What is your role in small-scale cattle farming?

a. Owner

b. Employee

c. Veterinary Officer

d. Other

5. *What is the size of your herd or size of herd you previously owned?*

- a. 1 – 20
- b. 20 – 50
- c. 50 – 100
- d. 100 – 150
- e. 150 or more

6. *How many years of experience in cattle farming do you have?*

- a. Less than 1 year
- b. 1 – 5 years
- c. 6 – 10 years
- d. 11 – 20 years
- e. 21 years or more

Section B – Research Questions

1. *What are the financial challenges faced by small-scale cattle farmers in turning their farms into sustainable businesses?*

- a. Lack of access to capital
- b. Low profit margins
- c. High input costs
- d. Lack of bargaining power

2. *What are the environmental challenges faced by small-scale cattle farmers in implementing sustainable practices on their farms?*

- a. Exposure to climate change
- b. Land availability and land tenure
- c. Overgrazing land degradation

3. *Are you willing to invest time and resources in making small-scale cattle farming more sustainable?*
 - a. Yes
 - b. No
4. What are the market challenges faced by small-scale cattle farmers in marketing their products as sustainable?
 - a. Lack of consumer awareness and demand
 - b. Difficulty in accessing premium markets
 - c. Competition from large scale operations
5. What are the infrastructure challenges faced by small-scale cattle farmers in adopting sustainable technologies and practices?
 - a. Lack of proper handling facilities
 - b. Lack of fencing for controlled grazing
 - c. Lack of efficient water systems
 - d. Poor roads
6. *What are the knowledge and skills challenges faced by small-scale cattle farmers in implementing sustainable farming methods?*
 - a. Limited general education in farming
 - b. No formal training in cattle farming
 - c. Lack of technical knowledge
 - d. Lack of knowledge about cattle health and breeding management
7. *What is your biggest policy or regulatory challenge as a small-scale cattle farmer?*
 - a. Lack of input subsidies or grants
 - b. Lack of marketing incentives
 - c. Inconsistent regulations favoring large scale operations

8. *What recommended feeding practices for small-scale cattle farming do you consider critical?*
- a. Provide adequate clean water
 - b. Actively manage forage quality
 - c. Supplementary feeding
9. *What is the most effective way to manage pasture and grazing systems for small-scale cattle farming?*
- a. Rotational grazing
 - b. Soil conservation
 - c. Weed control
10. *What are the key considerations for ensuring proper animal health and disease prevention in small-scale cattle farming?*
- a. Vaccination and veterinary care
 - b. Regular parasite control
 - c. Proper feeding
11. *What is the most effective strategy to optimize reproduction and breeding in small-scale cattle farming?*
- a. Genetic diversity
 - b. Accurate heat detection
 - c. Proper artificial insemination
 - d. Monitoring bull fertility
 - e. Maintain optimal health conditions for cows
 - f. Use of techniques and technology
12. *How can small-scale cattle farmers improve animal welfare and handling practices?*
- a. Proper handling during transportation

- b. Adequate pen space provision
 - c. Proper farm hygiene
 - d. Regular upkeep of infrastructure
 - e. Collaboration and knowledge sharing
13. *What is most essential for effective farm management and record-keeping in small-scale cattle farming?*
- a. Upkeep of detailed records
 - b. Computer-based record keeping and cloud backups
 - c. Comprehensive financial management system
14. *What strategies that can be adopted to improve the economic viability for small-scale cattle farmers?*
- a. Develop value added products
 - b. Leverage direct marketing channels
 - c. Diversify income channels
 - d. Invest in technology
 - e. Continuous learning and development
15. *Have you received formal training on sustainable cattle farming practices?*
- a. Yes
 - b. No
16. *If yes, where did you receive your training?*
- a. Public sector programs (Agritex Officers)
 - b. College or university courses
 - c. Learning from others (on the job training)
17. *What is the impact of small-scale cattle farming on water pollution?*
- a. Water pollution

- b. Pollution from fertilizers
- c. Antibiotic overuse

18. How does small-scale cattle farming affect soil condition?

- a. Overgrazing
- b. Deforestation for pasture growth

19. Do you agree that cattle farming can lead to a loss of biodiversity as natural habitats are cleared for cattle operations, which disrupts the delicate balance of ecosystems and reduces species diversity?

- a. Yes
- b. No

20. Do you agree that farming practices can have various impacts on the local ecosystem, including changes in vegetation composition, altered nutrient cycling, and increased pressure on native plant and animal species?

- a. Yes
- b. No

21. How do small-scale cattle farmers contribute to local economy and job creation?

- a. Supporting downstream industries
- b. Supporting upstream industries
- c. Employment labor for animal husbandry

22. What is the biggest positive social benefit of small-scale cattle farming?

- a. Provision of draught power for crop farming
- b. Cultural heritage preservation
- c. Reduce rural to urban migration
- d. Traditional farming practices preservation
- e. Food security

- f. Improvement of community cohesion

23. *What are the negative social impacts of small-scale cattle farming?*

- a. Conflicts for land and water use
- b. Environmental degradation
- c. Giving rise to occupational hazards
- d. Exposes crops to damage by cattle

24. *What is the target market for small-scale cattle farming produce?*

- a. Direct sales to the public
- b. Farmers' markets
- c. Local restaurants
- d. Unique products customers
- e. Partnering with complementary businesses
- f. Loyal customers
- g. Agricultural exhibitions
- h. Social media and online customers

25. *What are the competitive advantages for small-scale cattle farming produce?*

- a. Proximity to wider community consumer base
- b. Low labor cost
- c. Government policies promoting local sourcing

26. *How has technology positively impacted small-scale cattle farming operations?*

- a. Improved efficiency and productivity
- b. Enhanced disease detection and monitoring
- c. Precision agriculture tools, like GPS trackers
- d. Access to real-time market data and online platforms

- e. Access to data analytics for informed decision making

27. *What are the negative impacts of technology on small-scale cattle farming operations?*

- a. Increased reliance on expensive technology
- b. Reduced need for manual labor, resulting in job losses
- c. Potential equipment malfunctions
- d. Requires technical skills which maybe expensive
- e. dependency on constant technological support
- f. Cyber security risks
- g. Ethical concerns

28. *What is the mostly used assisted reproductive technique in cattle farming?*

- a. Artificial insemination (AI)
- b. Embryo transfer (ET)
- c. In vitro fertilization (IVF)
- d. Synchronization protocols for better heat detection

29. *How can artificial insemination benefit small scale cattle farmers?*

- a. Access to superior genetics without owning expensive high-quality bulls
- b. Increased genetic diversity within the herd
- c. Reduced risk of injury by circumventing natural bull mating

30. *What are the advantages of embryo transfer for small scale cattle farmers?*

- a. Allows farmers to reproduce from their most productive and genetically superior cows
- b. Increases the number of offspring from genetically superior females
- c. Facilitates genetic advancement by producing multiple offspring simultaneously

31. *How can In-Vitro Fertilization (IVF) improve productivity for small scale cattle farmers?*

- a. Increases the number of genetically superior calves produced per donor cow
- b. Shortens the generation interval, accelerating genetic progress
- c. Enables the use of sexed semen for gender selection, optimizing the breeding program

Thank you for participating in this survey!

Appendix 5: Structured Questions for Interviews

Section A – Personal Information

1. What is your gender?

- a. Male
- b. Female
- c. Other (please specify): _____

2. What is your age?

- a. 18 - 30 years old
- b. 31 - 40 years old
- c. 41 - 50 years old
- d. 51 - 60 years old
- e. 60 years and above

3. What is your highest level of education?

- f. Ordinary Level
- g. Advanced Level
- h. Certificate
- i. Diploma
- j. Degree

4. What is your role in small-scale cattle farming?

- e. Owner
- f. Employee
- g. Veterinary Officer
- h. Other

5. *What is the size of your herd or size of herd you previously owned?*

- f. 1 – 20
- g. 20 – 50
- h. 50 – 100
- i. 100 – 150
- j. 150 or more

6. *How many years of experience in cattle farming do you have?*

- f. Less than 1 year
- g. 1 – 5 years
- h. 6 – 10 years
- i. 11 – 20 years
- j. 21 years or more

Section B – Research Questions

1. *How can small scale cattle farmers improve their use of Assisted Reproductive Techniques (ART)?*

- a. Attend workshops or training programs on assisted reproductive techniques
- b. Seek guidance from local agricultural extension services or veterinarians
- c. Collaborate with other farmers or cooperatives to share costs and resources
- d. Stay updated with advancements in assisted reproductive technologies through literature and scientific publications.

2. *What financial support can the government provide to small-scale cattle farmers?*

- a. Equipment purchase subsidies
- b. Subsidies for feed purchase
- c. Veterinary services and subsidized vaccination

- d. Training for farmers and technical support
 - e. Low interest loans and grants
 - f. Tax benefits
 - g. Regulations to protect small scale cattle farmers
 - h. Collaboration and networking platforms
 - i. Research and development
 - j. Information and awareness campaigns
 - k. Infrastructure development
3. *What measures can the government take to improve access to veterinary care and disease prevention for small-scale cattle farmers?*
- a. Mandatory vaccination
 - b. Mandatory dipping
 - c. Permitting system to control cattle movement between regions.
4. *What is your view on collaboration of small-scale cattle farmers?*
- a. Better productivity from pooling resources and expertise
 - b. Collective bargaining with suppliers for better prices
 - c. Detrimental due to rise in conflicts due ineffective leadership and poor communication.
 - d. No continuous improvement due to lack of competition.

Thank you for participating in this survey!