BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF AGRICULTURE AND ENVIRONMENTAL SCIENCE

DEPARTMENT OF ANIMAL SCIENCE

TITLE: A SURVEY ON THE CAUSES OF CALF MORTALITY IN WARD 19 OF MAKONI DISTRICT, MANICALAND PROVINCE.

BY

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The research project submitted in partial fulfilment of the requirements for the Bachelor of Agricultural Science Honours degree in Animal Science and Technology (BAgSASc&T)

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APPROVAL FORM

This confirms that I have endorsed the dissertation entitled "**A survey on the causes of calf mortality in Ward 19 of Makoni District, Manicaland Province**," presented in partial fulfilment of the requirements for the Bachelor of Science Honours degree in Animal Science and Technology at Bindura University of Science Education.

Name of Supervisor: Mr T.N.C Mangwiro

Signature: 

Date: 24.6.2024

DECLARATION

As the author of this research project, l declare that this thesis entitled, **"A survey on the causes of calf mortality in ward 19 of Makoni District, Manicaland Province,"** represents my own work, which was conducted after registration of the Bachelor of Agricultural Science Honours Degree in Animal Science and Technology at Bindura University of Science Education, under the supervision of Mr. T.N.C. Mangwiro. The work has not been previously submitted for a degree, diploma, or other qualification at this or any other institution. All sources of information and data used in this thesis have been acknowledged and properly referenced.

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Date: 30/09/2024

I confirm that l have thoroughly checked the Research project and be assured that it conforms to the department of Animal Science Guidelines for Project Preparation and Presentation. I therefore, authorize the student to submit this dissertation.

Chairperson: Mr T.N.C Mangwiro

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Date: 30/09/2024

ABSTRACT

Calf mortality is one of the paramount factors that influence cattle production in terms of herd expansion, genetic improvement and market performance. High calf mortality can lead to reduced market performance of the cattle industry, reduced rural livelihoods as they mostly depend on livestock production and loss of productivity in the industry. Reduced calf mortality can however make the cattle business profitable. A survey was conducted in ward 19 of Makoni District to investigate the causes of calf mortality. The research aimed in establishing the ideal causes of calf mortality, the prevalence of calf mortality, challenges faced by farmers in reducing calf mortality as well as recommending the possible interventions for reducing calf mortality in the area. All the cattle farmers in the ward were involved in the study, both A1 and A2 farmers. Data was collected physically by the researcher using structured questionnaires, focus groups and key informants. Data was analysed using SPSS version 20 and Microsoft Excel. Pneumonia was identified as the leading cause of calf mortality in the study area with 56.7% followed by diarrhoea with 50%. Starvation, heart water and theileriosis were also identified among the major causes of calf mortality in ward 19. The calf mortality prevalence in the study area was 8.6%. Farmers in the study area reported that the top challenges they are facing to reduce calf mortality are drought, high drug and feed costs, distant veterinary facility, lack of knowledge and lack of finance. Therefore, the researcher recommended infrastructure development such as improved calf housing and biosecurity measures which ensures a hygienic environment to reduce diseases such as pneumonia and calf diarrhoea. Additionally, the researcher encouraged ward 19 farmers to make use of traditional ways of treating animals known as Indigenous Knowledge Systems such as use of medicinal plants in order to cover up the financial gap. To fight starvation and drought, the researcher recommended farmers to invest in nutrition management such as calf and dam supplementation during drought period using harvested hay, crop residues and calf supplements. Moreover, the researcher gave a recommendation for farmers to make use of available equipment to harvest hay such as use of sickles. The researcher recommended financial support and training services to farmers. By implementing these recommendations, calf survival rates will be increased as well as improved productivity.

Key words: Causes, Calf, Mortality, Prevalence rate, Challenges, Interventions, Makoni District.

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DEDICATION

I dedicate this research project to my future children to see the hard work done by their mother and be assured that studies are a weapon to victory.

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LIST OF ACRONYMS

AGRITECH	Agricultural Technology
AFDA	Agriculture and Food Development Authority
BRD	Bovine Respiratory Disease
GDP	Gross Domestic Product
FAO	Food Agriculture Organization
ILRI	International Livestock Research Institute
GIT	Gastro Intestinal Tract
NADIS	National Animal Disease Information Service
NGO	Non-Governmental Organization
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

1.0: Background

As per Jacoby, Deininger, & Hillhorst (2024), most of the world's impoverished population dwell in the rural areas and are primarily engaged in agricultural pursuits, and thus, augmenting the productivity of agriculture assumes paramount importance to reducing poverty. Zimbabwe is a small nation with a populace of 13 million, out of which 7.1 million depend on agriculture for their sustenance (Kuhudzayi & Mattos, 2018). Smallholder farmers possess 80% of the livestock and half of the land, and every smallholder farmer has livestock (Kuhudzayi & Mattos, 2018). Recently, the beef sub-sector has garnered attention as an avenue that can significantly heighten the earnings of cattle farmers in Zimbabwe. Zimbabwe is currently ranked 68th in terms of production with Burkina Faso in the lead at 107,390 metric tons (ReportLinker, 2022). Supply has increased by 0.1% on average annually since 1966 (ReportLinker, 2022). According to Mangwiro (2023), there are currently 5,509,983 cattle in Zimbabwe, and the majority of this herd, 89% as reported by Madyavanhu et al. (2024), can be found in communal areas. Among these communal areas, a significant portion of the cattle population (3.5 million) comprises of indigenous breeds, and Assan (2013) estimates that about 88% of households in these areas own indigenous cattle or predominantly indigenous crossbreeds.

In the cattle industry, increasing the size of a herd and making genetic improvements can be difficult due to the significant impediment of calf mortality (Fentie, et al., 2020). According to Tautenhahn, Merle, & Muller (2020), there is a significant impact on production due to unusually high calf mortality rates and slow growth among the surviving animals in the livestock sector. While technology has enabled improved conception and use of locally adapted breeds, crossbreeding low-yielding native breeds with high-yielding exotic breeds in order to enhance overall performance in livestock production, (Maburutse, Mutibvu, Mbiriri, & Kashangura, 2012), calf loss is a critical area that costs farmers.

Some beef farmers in Makoni District engage in cow calf operation and sell those calves soon after weaning to obtain profit. Offtake of beef in Makoni district remains stagnant at 4% (Makoni

District food and nutrition security profile, 2022). Efforts to rebuild the cattle herd are hampered by mainly calf mortality. Loss of those calves from birth to weaning stage means that Makoni rural inhabitants are no longer able to do the business as expected leading to severe losses. Calf mortality in Zimbabwe ranges from 2 to 31% across provinces, Manicaland Province leading with 31% which is against recommended 2% (Masuka, 2022). Because of inadequate management practices such as limited utilization of advanced technologies (such as vaccinations and deworming) and insufficient cow nutrition resulting in reduced milk output, communal farmers are facing challenges with low cattle production, which is contributing to high rates of calf mortality soon after birth (Ngongoni, et al., 2007). Calves are at their highest risk, particularly in the dry period and at the onset of the wet season. (Ndebele, et al., 2007). They are vulnerable to various diseases such as tick borne, scours and respiratory infections leading to high mortality rate mainly before weaning. Inadequate disease management can have adverse financial and productivity consequences, given that 70% of calves are typically given birth in the dry season (Ngongoni, et al., 2007).

1.1: Problem Statement

Most cattle farmers are experiencing great losses as a result of high calf mortality, especially within the first four months of birth (Ahmedin & Assen, 2023). This has negatively impacted cattle farmers in terms of poor beef off take, reduced mild yield, high drug costs, increased lost days of production, thereby increasing the cost of production and making the enterprise unprofitable. This survey therefore seeks to ascertain the causes of calf mortality, prevalence of calf mortality, challenges faced by cattle farmers in ward 19 of Makoni District and possible solutions in order to boost productivity and efficiency in cattle production.

1.2: Justification

Cattle play a significant role in Zimbabwe's economy by contributing approximately one-fourth of the country’s GDP (Gobvu, Chirigo, Charakupa, & Mudzengi, 2023). In general, the socio-economic well-being of rural households is closely linked to cattle farming. Nevertheless, the death of young calves is having a substantial negative impact on cattle production. Calf mortality is a significance concern for cattle producers as it directly impacts their productivity and sustainability. Understanding the causes of calf mortality is crucial for implementing effective interventions and improving the overall productivity and profitability. Focusing on ward 19 of

Makoni District in Manicaland Province ensures that the research is tailored to the specific context of cattle farming in the area. This localized approach allows for a comprehensive understanding of the unique challenges faced by farmers in ward 19 of Makoni District, enabling the development of the targeted solutions. There may be limited research conducted on the calf mortality causes in the specific context of Makoni District. This survey aims to fill the gap in knowledge by collecting pertinent data regarding the causes of calf mortality. The survey results can be utilized to direct future research initiatives, guide policy-making, and improve extension services in Zimbabwe. By carrying out this survey, cattle farmers can be empowered with valuable information which can enable them to take proactive measures to mitigate calf mortality thereby improving herd health, productivity and livelihoods. Agricultural and livestock stakeholders will benefit from the findings of the research.

1.3: Research Objectives

The primary objective of the research is to examine the causes of calf mortality amongst cattle producers in Ward 19 of Makoni District.

1.3.1: Specific Objectives

- To establish the causes of calf mortality among cattle producers in ward 19 of Makoni district from January 2023 to January 2024.
- To assess the prevalence of calf mortality among cattle producers in ward 19 of Makoni District from January 2023 to January 2024.
- To evaluate the challenges faced by farmers in reducing calf mortality in ward 19 of Makoni district
- To establish potential interventions for reducing calf mortality among cattle producers in Makoni District.

1.4: Research questions

- What are the causes of calf mortality among cattle producers in ward 19 of Makoni District from January 2023 to January 2024?
- What is the prevalence of calf mortality among cattle producers in ward 19 of Makoni District from January 2023 to January 2024?
- What challenges are faced by cattle producers in reducing calf mortality in ward 19 of Makoni District?
- How can calf mortality be reduced among cattle producers in ward 19 of Makoni District?

CHAPTER 2

LITERATURE REVIEW

2.1: Introduction.

This literature review delves into the causes of calf mortality in ward 19 of Makoni District, Manicaland Province, providing both intellectual and empirical justifications. First stage of the literature provides the historical background of cattle rearing followed by causes of calf mortality worldwide. The literature will then focus on regional context that is Zimbabwe and other surrounding regions in Africa. This will also include specific disease outbreaks or management practices relevant to Makoni District. The last stage of the literature identifies the knowledge gap this study is willing to address and then a summary of findings from the literature review regarding calf mortality causes. The specific focus on Makoni District allows for a deeper understanding of calf mortality within a particular geographical and socio-economic context.

2.2 Historical background.

Calf mortality is a significant challenge in cattle production worldwide, leading to economic losses for farmers and reduced herd productivity (FA0, 2019). It is particularly acute in developing regions such as sub-Saharan Africa, where resource limitations can exacerbate the problem (ILRI, 2017). Historically, cattle were among the first animals to be domesticated by early human civilizations, primarily for their role in providing food, labour, and other essential resources. As per Felius et al. (2014), domestication of large wild terrestrial species were successful based on certain criteria, including the consumption of plants, quick growth, possibility of breeding in captivity, genetic disposition of calm behavior in confinement, and a social nature that makes handling easy. Many species of bovine have been tamed, however, taurine cattle (*Bos taurus*) and zebu (*Bos indicus*) make up the majority of them. It is worth noting that both of these species can be followed back to the wild aurochs (*Bos primigenius*).

In ancient Mesopotamia, one of the earliest known human civilizations, cattle were revered as symbols of wealth and prosperity. The epic of Gilgamesh, an ancient Sumerian poem dating back to the 18th century BCE, mentions the importance of cattle in agricultural practices and as offerings to the gods (FA0, 2019). Similarly, in ancient Egypt, cattle were highly valued for their

milk, meat, and hides, with depictions of cattle found in hieroglyphics and tomb paintings showcasing their central role in Egyptian society (Felius, et al., 2014). In medieval Europe, cattle farming became a fundamental aspect of feudal economics, with large estates and manors dedicated to raising livestock for dairy and meat production. The widespread adoption of the open-field system and common grazing lands further emphasized the importance of cattle as essential assets for agricultural productivity and economic stability (Dubrovsky, 2019). During the age of exploration, European colonizers introduced cattle to the Americans, Africa and other regions, leading to the establishment of cattle ranching and pastoralism as key livelihood strategies for indigenous populations and colonial settlers alike (Kansal, Kumar, Hitesh, & Yadav, 2022).

In more recent history, the industrialization of agriculture and advancements in animal husbandry practices have revolutionized cattle farming, leading to increased productivity and efficiency in meat and dairy production (Johnson & Pendell, 2017). The development of specialized breeds, improved feeding regimes, and modern healthcare technologies have further enhanced the economic significance of cattle as a valuable source of protein and revenue for farmers and agribusiness worldwide. Even though cattle are contributing to livelihoods of mankind, their production have been impacted due to disease outbreaks and poor management practices which in turn lead to high cattle and calf mortality rates.

2.3 Calf rearing doctrine.

Calf rearing doctrine provides the established principles and practices for raising young calves from birth to weaning, typically around 12weeks old. Just like with any animal, a healthy adult depends on how well a farmer cares for the newborn. For calves, the very first milk their mother produces, called colostrum, is essential. It is packed with things a calf needs to fight off infections and grow strong. Ideally, calves should stay with their moms for at least a day, or even a whole day longer, so they can drink this important colostrum (Uetake, 2013). If calves don't get enough colostrum, their immune system is weak, making them more likely to get sick (Morrill, et al., 2012). Milk or milk replacer provides essential nutrients for growth and development. Feeding strategies can vary depending on factors like cost and type of production, either dairy or beef. In addition, calf feeding programs consider factors like nutrient requirements, milk replacer

selection, weaning time, and concentrate and forage introduction. As noted by (Solarczyk, et al., 2023), without proper nutrition, animals' growth slows down.

Proper housing ensures calves are comfortable, safe, and protected from harsh weather and diseases. Maintaining clean housing and feeding utensils is vital for preventing calf illness. Calves love to lie down most of the day (80% of the time), so their beds should be dry and draft-free, with easy access to water and they need some light and fresh air to keep them healthy (Swan, 2021). Regular health checks, vaccinations, and parasite control measures help calves stay healthy and reach their full potential. Weaning process gradually transitions calves from milk to solid feed. AGRITECH (2023) highlighted that once the calf starts to intake water and calf concentrates, a healthy bacteria is introduced into the rumen for its development. Weaning should only be considered once the calves are taking 1.5 kilograms of concentrated feed each day (AGRITECH, 2023). Proper weaning reduces stress and digestive issues. AFDA (n.d), mentioned that raising healthy, happy calves is a 10-step process. It all starts with the calf itself, choosing a healthy one or buying from a good source. From there, it is about giving them the right stuff that is enough of that first milk (colostrum) to fight off infections, and transporting them carefully to minimize stress. Their living space matters too, a clean pen with the right amount of room, good air circulation, and fresh water are all essential. Feeding them on a regular schedule with clean equipment and proper milk is key, along with providing them with concentrates and fiber for a balanced diet. By following these steps, you'll raise healthy calves and ensure your farm thrives.

2.4 Calf Mortality theory

There are several definitions of calf mortality, which depends on the interest of study. Generally, calf mortality is defined as the death of young bovine animals, known as calves, before they reach one year old. Tautenhahn, Merle, & Muller (2020) defined calf mortality as the death of calves between the second day and sixth month of life. Calf mortality is a major cause of economic losses on cattle farms worldwide (Hordofa, Abunna, Mergersa, & Abebe, 2021) As noted by Fivet, 2024, many calves (around half) die within the first six weeks of life, and many more get sick. This can be linked to several factors, according to a study by Uetake (2013). The size of the herd, how well the calves are cared for, harsh weather, and especially the first four

weeks of a calf's life (the newborn period) can all affect how many calves die. By focusing on calf mortality control, farmers can raise healthier animals and improve their bottom line.

Mortality of calves is a key indicator of the overall health and well-being of a herd or livestock population. Calf mortality rates are often used to assess the success of breeding programs, animal husbandry practices, and disease control measures in cattle production systems. High calf mortality rates can have significant economic consequences for farmers and can also indicate underlying issues with nutrition, disease management, environmental conditions, or genetic factors within the herd. Understanding and addressing the causes of calf mortality is essential for maintaining healthy and productive cattle populations.

2.5 Causes of Calf mortality

Calf mortality causes are categorized as infectious diseases consisting of bacterial and parasitic, management factors, nutritional deficiencies and genetic factors.

2.5.1 Infectious diseases

Calf scours

The biggest killer of calves before weaning is diarrhoea, also called scours (Zychlinsk-Buczek, Bauer, Kania-Gierdziewicz, & Wronska, 2015). According to Silva, Coimbra, & Eyre (2023), diarrhoea is a major headache for cattle farmers as it is the most common illness in newborn calves and costs a lot of money. Calves with scours have constant diarrhoea, sometimes with mucus, blood, or unusual coloured stool. This makes it hard for them to digest their milk, so they lose their appetite, get weak, and run a fever. Most scours are caused by germs like E. coli, Salmonella, or viruses. The real danger is dehydration, so the most important treatment is replacing fluids and electrolytes the calf is losing. This condition is a significant concern in livestock management as severe cases of scours can result in calf mortality if left untreated (Kansal, Kumar, Hitesh, & Yadav, 2022).

It is indicated in studies that calf diarrhoea is popular during the first week of life and decrease latter (Uetake, 2013). Calf scours is the main cause of calf mortality worldwide, leading to the loss of valuable animals, cost of treatment and poor subsequent growth of the animal (Fivet, 2024).

Bovine Respiratory disease

Calf pneumonia, or Bovine Respiratory Disease (BRD), is a tricky illness in cattle. It is a mix of factors, the environment, the calf's own health, and tiny microbes all play a role. Even with better vaccines and antibiotics, BRD is still a major problem for cattle farmers worldwide (Kamel, Davidson, & Verma, 2024). According to Dubrovsky (2019), BRD is the number one reason calves die before weaning. This is not just bad for the calves; it costs U.S. cattle farmers a whopping $800 million to $900 million every year. This money goes towards calves that die, treating sick calves, and the extra work it takes to care for them (Johnson & Pendell, 2017)**.** Calf pneumonia, also known as BRD, can be a confusing illness. It has other names like shipping fever and undifferentiated fever, but because there is no one clear definition, it can be tough for vets to diagnose and treat exactly.

According to (Johnson & Pendell, 2017), BRD poses a very huge problem in the cattle industry, affecting both dairy and beef industry. There are numerous culprits behind the complex nature of BRD which are *Mannheimia haemolytica, Pasteurella multocida, Histophilus somni and Mycoplasma bovis* (McGill & Sacco, 2020). Observe the following signs if there is suspicion that calf might have calf pneumonia (BRD): fever, acting tired, and loss of appetite, coughing, with snot coming from their nose and eyes, struggling to breathe, breathing really fast, and with their mouth open. Vets usually confirm BRD by checking for a cough when they press on the calf's chest, listening to its breathing with a special tool, and looking for a high temperature (over 39.5 degrees Celsius) (Ferraro, Fecteau, Dubuc, & Francoz, 2021). Even though there are common signs, experts do not all agree on the exact definition of the illness. This also means there is no one standard test to definitively say a calf has BRD (Kamel, Davidson, & Verma, 2024).

Coccidiosis

Tiny organisms called Eimeria can infect young calves and make them sick with diarrhea. These Eimeria parasites live in the calf's gut and damage the lining, causing loose stools. Some types of Eimeria, like *E. zuernii, E. bovis, and E. alabamensis*, are more common and cause more problems than others. In Ethiopia, for instance, Eimeria is a major cause of diarrhea in calves and can even be deadly (Tautenhahn, Merle, & Muller, 2020). When calves get infected, they cannot absorb nutrients as well, which leads to diarrhea and sometimes even bloody diarrhea. These outbreaks of coccidiosis often happen a few weeks after calves from different groups are mixed

together for the first time. For beef calves on pasture, especially in the summer with limited water options, contaminated water sources can be a source of infection.

Veterinary personnel can usually diagnose coccidiosis based on the calf's symptoms and the farm's history of the disease. It can be trickier without that history because calves might show signs of being sick before they start releasing the parasite's eggs in their stool. Testing the calf's manure for the number of eggs can help confirm coccidiosis.

2.5.2 Management factors.

As highlighted by Fentie, et al. (2020), different management systems such as getting enough colostrum, proper calf housing, herd size, production system and timely assistance of calving difficulties are crucial. Swan (2021) recommends feeding calves colostrum equal to 5% of their body weight in the first 20 minutes of life. Colostrum is like a shield, protecting calves from diseases the mother has encountered. Difficult births (dystocia) can also lead to calf death. Whittier & Thorne (2007) found that 6 to 10% of United States beef calves die around birth, with dystocia responsible for about half those deaths. These calves are usually healthy but die from injuries or lack of oxygen during a difficult birth. There are three main reasons for calving problems, calf size (heavy birth weight), mother factors (age and pelvis size), and how the calf is positioned in the birth canal.

In addition, lack of vaccination protocols, biosecurity measures, and disease prevention practices can increase the susceptibility of calves to infectious diseases that can result in mortality. Rough handling, stress, and improper care practices can cause injuries, trauma, and health issues in calves, leading to increased calf mortality rates. Inadequate monitoring of pregnant cows, calving cows, and newborn calves can result in undetected health issues or complications that can lead to calf mortality.

2.5.3 Nutritional Deficiences

Silva, Coimbra, & Eyre (2023), observed that a major problem for beef calves in dry areas is not getting enough nutrients before they are even born. This lack of good nutrition during pregnancy, called malnutrition, has been linked to higher death rates among calves. Nutritional deficiences in pregnant cows can negatively impact calf health and increase calf mortality rates (Fordyce et al, 2023). Deficiences in protein and energy can hinder colostrum production, which is newborn

calf's primary source of antibodies. This leaves calves vulnerable to infections such as navel infection. Deficiences in minerals like selenium and vitamin B12 can weaken the immune system of calves making them more susceptible to diseases (NADIS, 2024). Calcium and phosphorous deficiences can impair bone development in calves leading to skelta problems and decreased viability. Nutritional deficiences can hinder overall growth and development in calves reducing their chances of survival.

2.6 Calf Mortality in Subsaharan Africa

Mortality of calves contributes to a severe economical loss for countries based on agriculture and is also a primary problem in the cattle herds of developed countries (Berber, et al., 2021). Sickness and death among calves are huge problems for Ethiopian cattle farmers. These issues make it very difficult to raise enough healthy young animals (replacement stock) to keep their herds going (Yitagesu, Fentie, N, W, & Smith, 2022). According to a study done by Monney, Adjogoua, Karamoko, & Akran (2017) in Ivory Coast, ddiarrhoea is the biggest health problem for newborn calves, costing cattle producers the most money. A cross- sectional study conducted in Shashemene Town, Ethiopia by Edao & Meribo (2021) the most frequent disease syndrome was diarrhea, followed by pneumonia, GIT disorder and septicemia.

2.7 Calf Mortality in Zimbabwe.

Calf nortality in Zimbabwe ranges from 2 to 31% across provinces which is against the national recommended 2% (Masuka, 2022). Manicaland province where ward 19 of Makoni District is located reported the highest calf mortality rate of 31%, nationwide. According to a survey carried out in Wedza and Marirangwe dairy schemes (Matondi, Nyamushamba, Motsi, & Masama, 2014), diarrhoea (scours) and coccidiosis are the main culprits behind calf deaths in Zimbabwe's communal cattle systems. Unfortunately, there has not been enough research done to fully understand and improve these traditional farming methods (Tavirimirwa, Mwembe, Ngulube, & Banana, 2013). In addition, most studies indicate calf mortality on dairy farms annd there is little information on calf mortality on beef farms.

CHAPTER 3

METHODOLOGY

3.1: Study Site

The study was conducted in ward 19 of Makoni District, situated in Manicaland Province in north-eastern Zimbabwe. Makoni district has 5 administrative constituencies: Makoni North, West, South, Central and Headlands, where ward 19 lies in Makoni. Makoni District is located in natural region 2b with average annual rainfall ranging from 700mm to just over 1000mm, occurring only during the hot season (Masarakufa, 2020). The estimate terrain elevation above sea level is 1428 meters (Geoview, 2024). Makoni District has Latitude -18 30’0’’ and Longitude 32 10’0.02 (Geoview, 2024). This region experiences three distinct seasons throughout the year. It is hot and dry from August to October, followed by a hot and wet season (rainy season) lasting from October/November to March/April. Finally, May to July brings a cold and dry winter (Matondi G. , Nyamushamba, Motsi, & Masama, 2014). Mean annual temperature is 27 degrees Celsius.

The land is surrounded by mountains and uncultivated lowlands. There are climate-weather problems that generally affect cattle production in Makoni district such as vegetation and water quality deterioration during the dry season (Svotwa, Hamudikuwanda, & Makarau, 2001). Most soils are loamy with high land use potential (Matikiti, et al., 2017). Major agricultural enterprises in the area are crop and animal livestock production. The major crop is tobacco, a summer crop and wheat, a winter crop. The main animals kept are cattle, goat, pigs and poultry. The majority of cattle farmers are indigenous. Herd size ranges from 10 to 300 or more beasts per household. The most common Breeds found in the area are Mashona and Brahmans and only a few add breeds like Boran. The veld found in Makoni district is sour and grasses found are *Hyparrhenia spp* and *Hyperthela spp*. Livestock is mainly kept for sale, though it is also used as draught power, manure, food, profit, security, status, presents and paying lobola (Ndava, Mapuwei, & Madoma, 2018).

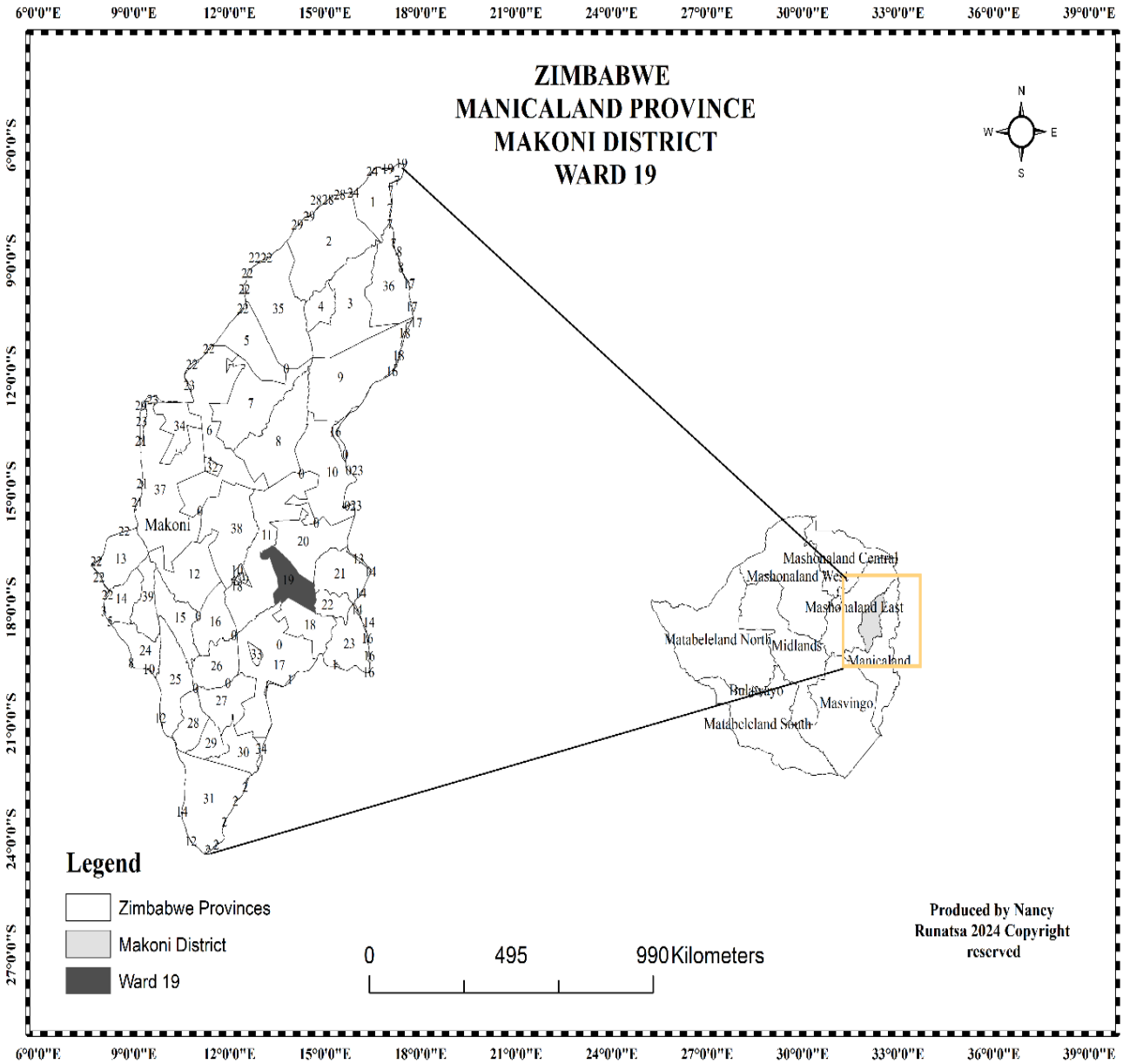

Figure 3.1: Study area map

3.2: Study Population

The study population comprised of all stock owners in ward 19 of Makoni district. List of the farms in the ward were obtained from Makoni Rural District veterinary office. The area consists of A1, A2 as well as communal farmers, which were all involved in the study. A comparison of those two groups of farmers will then be made to have effective results.

This study focuses on calves from birth up to 6 months old. Any calves born too early (premature) and dying before birth during the last three months of pregnancy are counted as prenatal losses. The calves' ages were determined using two methods, existing birth records if available, and examining their teeth. By one month old, calves typically have all 8 of their temporary front incisors grown in.

3.3: Study Design

The researcher used a snapshot approach (cross-sectional study) to gather information on calf mortality in ward 19. Data was collected from cattle farmers between December 2023 and January 2024. This data included information from the past year (retrospective) along with information from the current time period (cross-sectional).

3.4: Sample Size and Sampling

Single-stage cluster sampling was used where the selected ward 19 of Makoni district represented a cluster and all members within the cluster was involved in the study on both questionnaires and focus groups. The cluster consisted of single owned farms and subdivided farms into plots. An assumption that 80% of cattle farmers have adequate knowledge on the intended questions was made. Random sampling was done on key informants where 3 respondents were chosen randomly from the Makoni Rural District Veterinary department basing on ward 19.

3.5: Data collection

Data from stock owners or animal attendants was collected through use of structured questionnaires. The components of the questionnaire in gathering data were open and closed questions. A sample of the questionnaire is attached in the appendix. Additionally, data was also collected from key informants and focus groups. On these two research instruments, the researcher asked questions on the causes of calf mortality and recorded the information. Focus

groups consisted of 6 farmers each and 3 key informants were included from Makoni Rural District Veterinary Department.

The data was collected from December 2023 to January 2024.This was the cropping season, raining occurring so cattle where be enclosed and herding supervised. This increased efficient and accurate results as animals will be available during the survey. The questionnaire covered the possible causes of calf mortality, prevalence of calf mortality, calf rearing practices, breed types, disease treatment, control practices as well as the challenges they are facing in cattle production.

3.6: Data presentation and analysis

Qualitative data of this study was analysed using a statistical package and software. None valid questionnaires were removed. Data obtained from the study was processed in Statistical Package for the Social Sciences version 20 (SPSS Ver 20), for analysis. The frequency tables from SPSS were then transferred to excel spreadsheet for use in graphs drawing. Graphs were drawn using Microsoft Excel and tables were drawn using Microsoft Word.

Presentation of data was through tables, and graphs. This is because presentation in form of graphs and tables enhances understanding and show clear variation in some instances. Findings from qualitative analysis above was used for discussion, formulation of the conclusion and recommendations of the study.

STRENGTH OF THE STUDY

This study involved the researcher collecting data physically in ward 19 of Makoni District in order to avoid misinterpretation of the research questions. All cattle farmers in the ward were included in the study to increase accuracy of data within the area. Data collection was done during rainy season when cattle are enclosed so the researcher was able to collect accurate data in terms of herd composition and numbers. The researcher managed to obtain first-hand information from questionnaires, key informants and focus groups.

The current survey provides valuable insights into the factors contributing to calf mortality in ward 19 of Makoni District. Understanding the causes and challenges faced by farmers is crucial for developing targeted interventions to improve the survival rates. Calf mortality is a significant

economic burden for cattle producers, leading to animal loss, reduced milk production, reduced beef offtake and decreased income.

By identifying the causes and implementing effective interventions, this study has the potential to improve livelihoods. Reduced calf mortality can improve herd size, beef offtake and milk production, leading to increased income and financial security for farmers. Cattle are a vital source of protein and income in Zimbabwe. Decreasing calf mortality can contribute to a more stable and food supply. Better calf management practices can improve animal health and wellbeing.

LIMITATIONS

However, the current study had limitations which included a limited scope. The survey focused on a single ward (ward 19) out of 39 wards within Makoni District. Cattle breeds, management practices, and environmental conditions can vary across locations. Therefore, the identified causes and challenges might not be universal across other wards in the district or other districts. The survey relied on farmers' self-reported information on their practices and challenges which may be subjective and prone to bias. For instance, social desirability bias might lead farmers to under report management shortcomings. Farmers may have difficulty recalling details about calf deaths, particularly if the happened some time ago due to poor record keeping. This could lead to inaccurate reporting of causes of calf mortality, potentially inflating or downplaying the impact of special factors. In addition, due to lack of uniformity on herd size, the overall calf mortality prevalence rate was compromised as farmers with large herds had low or same mortality rates with those with smaller herds yet they lost many cattle.

CHAPTER 4

RESULTS

4.1: INTRODUCTION

Data collection was done using questionnaires, key informants and focus groups. The researcher had 100 questionnaires and 97 responded. However, 7 questionnaires were discarded due to invalid responses and 90 were recorded. In some case respondents would ask the researcher to complete the form as they would be doing other chores during the interview and would not be willing to abandon the chores. There are 3 key informants who participated and their views were considered regarding calf mortality in ward 19 of Makoni District. Focus groups were carried out at community dip tanks. For large farms with personal dip tanks, groups of 3 farms formed a single focus group due to distances between farms. Only 6 focus groups responded and their responses regarding the causes of calf mortality were recorded.

Figure 4.1: Shows a student collecting data using questionnaires

4.2 Age, gender and educational level of respondents

The WHO age groups (Hawkinson, Operario, Skylar, & Berg, 2023) were used in the study. According to the guidelines, age groups are divided into 6 groups as follows: 18-24, 25-34, 35-44, 45-54, 55-64 and 65+. Most respondents were in the age group 45-54 years with 21.1%, followed by 65+ years with 20%. The 55-64 age groups were the third with 18.9%, 35-44 years category followed with 16.7%, then 13.3% on 25-34 years and the least age group was 18-24 years with 10% (Figure 4.2). On gender, 61.1% of the respondents were males (figure 4.3). Additionally, of all the 90 respondents, 30 (33.3%) were degree holders, 24 (26.7%) did not attend formal education, indicated as other. 14 (15.6%) Ordinary Levels, 14 (15.6%) Advanced Levels and 8 (8.8%) students. Figure 4.4.

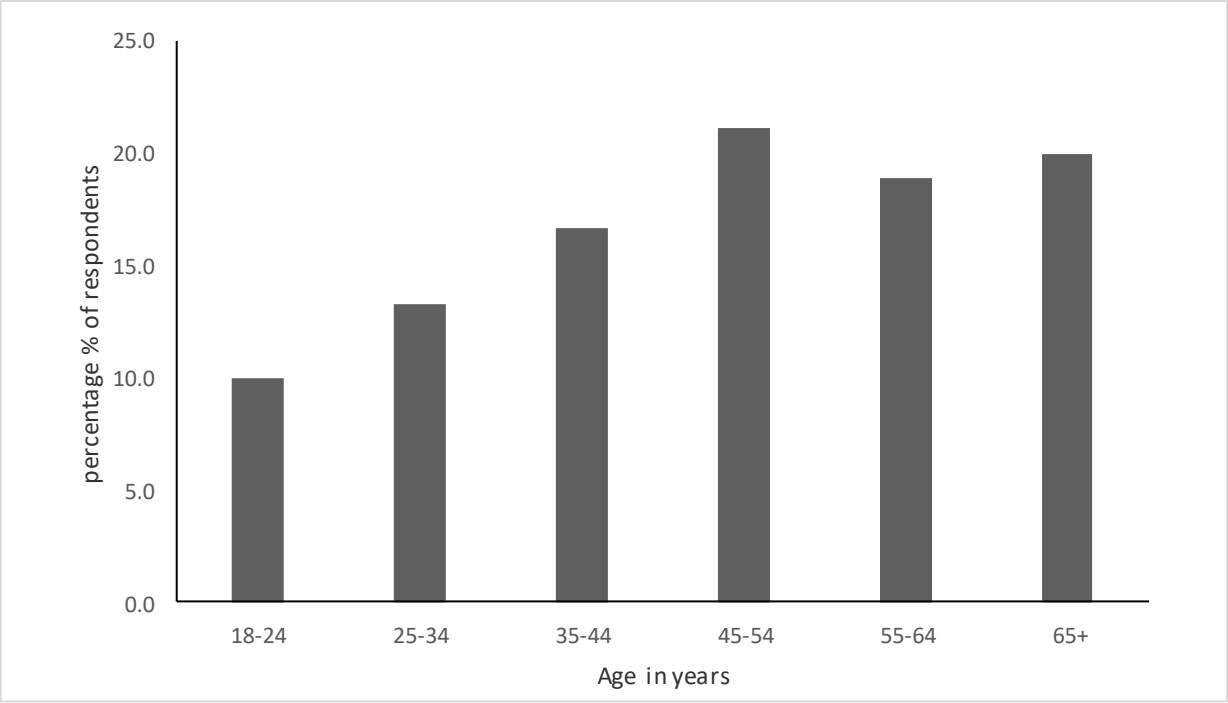

Figure 4.2: Age group of respondents

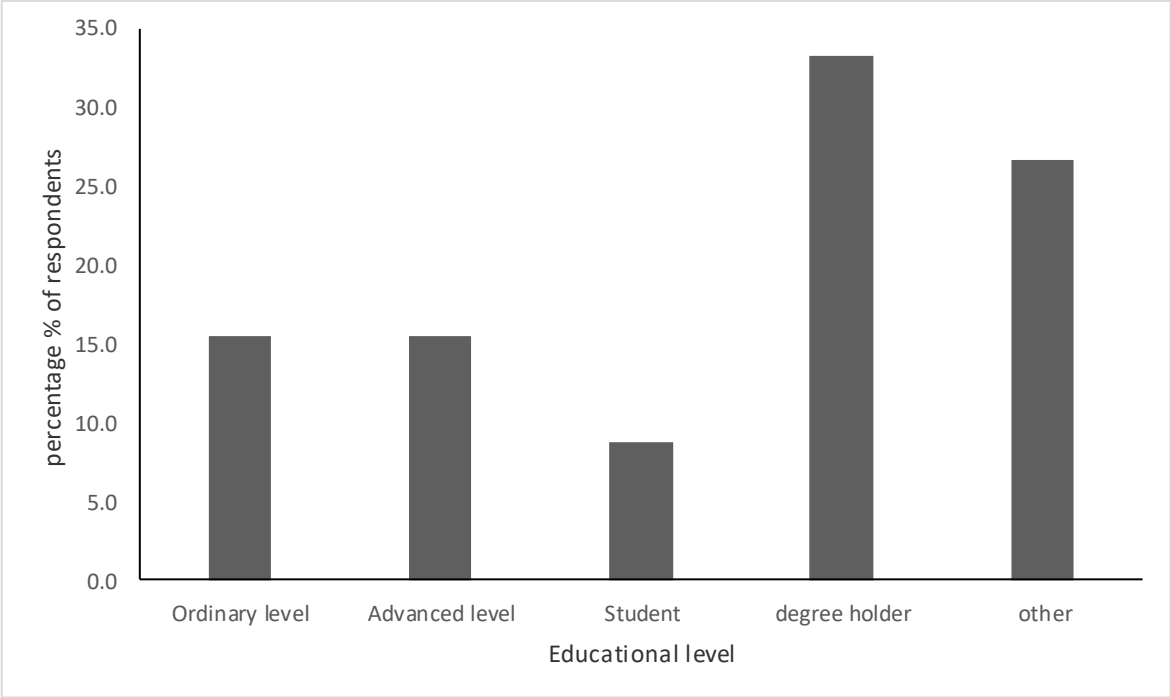

Figure 4.3: Educational level of respondents

4.3 Years of Experience, cattle ownership and breeds kept by farmers.

Most of the respondents had 4-9 years' experience. The medium working experience were in two groups which are 10-14 years and 15 to 19 years with 18(20%) respondents respectively and the least was 30-34 years with 2(.2%) respondents only (Figure 4.5). Most respondents owned less than 50 animals and a few owned between 250 and 300 herd (Figure 4.6). Farmers owned crosses with dominant cross traits such as predominantly Mashona cross. Some of the farmers were not able identify the cross breeds so observations were made for assistance whilst others fully identified the crosses. Most of the farmers have more than one cross breed in their herds. The majority of the farmers in ward 19 kept Mashona crosses (57 respondents). Brahman crosses are among the dominating cross breeds (48 respondents). Cattle owners in the study area also preferred Boran crosses (29respondents) and Tuli cross (17respondents) in their herds. Few farmers kept Beefmaster crosses (12 respondents). Figure 4.7.

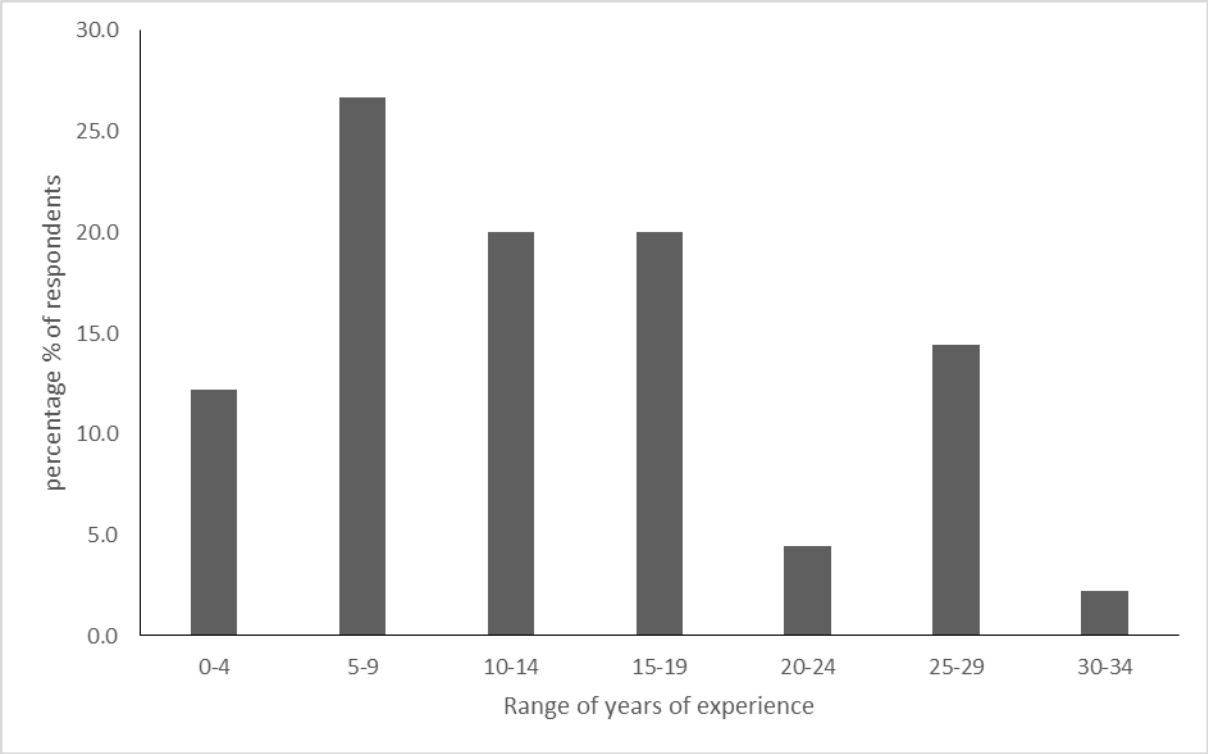

Figure 4.4: Working experience of the respondents.

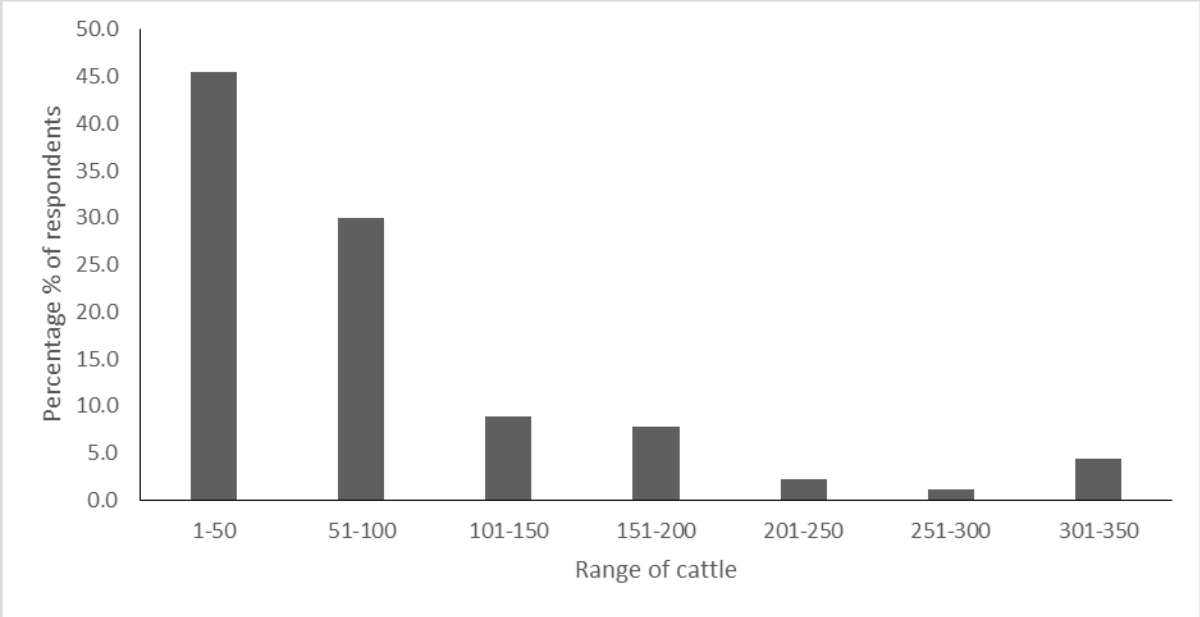

Figure 4.5: Range of cattle owned by respondents.

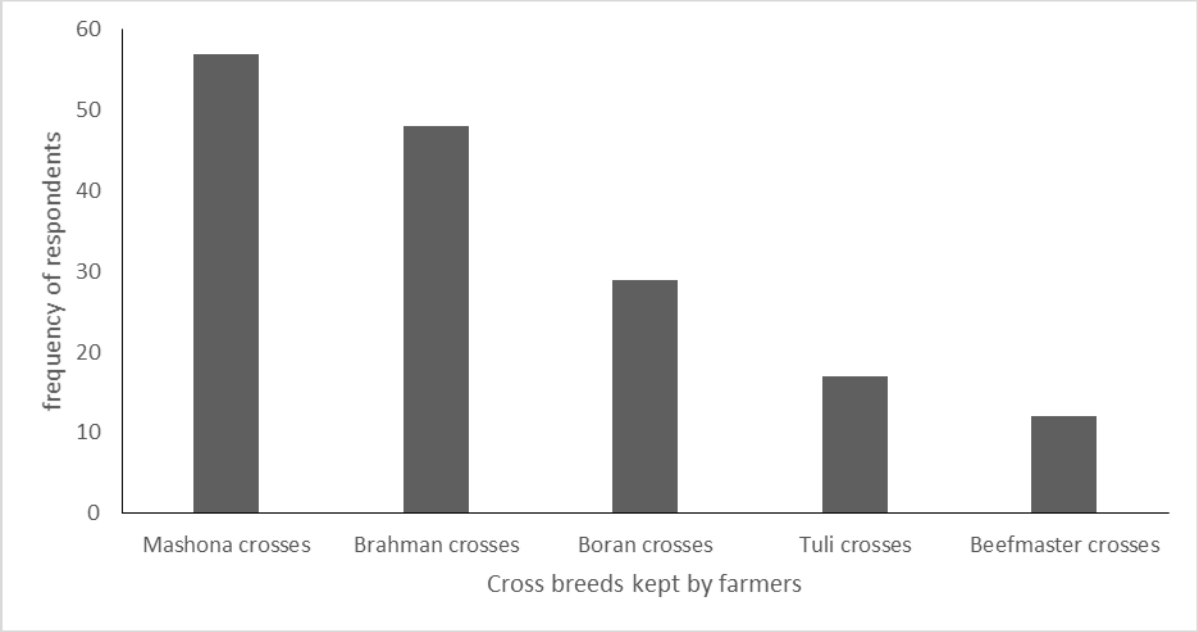

Figure 4.6: Breeds kept by farmers.

4.4 Cattle and calves lost in the past one year, causes of calf mortality and post mortem done.

27.8% of the farmers lost 4 or less animals, 27.8% respondents lost 5-9 cattle, 17.8% respondents lost 10-14 cattle, followed by 12.2% of respondents who lost 15-19 cattle, then 5.6% lost 30-34 cattle. Some farmers of about 4.4% lost 25-29 followed by 2.2% respondents who lost 20 and 24 cattle. 1.1% lost cattle in the range of 35-39 whilst 1.1% lost cattle within the range of 40 to 44 (Figure 4.8). More than half of the respondents that is 55.6% lost 4 or less calves, followed by 20% who lost 5-9 calves. 11.1% of the respondents lost 10-14 calves, 6.7% of respondents lost 15-19 calves, 2.2% respondents lost 25-29 calves and 1.1% lost 20-24 calves.

Figure 4.9 highlights the probable causes of calf mortality ranked with severity. Pneumonia was the top cause of calf mortality where 51 respondents faced the disease. Scours was the second cause of calf mortality as 45 respondents lost their calves to it. Starvation or poor diet killed a lot of calves, 39 farmers experienced the loss. Some calves died due to heart water as indicated by 38 respondents, 22 farmers said some of their farmers were lost to January disease while other 20 farmers lost their calves to Bloat. Hyenas as indicated by 15 farmers led to the loss of many calves. In addition, 12 respondents explained accidents to have caused some of the deaths, 10 farmers complained their calves to have drowned and died, 7 respondents lost calves to

Septicaemia, 7 respondents lost calves to poisoning, 6 respondents lost calves to respiratory disease, 5 respondents lost calves to navel ill, 2 respondents said the diseases were unidentified and 1 respondent indicated that snake bite killed the calf. Furthermore, 80% of the respondents have post mortem done on their animals whilst the remaining 20% did not perform post mortem on dead animals.

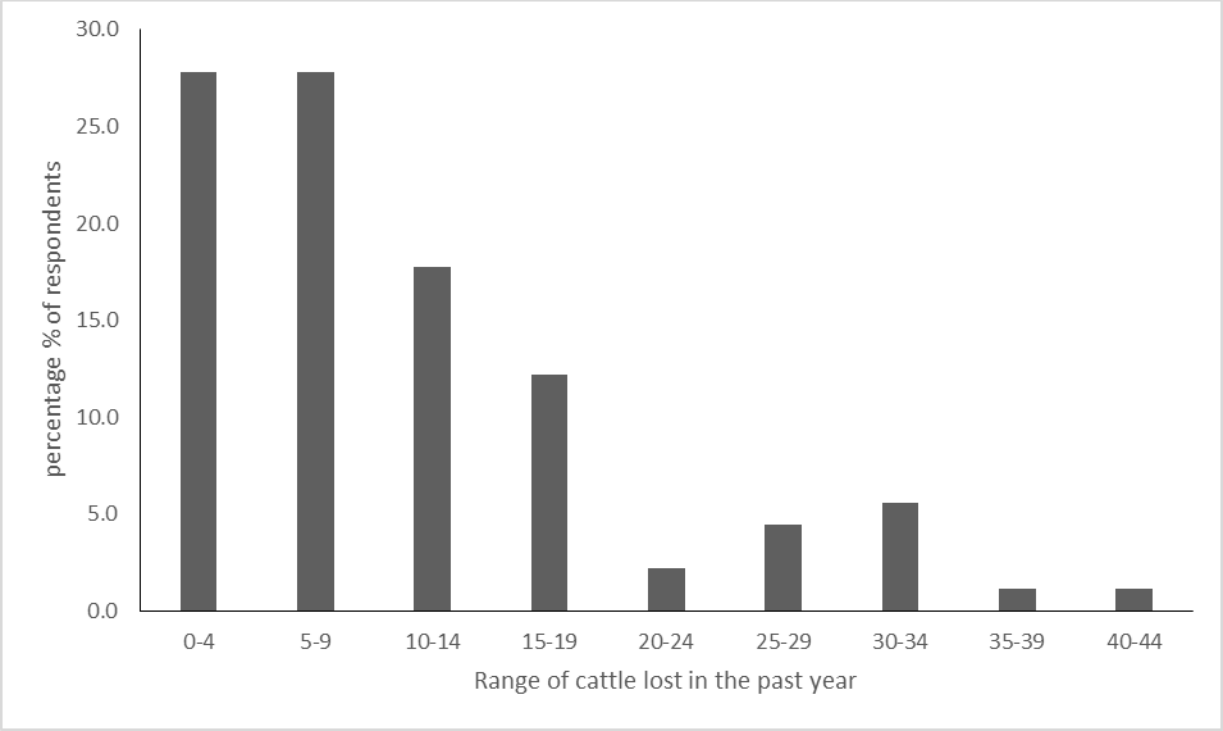

Figure 4.7: Range of cattle lost by farmers

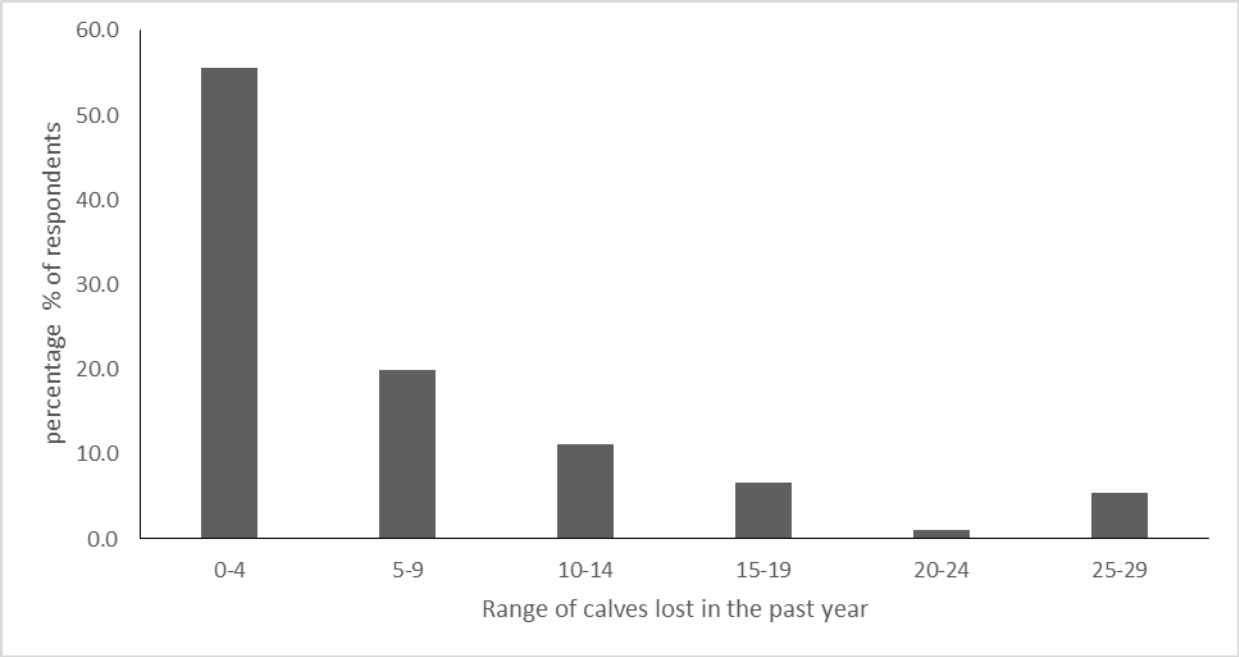

Figure 4.8: Number of calf deaths

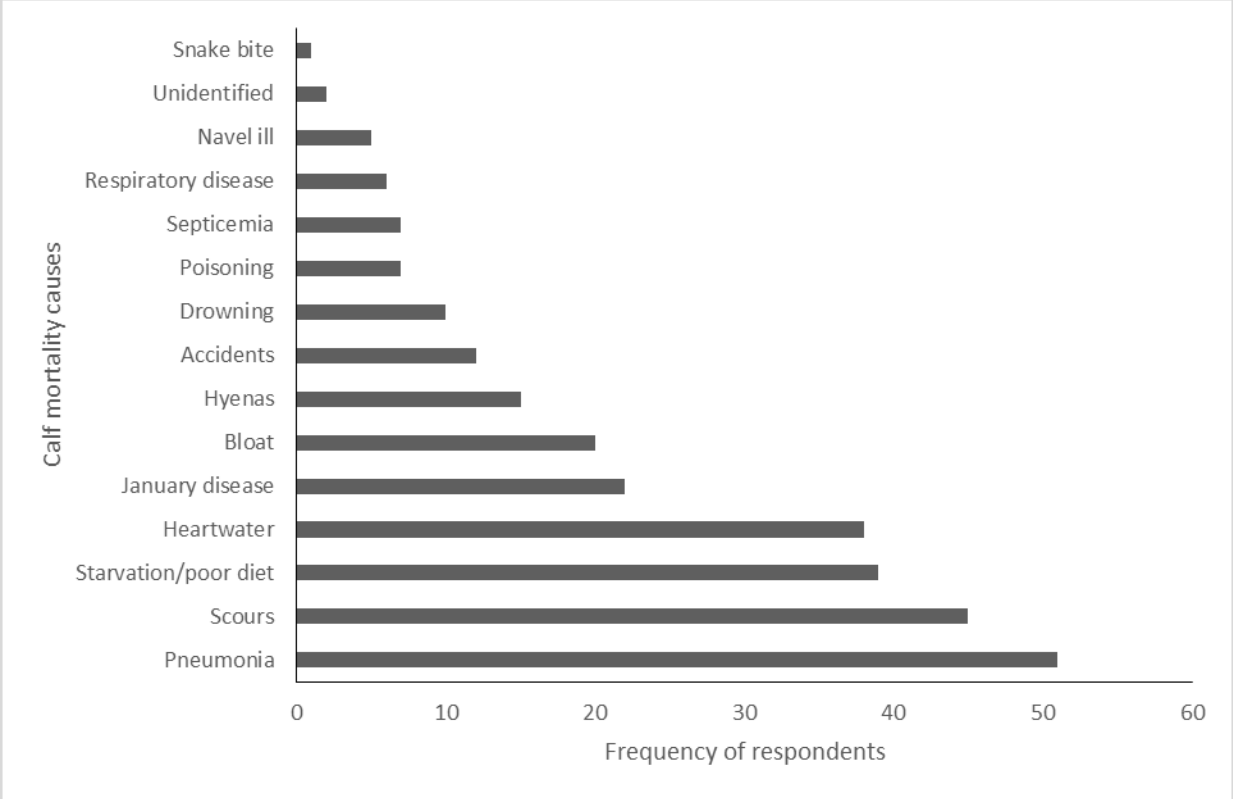

Figure 4.9: Causes of calf mortality

4.5 Ways in which causes of death was addressed.

Calf mortality was addressed through several ways where 35 respondents managed to supplement their calves to fight against starvation. The presentation below comprises of various ways which were used by some of the farmers.

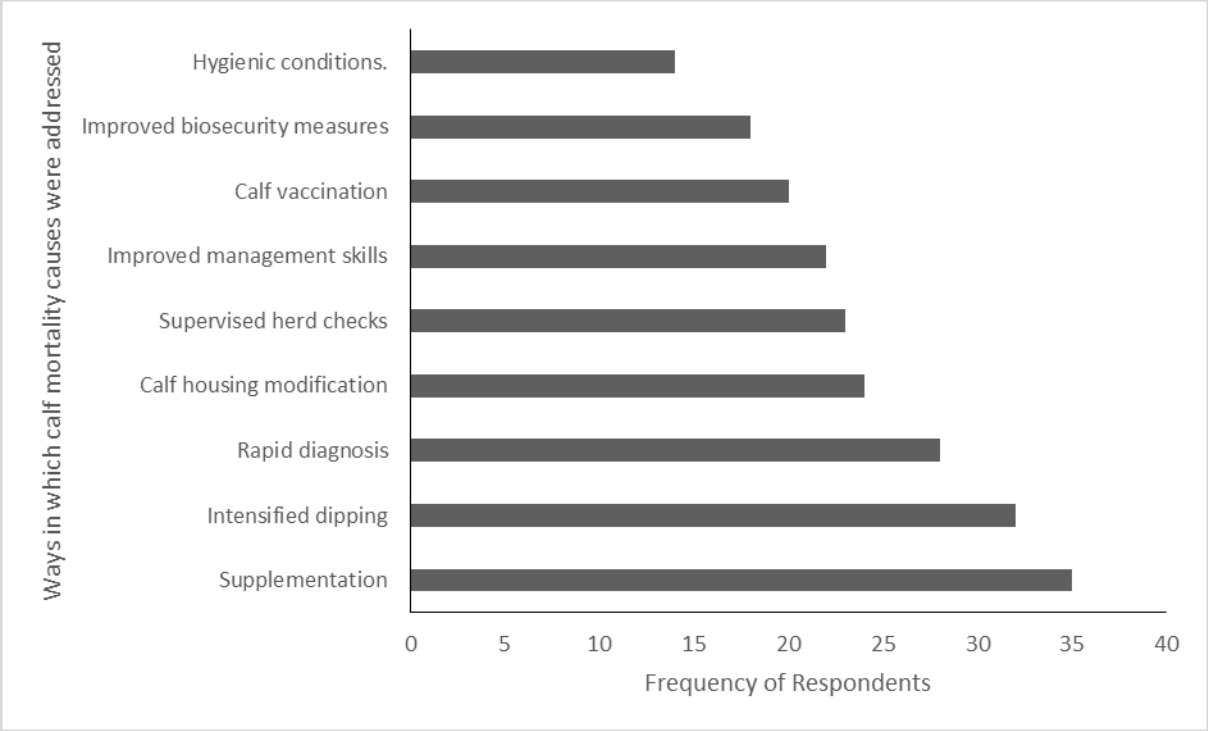

Figure 4.10: Ways in which causes of calf mortality were addressed.

4.6 Average calf mortality rate in the past year and trends or patterns of calf mortality.

Each farm had an average calf mortality rate which was calculated as per calves lost in the past year for example a farmer owning 50 cattle lost 7 calves, the average calf mortality rate is 14% obtained from (7/50)100. However due to the number of respondents, only ranges are summarized. A small herd size had a high percentage when 1 or 2 calves died whereas a large herd have a small percentage, say 20 calves and will be the same to 1 or 2 calves for small herds. Out of the 90 respondents, the leading average mortality rate is 5 to 9% with 41 (45.6%) respondents, followed by 0 to 4% with 24(26.7%) respondents, then 15 to 19% mortality rate responded by 11 (12.2%) farmers. Furthermore, 10(11.1%) respondents have mortality rates between 10 and 14% whilst 2(2.2%) respondents had 25 to 29% mortality rate. (Figure 4.11). The overall average calf mortality rate for ward 19 is 8.6%. Respondents were asked on the

trends or patterns of calf mortality over the years, that is a regularity in calf deaths continuing every year. 65.6% of the respondents noticed trends or patterns in calf mortality over the years and 34.4% of the respondents did not notice any trend in calf mortality.

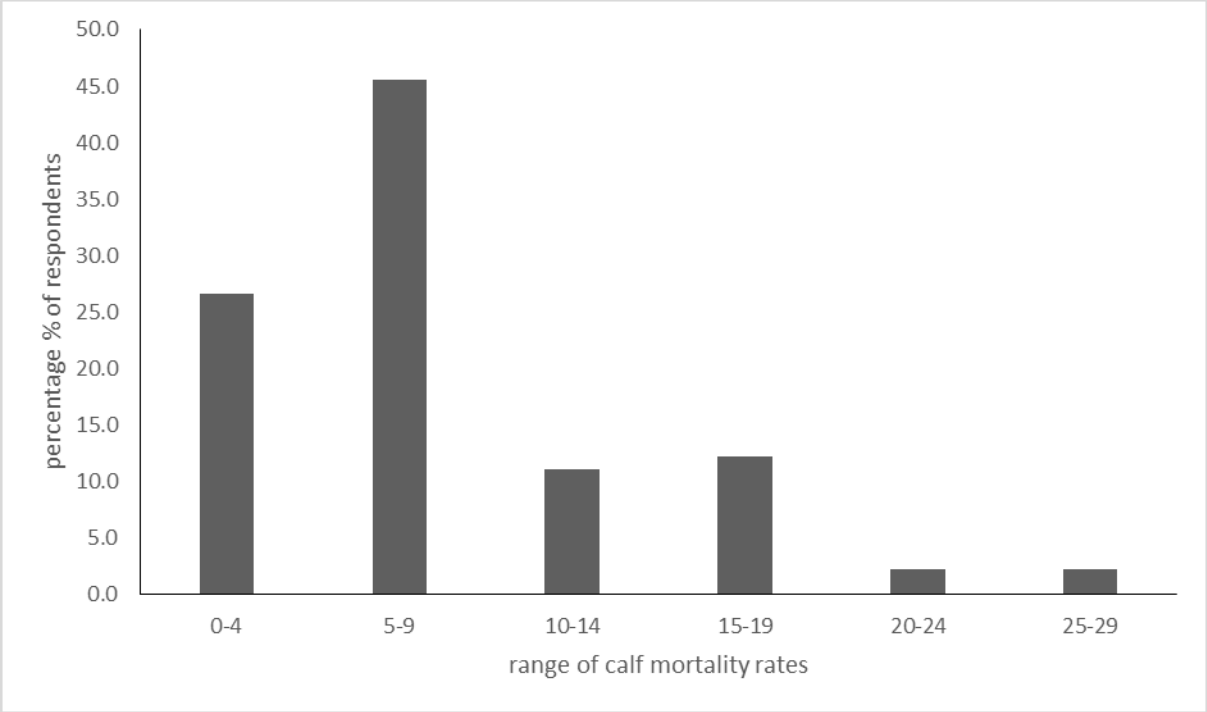

Figure 4.11: Average calf mortality rate.

4.7 Information source on animal health

Majority of the farmers depend on Veterinary as their primary source of information. Very few respondents used one information source whereas many used sources above one. 88 (97.8%) respondents explained that they get information first from veterinary then consider other sources later. 60 (66.7%) respondents said WhatsApp is also providing the information they need on animal health. 36(40%) respondents linked up with other peers to obtain information, 24(26.7%) sourced from radio as well while only 15(16.6%) of the respondents linked with family to get animal health information. Figure 4.12.

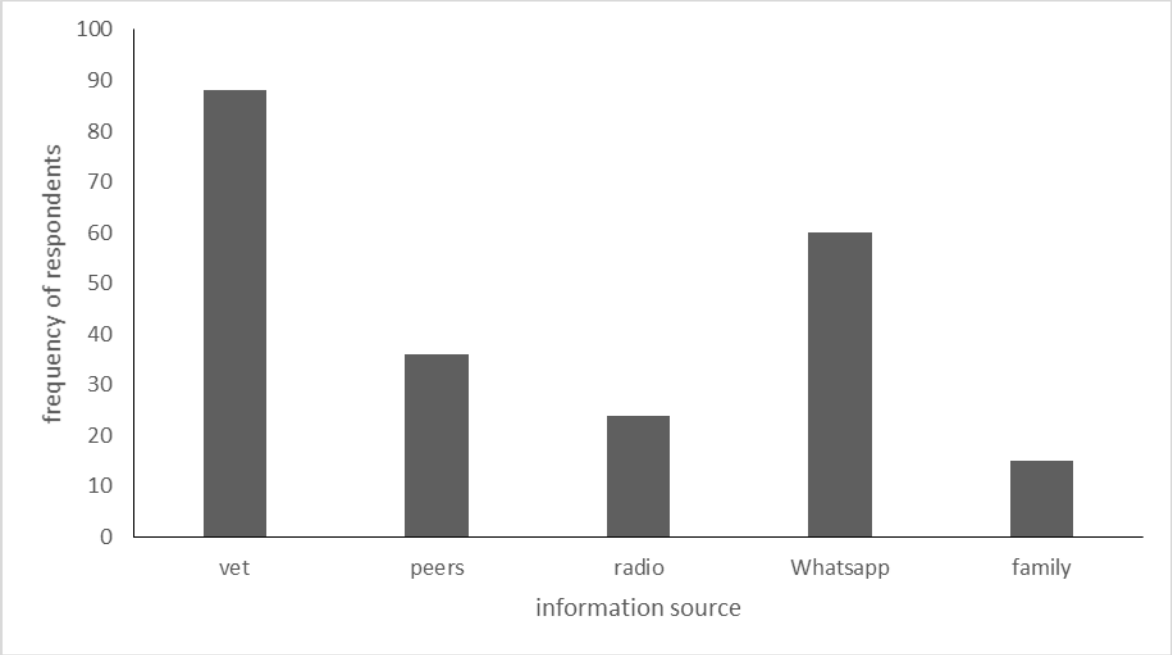

Figure 4.12. Sources of Information on animal health.

4.8 Challenges faced in reducing calf mortality.

The top challenge faced by farmers in reducing calf mortality was drought whilst the least was tick resistance.

Table 4.1: Challenges faced by respondents in reducing calf mortality.

Main challenges faced by farmers in reducing calf mortality	Frequency	Percentage
1. Drought	87	96.7
2. high drug and feed costs	75	83.3
3. Veterinary services far away	72	80
4. lack of knowledge or limited skills	56	62.2
5. lack of finances	52	57.8
6. ignorance by workers	42	52.2
7. poor housing and handling facilities	34	37.8
8. poor biosecurity measures	22	24.4
9. Veld fires	20	22.2
10. Tick resistance	16	17.7

4.9 Awareness of farmers on best practices or strategies to reduce calf mortality, Interest of farmers in participating in training programs and support which was regarded as beneficial by farmers in reducing calf mortality.

56.7% of the respondents were aware of some of the best practices or strategies in reducing calf mortality and 43.3% were unaware. Moreover, 100% respondents showed interest in participating in workshops or training programs related to calf mortality prevention. All farmers indicated training and workshop programs as the best type of support they need to reduce calf mortality on their farms. A few came up with the idea of irrigation pastures to support them against drought situation (Table 4.2).

Table 4.2 Support regarded as beneficial by farmers in reducing calf mortality.

Type of Support needed by respondents	Frequency	Percentage
1. Training and workshops	90	100
2. Veterinary facility nearby	83	94.4
3. Regular visits by qualified personnel	84	93.3
4. Affordable drug and feed prices	81	90
5. Financial support	76	84.4
6. More community dip tanks	33	36.7
7. Input donation	29	32.2
8. Look and learn visits	27	30
9. introduction of irrigation pastures in the ward	23	25.6

4.10 Key informants responses

Veterinary personnel were used as key informants in data collection. The managed to identify top 5 causes of calf mortality in ward 19 according to their risk levels. The causes are ranked in order of their severity.

Table 4.3: Causes of calf mortality highlighted by key informants.

Top causes of calf mortality
1. Diarrhoea
2. Pneumonia
3. Malnutrition
4. Septicaemia
5. Tick borne

4.11 Focus group responses on calf mortality

6 Focus groups were used to collect data on causes of calf mortality. They provided what they regard as the top causes of calf mortality in their area. Pneumonia was the major cause whilst the least cause was poisoning.

Table 4.4: Causes of calf mortality highlighted by Focus Groups.

Top causes of calf mortality	**Frequency**	**Percentage**
1. Pneumonia	6	100
2. Diarrhoea	5	83.3
3. Malnutrition	5	83.3
4. Tick borne diseases	4	66.7
5. Accidents	3	50
6. Predation	3	50
7. Septicaemia	2	33.3
8. Poisoning	2	33.3

4.12: SUMMARY.

The results showed that questionnaire respondents and focus groups regard pneumonia as the major cause of calf mortality in ward 19 followed by scours whilst key informants are saying scours is the major cause followed by pneumonia.

CHAPTER 5

DISCUSSION

The study first collected data on demographics within the study area and the results indicated that most cattle owners range from 45 to 65+ years which is the old age. The study done in Mutare Rural District by Tirivanhu, Ruzhani, & Jambo (2023) showed that most respondents (57.8%) were over 50 years, which is almost similar to the current study area. Old age dominating livestock production in the study area is important as they have enough experience in livestock production. This study found that men are significantly more involved in running livestock farms compared to women. This aligns with research by Tirivanhu, Ruzhani, & Jambo (2023) in Mutare Rural District, where men headed most households (74.4%) and women led the remaining ones (25.6%). This suggests a potential gender gap in livestock management. Similar results were reported by Abebe, et al., 2023 who said that most cattle owners in southern Ethiopia are males (75.7%) whilst 24.3% were females. This is related to males being inheritors of wealth in most rural households which limits many females to be livestock owners. However, according to the data obtained in this study, female farmers experienced few deaths as compared to male owners. This is because females have a good mothering ability hence, they can even take good care of calves.

Moreso, the research showed that most of the respondents had working experience between 4 to 9 years working experience. According to a study done in Gwanda and Mangwe by Melesse, Tirra, Tui, Van Rooyen, & Hauser (2023), the average years of experience was 7 years which is within the range of the current results. Working experience is essential in livestock production as a farmer gets to familiarize with the challenges in the industry and how to tackle them. In the current research area, most cattle owners are degree holders (33.3%). This opposes a study by Tirivanhu, Ruzhani, & Jambo (2023) where the majority of the respondents had completed secondary education. This suggests that the study area consists of well educated people who can easily understand knowledge instilled in them to prevent high calf mortality. According to Matondi, Nyamushamba, Motsi, & Masama (2014), The more educated a farmer is, the better equipped they are to manage their cattle's health. This is because a good education gives farmers

the knowledge they need to understand and implement disease prevention and control practices effectively.

Additionally, the present study found that most respondents owned less than 50animals whist a few owned 250 to 300 cattle. The number of cattle reared by farmers in the ward are linked to the size of farms found in the study area, which are A1 and A2 farmers. A1 farms are small in size, often focusing on subsistence livestock production and are at least six hectares depending on natural regions (Scoones, 2017). A2 farms have the potential to support large herds as they have larger grazing lands, enabling A2 farmers to engage in more commercial livestock production (Nkomboni, 2015). In the current study area, A1 farmers kept as from as low as 4 cattle up to 25 cattle which is a large number as per their farm sizes because they poach for grazing lands from nearby large farms. In addition, A2 farmers, both crop-livestock farmers and livestock farmers only owned 20 and above cattle. In ward 19, 50% were A1 farmers whilst the remaining were A2 farmers. As obtained from the survey, A1 farmers usually lost calves due to starvation in the dry season only due lack of grazing land and inadequate capital to spend on supplements. However, they were not prone to other diseases such as calf diarrhoea and pneumonia as their herds are easily manageable.

Most of the farmers in the study area kept predominantly Mashona cross, followed by Brahman crosses. These breeds are highly adaptable to the study area as the area is associated with very harsh conditions in the dry season. Mashona and Brahman breeds are drought tolerant and disease resistant (Wilson, 2018). Crossbreeding practiced in the study area is an important practice as it leads to highly productive crosses. Research by Thomas (2024) shows that mixing breeds (crossbreeding) can create animals with better qualities than purebred ones. This is especially true for traits that cattle ranchers care about, like having more calves, living longer, needing less feed, and fighting off diseases. The reason for this is something called hybrid vigour, which gives mixed-breed animals a boost. Brahman cattle stand out because they are genetically very different from most other domesticated breeds. This means crossing them with other breeds leads to the strongest hybrid vigour effect (Thomas, 2024).

The current study indicated that farmers with more cattle lost many cattle as compared to farmers with less cattle. Rearing a large herd with limited management contributes to more deaths and vulnerability of the herd to diseases. In addition, farmers with a large herd lost many calves as

compares to those with a small herd. Due to large herd, it becomes difficult to prioritize calves as they have got weaker immune system which increase their susceptibility to diseases and high mortality. Uetake (2013) highlighted that an increase in calf mortality rate is interlinked to an increase in herd size. In the same study, Uetake (2013) explained that on some farms, a growth in new born population each year is to be related to an increase in calf deaths. Among the dead animals, the present study highlighted that 80% of the respondents did post mortem. Post mortem is important as farmers get to know the real cause of deaths on their animals. Farmers will then provide right diagnosis to live animals and also take appropriate preventive measures.

This survey was aiming in finding the ideal common calf mortality causes in ward 19 of Makoni District. Respondents (57%) identified pneumonia as a top cause of calf mortality followed by diarrhoea with 50% respondents. The results oppose to a study by Ahmedin & Assen (2023) which indicated that diarrhoea is that the top cause of calf mortality, followed by pneumonia. However, the current results are consistent to a study by Dubrosky (2019) where pneumonia was indicated as the leading cause of calf mortality. Calf scours are well noted to be a serious constraint in cattle production (Matondi G. , Nyamushamba, Motsi, & Masama, 2014). As highlighted by key informants and other respondents, the major causes of calf mortality in ward 19 of Makoni District depend on seasonality. Uetake (2013) highlighted that seasonal variation of the mortality rate is found to be large. In hot dry summer, farmers lost calves mainly due to starvation and inadequate colostrum from the dams as poor nutrition and water scarcity lead to poor milk production.

During hot wet summer known as the rainy season, farmers lose calves mainly due to pneumonia and calf scours. Most farmers in the study area have no shades to shelter their calves so due to exposure to rain, they end up losing calves. Most farmers do not administer vaccines to dams against scours to pass immunity to calves so as the veld and watering facilities are exposed to parasites, hence high incidence of scours. During the rainy season, heart water and theileriosis were also reported among the primary causes of calf mortality in the current study area. Pneumonia was also reported as the major cause of calf mortality during the winter season. This made pneumonia the outstanding cause of calf death in two seasons other that other causes which were only experience in a single season.

Supplementation (38.9%) followed by intensified dipping (35.6%) were the most ways in which farmers have used in addressing the causes of death. The supplementation system was done in dry season by farmers who are financially stable, especially among A2 farmers. Supplementing dams and calves are important as it increases calf survival chances. Intensified dipping help farmers to fight tick borne diseases such as heart water and January disease which were among the top causes of calf mortality in the present study. Calf housing modification was used to prevent calves from getting pneumonia from bad weather. This was done by some farmers who could afford it. Calf mortality rates were generated on individual farms, calculated as per calves lost in one year to number of animals at a farm. The average calf mortality rates in the study area ranged from 0% to 34%. Calf mortality rate (31%) reported for Manicaland Province by Masuka (2022) in Second Round Crop and Livestock Assessment Report is within the range found in the current study area. Knowledge of calf mortality rates were important in order to find the prevalence of calf mortality in ward 19. The overall calf mortality prevalence in the study area is 8.6% which is too high above the national recommended 2% (Masuka, 2022). High calf mortality rate is not preferred on farms as it reduces the profitability of the cattle business. There are several factors which are related to high calf mortality in ward 19 which are diseases, management factors and nutrition challenges.

In the present study, most farmers depend on veterinary as their primary source of information regarding livestock health. In addition, they also use other sources such as WhatsApp, family, radio and peers. It is important to consult veterinarians concerning calf mortality as they are experts in the field. They provide valid information as compared to other information sources. However, veterinary sources might not be always physically available so farmers also utilize other sources of information. Nowadays, farmers have WhatsApp groups where they link up and share useful information on cattle production. The current study showed that the most challenge faced by farmers in reducing calf mortality was drought (87%), followed by high drug and feed costs (75%). Farmers found it a challenge to reduce calf mortality caused by starvation due to drought in the dry period.

Finding enough good food for cattle gets tough during the dry season. Both the amount and quality of grazing land are limited. In the wet season, there's more grazing available, but during the dry months, cattle have to rely mostly on leftover cereal stalks (stover), which is not very

nutritious (Gobvu, Chirigo, Charakupa, & Mudzengi, 2023). Most of the farmers could not afford to buy supplements to sustain the period due to high costs of feed and poor finance base. Feed is a major drain on livestock farmers' wallets, gobbling up over 70% of their production expenses. High drug costs led to high calf mortality because farmers could not afford to buy the drugs needed at the required time. Zimbabwe's rural livestock farmers are struggling on multiple fronts. Expensive veterinary medicines make it tough to keep animals healthy. Government veterinary services used to provide medication, but they're no longer able to do so effectively. Poor road conditions and communication networks make it difficult to get help and supplies (Gobvu, Chirigo, Charakupa, & Mudzengi, 2023).

In this survey, 56.7% of the respondents were aware of the best strategies or practices in reducing calf mortality whilst 43.3% were unaware. This is related to networking system which was not accessible by all farmers especially A1 farmers. Limited extension services led to inadequate knowledge by some farmers on the best strategies on reducing calf mortality. Knowledge on best calf rearing practices is vital as it increases survivability, productivity and profitability. In addition, all respondents under the study were interested in participating in workshops or training programs related to the prevention of calf mortality. They were eager to eradicate the burden of calf deaths on their farms. Veterinary facility nearby was also mostly needed by respondents. This is because the area is remote so transport to a nearby veterinary facility in Rusape town is not always available, which make it difficult to access veterinary services in cases of emergency.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

This survey investigated the causes of calf mortality, calf mortality prevalence, challenges faced by farmers, and potential interventions to reduce calf mortality in ward 19 of Makoni District, Manicaland Province, Zimbabwe. The survey successfully identified major causes of calf mortality in the ward, with top five causes ranged with severity are pneumonia, calf scours, starvation, heart water and January disease. Those diseases were extreme depending on seasonality which are hot dry summer, hot wet summer and winter season. The prevalence of calf mortality among cattle producers in ward 19 was determined to be 8.6%, against the national recommended 2%. Farmers reported facing challenges in reducing calf mortality with the top five being drought, high drug and feed costs, veterinary services far away, lack of knowledge and lack of finance. Respondents pointed out various potential interventions which they regarded as beneficial in helping them fight against calf mortality causes such as the provision of training programs and workshops to farmers in order to instil knowledge based on calf mortality. The other potential intervention needed by farmers was to construct a veterinary facility specifically in the study area where farmers could easily access the veterinary services at the required time. Regular visits by qualified personnel, affordable drug and feed costs as well as financial support were some of the top interventions established in the study area which can be useful in reducing calf mortality in ward 19 of Makoni District.

6.2 RECOMMENDATIONS

Regarding the findings of the study, pneumonia was the top cause of calf mortality in ward 19 of Makoni District and the outstanding factor to this condition is exposure of calves to harsh environmental conditions such as rain and cold. Therefore, the researcher recommends farmers to invest in infrastructure development, which are building proper calving pens, ensuring clean water sources, and proper waste facilities. This can help to reduce disease incidence, improve hygiene and farm biosecurity. Proper hygiene can also reduce the occurrence of calf scours

which was another top cause of calf mortality in ward 19. The researcher recommends the farmers to have proper medication in stock in order to treat animals rapidly when required.

Improving veterinary services for diagnosis, treatment and preventive care for calves is vital. This includes building a veterinary facility where all farmers can reach without delaying and training community animal health workers. Veterinary officers must also regularly visit farmers for inspections and teaching farmers on good calf rearing practices and possible treatments that can be given to farmers in cases of disease outbreaks. Since farmers often lack the money for expensive medications and veterinary care, the researcher suggests they look to traditional methods of animal care. This approach, called Indigenous Knowledge Systems (IKS), can be a valuable tool for these farmers. They must use medicinal plants which are available in the area and this is beneficial as they are always available without thinking of costs and distance to the veterinary facilities.

Calves were also lost due to starvation. Dams did not produce enough milk required by the calves. The researcher recommends farmers to promote better nutrition for pregnant cows and new-born calves. Nutrition is usually a challenge during the dry season. Therefore, farmers should use cheaper methods for harvesting hay such as use of a sickle and they can also keep crop residues at a safer place for the dry season. By doing so, pregnant cows can benefit from the harvested supplements. This can help to build immunity for calves and also enhance colostrum production. Calf supplements can also be used such as calf grower meals and milk replacers in times of drought. The researcher also like farmers in ward 19 to consider controlled breeding system that is to schedule the calving season during the wet period where there are plenty of pastures and enforce a strict management to avoid diseases such as pneumonia, scours and others.

In addition, the researcher also encourages farmers to participate in breeding programs that focus on selecting cattle breeds resistant to diseases prevalent in the area. They should also reduce inbreeding to avoid inbreeding depression which increases cattle' susceptibility to diseases. It is also important to implement educational programs for farmers on calf health management practices, including colostrum feeding, proper hygiene, disease prevention, and identification of common calfhood illness. The Government and NGOs should also consider providing financial

incentives to farmers who adopt recommended calf management practices. This could motivate them to invest in better care for their calves.

REFERENCES

Abebe, R., Dema, T., Libiyos, Y., Teherku, W., Regassa, A., Fekadu, A., & Sheferaw, D. (2023). Longitudinal study of calf morbidity and mortality and the associated risk factors on urban and peri-urban dairy farms in southern Ethiopea. *BMC Vet Res*.

AFDA. (n.d.). Introduction to Calf Rearing. *Agriculture and Food Development Authority*.

AGRITECH. (2023, January 1). *Successful Calf Rearing-Getting the basics right.* Retrieved from AGRITECH: agritech.ie/successful-calf-rearing

Ahmedin, U., & Assen, A. (2023). Cal morbidity, mortality, and management practices in dairy farms in Jimma City, Southwestern Ethiopia. *BMC Veterinary Research*.

Assan, N. (2013). Future priorities on improved livestock production in Zimbabwe. *International Journal of Environmental Sciences Volume 2*.

Fentie, T., Mekonen, G., Temesgen, W., Melaku, A., Asefa, G., Tesfaye, S., . . . Abera, B. (2020). Assessment of Major Causes of Calf Mortality in Urban and Periurban Dairy Production System of Ethiopea. *Veeterinary Medicine International*, 2.

Fivet. (2024). *Calf Scours in the Dairy Herd.* Retrieved from Fivet Animal Health: vetanimalhealth.com

Geoview. (2024). *Makoni District*. Retrieved from geoview.info: zw.geoview.info/make

Gobvu, V., Chirigo, K., Charakupa, T., & Mudzengi, C. (2023). Use of Indigenous Knowledge Systems for Managing Cattle Health in Zimbabwe: Challenges and Opportunities. In *Medicinal Plants-Chemical, Biochemical, and Pharmacological Approaches.*

Hawkinson, E., Operario, D., Skylar, H., & Berg, J. (2023). Bridging age gap: intergenerational communication of HIV risk and prevention among younger and older men who have sex with men. *Aids care*, 538-544.

Hordofa, D., Abunna, F., Mergersa, B., & Abebe, R. (2021). Incidence of morbidity and mortality in calves from birth to six months of age and associated risk factors on dairy farms in Hawassa city, southern Ethiopea. *Heliyon Volume 7, Issue 12*.

Jacoby, H., Deininger, K., & Hillhorst, T. (2024). *Agriculture and Rural Development.* Retrieved from The World Bank: worldbank.org/en/pr

Kuhudzayi, B., & Mattos, D. (2018, August 29). *Model for Farmer Support in Zimbabwe-Opportunity for Change.* Retrieved from Institute of Agriculture and Natural Resources, AGRICULTURAL ECONOMICS: agecon.unl.edu/corn

Maburutse, B., Mutibvu, T., Mbiriri, D., & Kashangura, M. (2012). Constraints and Opportunities for increased livestock production in communal areas: A case study of Simbe, Gokwe south of Zimbabwe. *Livestock Research for Rural Development 24(9)*.

Madyavanhu, N., Shekede, M., Kusangaya, S., Phukenyi, M., Chikerema, S., & Gwitira, I. (2024). Bovine anaplasmosis in Zimbabwe: spatio-temporal distribution and environmental drivers. *Veterinary Quarterly 44(1)*, 1-16.

Mangwiro, T. (2023). *Zim sees uptick in livestock population.* The Herald.

Masarakufa, C. (2020). *NATURAL FARMING REGIONS IN ZIMBABWE.* Harare: STARTUPBIZ ZIMBABWE.

Masuka, J. (2022). *SECOND ROUND CROP AND LIVESTOCK ASSESSMENT REPORT.* MINISTRY OF LANDS, AGRICULTURE, FISHERIES, WATER AND RURAL DEVELOPMENT.

Matikiti, A., Allemann, J., Kujeke, G., Gasura, E., Masekesa, T., & Chabata, I. (2017). Nutritional composition of cocoyana, grown in Manicaland province in Zimbabwe. *Asian Journal of Agriculture and Rural Development Volume 7, Issue 3*.

Matondi, G., Nyamushamba, G., Motsi, T., & Masama, E. (2014). Evaluation of smallholder dairy calf rearing systems in Zimbabwe. *Livestock Research for Rural Development 26(3)*.

Matondi, G., Nyamushamba, G., Motsi, T., & Masama, E. (2014). *Evaluation of smallholder dairy calf rearing systems in Zimbabwe.*

Melesse, M., Tirra, A., Tui, S., Van Rooyen, A., & Hauser, M. (2023). Production decisions and food security outcomes of smallholder's livestock market participation: emprical evidence from Zimbabwe. *Sec. Land, Livelihoods and Food Security*.

Morrill, K., Conrad, E., Lago, A., Campbell, J., Quigley, J., & Tyler, H. (2012). Nationwide evaluation of quality and composition of colostrum on dairy farms in the United States. *Journal of Dairy Science 95*, 3997-4005.

Ndava, J., Mapuwei, W., & Madoma, C. (2018). *Journal of Entomology and Zoology Studies*.

Ndebele, J., Muchenje, V., Mapiye, C., Chimonyo, M., Musemwa, L., & Ndlovu, T. (2007). Cattle breeding management practices in the Gwayi smallholder farming area of South-western Zimbabwe. *Livestock Research for Rural Development 19(12).*

Ngongoni, N., Mwale, M., Mapiye, C., Moyo, M., Hamudikuwanda, H., & Titterton, M. (2007). Evaluation of cereal-legume intercropped forages for smallholder dairy production in Zimbabwe. *aLivestock Research for Rural Development. Vol 19 (09)*.

Nkomboni, P. (2015). Beef value chains in A2 resettled farms in Zimbabwe: A review. *Livestock Research for Rural Development 27(7).*

ReportLinker. (2022). *Zimbabwe Beef Industry Outlook 2022-2026*. Retrieved from ReportLinker Web site: reportlinker.com/clp

Scoones, I. (2017). *Medium-scale commercial farming in Zimbabwe.* Zimbabweland.

Solarczyk, P., Sakowski, T., Golebiewski, M., Slosarz, J., Grodkowski, G., Grodknowska, K., . . . Puppel, K. (2023). The Impact of Calf Rearing with Foster Cows on Calf Health, Welfare, and Veal Quality in Dairy Farms. *MPDI*.

Svotwa, E., Hamudikuwanda, H., & Makarau, A. (2001). Influence of Climate and weather on cattle production semi-arid communal areas of Zimbabwe. *Electronic Journal of Enmvironmental, Agricultural and Food Chemistry*.

Swan, E. (2021). *Successful calf rearing: from birth to weaning.* Retrieved from Alltech: alltech.com/en-ie/blog/successful calf rearing

Tautenhahn, A., Merle, R., & Muller, K. (2020). Factors associated with calf mortality and poor growth of dairy heifer calves in northeast Germany. *Prev Vet Med*.

Tavirimirwa, B., Mwembe, R., Ngulube, B., & Banana, N. (2013). Communal cattle production in Zimbabwe: A review. *Livestock research for rural people 25(12)*.

Thomas, H. (2024, April 19). *Western Farmer-Stockman*. Retrieved from Farm Progress: farmprogress.com

Tirivanhu, N., Ruzhani, F., & Jambo, N. (2023). Determinants of effective cattle disease management among smallholder farmers in light of rapid theileriosis outbreaks and economic losses: The case of Mutare rural district, Manicaland province, Zimbabwe. *Animal Husbandry and Veterinary Science*.

Uetake, K. (2013). Newborn calf welfare: A review focusing on mortality rates. *Anim Sci J*, 101-105.

Wilson, R. (2018). Crossbreeding of Cattle in Africa. *Journal of Agriculture and Environmental Sciences 6(1)*.

BIBLIOGRAPHY \l 1033 Berber, E., Canakoglu, N., Sozdutmaz, I., Simsek, E., Sursal, N., Ekinci, G., . . . S. (2021). Seasonal and age-associated pathogen distribution in newborn calves with diarrhea admitted to ICU. *Veterinary Sciences 8 (7)*, 128.

Dubrovsky, S. e. (2019). Bovine respiratory disease cause-specific and overall mortality in preweaned calves on California dairies: The BRD 10K study. *Journal of Dairy Science*.

Edao, A., & Meribo, A. (2021). Major causes of Calf Morbidity and Mortality in smallholder Dairy Frms in Shashemene Town, Ethiopia. *NASS Journal of Agricultural Sciences*, 56.

FA0. (2019). *Livestock mortality and morbidity*. Retrieved from https://www.fao.org/livestock-environment/en.

Felius, M., Beerling, M., Buchanan, D., Theunissen, B., Koolmees, P., & J.A., L. (2014, November 12). *On the history of cattle Genetic resources*. Retrieved from mpdi.com,1424-281.

Fentie, T., Mekonen, G., Temesgen, W., Melaku, A., Tesfaye, S., Niguse, A., . . . Begna, F. (2020). Assessment of major causes of calf mortality in urban and Periurban dairy production system of Ethiopia. *Veterinary Medicine International*.

Ferraro, S., Fecteau, G., Dubuc, J., & Francoz, D. (2021). Scoping review on clinical definition of bovine respiratory disease complex and related clinical signs in dairy cows. *Journal of Dairy Science- Elsevier*.

ILRI. (2017). *improving calf survival in extensive livestock production systems in East and Southern Africa*. Retrieved from https://www.ilri.org/research/initiatives/livestock-climate-and-system-resilience.

Johnson, K., & Pendell, D. (2017). Market impacts of reducing the prevalence of bovine respiratory disease in United States beef cattle feedlots. *Frontiers in veterinary science-frontiersin.org*.

Kamel, M., Davidson, J., & Verma, M. (2024). Strategies for Bovine Respiratory Disease Diagnosis and Prognosis: A Comprehensive Overview. *Animals 14(4)*, 627.

Kansal, G., Kumar, A., Hitesh, & Yadav, V. (2022). Factors affecting neonatal calf mortality, controlling measures and welfare practices: A Review. *The Pharma Innovation Journal*, 3220.

Matondi, G., Nyamushamba, G., Motsi, T., & Masama, E. (2014). Evaluation of smallholder dairy calf rearing systems in Zimbabwe. *Livestock Research for rural development*.

McGill, J., & Sacco, R. (2020). The Immunology of Bovine Respiratory disease: recent advancements. *Veterinary Clinics of North America: Food Animal- Elsevier*.

Monney, J., Adjogoua, E., Karamoko, Y., & Akran, A. (2017, October). *Incidences of calf diarrhea and the associated risk factors in Ivory Coast*. Retrieved from revistas.udesc.br.

NADIS. (2024). *Trace Element Deficiency in cattle.* nadis.org.uk/disease.

Silva, L., Coimbra, L., & Eyre, K. (2023). Malnutrition of pregnant beef cows and the impact on passive immunity transfer to calves. *Animal Production Science*, 1.

Tamrat, H., Mekonnen, N., Ferede, Y., Cassini, R., & Belayneh, N. (2020). Epidemiological study on calf diarrhoea and coccidiosis in dairy farms in Bahir Dar, North West Ethiopia. *Irish Veterinary Journal*.

Whittier, J., & Thorne, J. (2007). Assisting the Beef Cow at Calving Time. *The Cattle Site*.

Yitagesu, E., Fentie, T., N, K., W, J., & Smith, W. (2022). The magnitude of calf morbidity and mortality and risk factors in smallholder farms across livestock production systems in central Ethiopia. *Veterinary Medicine and Science 8(5)*, 2157-2166.

Zychlinsk-Buczek, J., Bauer, E., Kania-Gierdziewicz, J., & Wronska, A. (2015). The main causes of calf mortality in dairy farms in Poland. *Journal of Agricultural Science and Technology*, 363.

APPENDICES

Annex 1: Research Questionnaire

QUESTIONNAIRE

STUDY TOPIC: A SURVEY ON THE CAUSES OF CALF MORTALITY IN WARD 19 OF MAKONI DISTRICT, MANICALAND PROVINCE.

I'm **Nancy Runatsa**, a student at Bindura University of Science Education (BUSE), who is researching on the above-mentioned study topic as part of my studies in the department of Animal Science. I would appreciate to hear your feedback of the study and I assure you that your identity will not be revealed. The information gathered will remain confidential and will only be used for academic purposes. The results of the study will be used to benefit farmers in Makoni District and the rest of the nation.

SECTION A

1. What is your age group? (years)

18-24	25-34	35-44	45-54	55-64	65+
☐	☐	☐	☑	☐	☐

2. What is your Gender?

male	female
☑	☐

3. What is your level of Education?

'O' level	'A' level	student	degree holder
☐	☐	☐	☑

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

years

11

SECTION B

5. How many cattle do you currently own?

310

}

6. What is your herd composition, that is the breeds you have?

Mashona pure and crosses

Tuli pure and crosses

Boran crosses, Brahman crosses

Beefmaster, Charolais.

SECTION C

7. How many animals have you lost (died)? in the past 1 year.

15M

5Females.

8. Then how many were calves? in the past 1 year.

8M

3Females

9. What are probably causes of mortality?
   1. Pneumonia
   2. Tick borne/Heart water and January disease.
   3. Accidents during fight of bulls.
      Starvation in dry season.
10. Was a post mortem done on dead animals?

yes	no
☑	☐

11. How have you addressed the causes of death?
    1. dipping intervals from weekly to 5 days.
    2.
    3.
12. What is the average calf mortality rate on your farm in the past year?

    %

    3,5

13. Have you noticed any trends or patterns in calf mortality rates over the years?

yes	no
☑	☐

SECTION D

14. Where do you get information on animal health?

vet	peers	radio	WhatsApp	family
☑	☑	☑	☑	☑

15. What are the main challenges you face or faced in reducing calf mortality on your farm?

1. poor calf housing facities.
2. Inexperienced workers to monitor calf health from birth
3. lack of finances to support the calves/ dams during dry season.

15. Are you aware of any best practices or strategies to reduce calf mortality?

yes	no
☐	☑

16. Would you be interested in participating in workshops or training programs related to calf mortality prevention.

yes	no
☑	☐

17. What kind of support or assistance would be most beneficial in helping you reduce calf mortality on your farm?

1. financial support from government and NGOs during dry season.
2. workshops.
3.

Thank you for your participation. This will help a lot throughout this research.

CLIFTON FARM

Annex 2: Field observation of animals in ward 19.