BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF AGRICULTURE AND ENVIRONMENTAL SCIENCE

DEPARTMENT OF ANIMAL SCIENCE

AN INVESTIGATION ON THE EFFECTS OF TICK-BORNE DISEASES ON CATTLE PRODUCTION IN MUREWA DISTRICT WARD 23 MASHONALAND EAST ZIMBABWE

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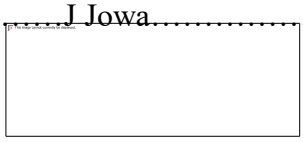
DECLARATION

Student

I do hereby declare to Bindura University of Science Education that this research **is** a result of my original research work entitled , **An investigation on the effects of tick borne diseases on cattle production.** It is being submitted in partial fulfillment of theBachelor of Agricultural Science Honors Degree in Animal Science. The findings of this research have never been submitted in any other institution.

Signature……J Jowa…….. Date……31 .08 2025



Supervisor

I have supervised the research project for the above mentioned student and I am convinced that the research project can be submitted.

Signature  Date 31.8.25

Chairperson Date

ABSTRACT

Tick-borne diseases (TBDs) represent a major constraint to livestock productivity in sub-Saharan Africa, including Zimbabwe. This study investigated the Effects of tick-borne diseases on cattle production in Murewa District, ward 23 Mashonaland East. A descriptive survey was conducted using structured questionnaires administered to a representative sample of farmers. Data were collected through structured interviews, questionnaires, field observations and veterinary records from dip tanks and animal health centers were distributed and 100 were retained. The demographic information indicated that men were most dominant amongst the farmers with 58.8% and 41.8% female respondents, reflecting gender dynamics in cattle farming in the district. The study revealed that Theileriosis (54%) was the most prevalent TBD, followed by Anaplasmosis (21%), Babesiosis (15%), and Heartwater (10%, significantly impact livestock health, leading to reduced productivity and economic losses among smallholder farmers. Farmers identified ticks (55%) and poor cattle management practices (35%) as the primary causes of TBDs. Diagnosis was predominantly based on clinical signs (55%), with limited reliance on veterinary and laboratory support. Control methods included chemical acaricides, cultural and biological practices, with 50% of respondents using an integrated approach. However, challenges such as limited resources (45%), inadequate knowledge (35%), and inconsistent tick control measures (20%) were significant barriers. The findings revealed a strong correlation between tick-borne diseases prevalence and decreased cattle productivity. The study concludes that while there is awareness of TBDs among farmers, resource constraints and knowledge gaps hinder effective control. It recommends increased access to veterinary services, farmer training on integrated tick management, and support for sustainable, low-cost tick control solutions to reduce TBD-related losses and enhance cattle production .

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Above all I thank God for his protection intervention for his wisdom and guidance

Dedication

I dedicate this project to my loving husband Mr. Hove for his support throughout the whole process, his patience and love gave me strength to work hard and to my aunt Mrs Nyakudya who encourages me to push forward and never to give up and to all the farmers who were willing to work with me I salute you all.

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LIST OF ABBREVIATION

TBD- TICK-BORNE DISEASE

Chapter 1:

1.1 Background of the Study

Livestock farming has long been a cornerstone of agricultural activities in many developing countries, particularly in Sub-Saharan Africa, where it serves as a primary source of income, food security, and social capital for rural communities. In Zimbabwe, cattle farming plays a vital role in supporting the livelihoods of millions of smallholder farmers. Cattle are used for various purposes, including plowing fields, providing milk, and serving as an important asset for trade and social exchange. As a result, the cattle sector forms an integral part of Zimbabwe's rural economy, contributing significantly to food security, poverty alleviation, and the national economy.

In Murewa District, located in the Mashonaland East Province of Zimbabwe, livestock farming, especially cattle, is a critical part of the local economy. The district is home to many smallholder farmers who rely on cattle for sustenance, income generation, and as a store of wealth. Cattle also play an essential role in cultural practices and traditional ceremonies, further increasing their significance in the lives of local communities.

However, despite the immense value of cattle to Murewa's rural population, livestock production is constantly threatened by several factors, with tick-borne diseases (TBDs) emerging as one of the most significant challenges. Tick-borne diseases, such as Theileriosis, Babesiosis, and Anaplasmosis, have been recognized as critical health threats to cattle populations in Zimbabwe. These diseases are transmitted by ticks and can result in severe health complications, including fever, anemia, and in some cases, death, leading to significant losses in cattle production and economic hardship for affected farmers.

Livestock production is central to rural livelihoods in Zimbabwe, particularly in Murewa District. It provides various services beyond just the sale of meat and milk. The contribution of livestock to the economy is multifaceted:

Cattle provide farmers with a form of savings or a "living bank account," as they can be sold or exchanged for money, goods, or services. This economic asset is vital in times of need, such as for paying school fees or purchasing food. Livestock, particularly cattle, contribute to the nutrition of rural families through milk and meat, which are key sources of protein. This helps improve the dietary diversity of households.

Cattle are highly valued in Zimbabwean society and are often used in traditional ceremonies, such as weddings and dowry exchanges. They are also an important part of community wealth-building. Cattle are used for draught power to plow fields, especially in rural areas where mechanization is limited. This greatly aids agricultural productivity.

Despite these benefits, the full potential of livestock production is hindered by several factors, with tick-borne diseases representing one of the most significant challenges. Farmers in Murewa, like in many parts of Zimbabwe, face numerous challenges that hinder optimal livestock production. Some of these challenges include poor veterinary services, inadequate grazing land, and the effects of climate change on pasture availability. However, one of the most pressing issues impacting cattle production in the district is the prevalence of tick-borne diseases (TBDs).

Tick-borne diseases are caused by pathogens transmitted by ticks, which are prevalent in tropical and subtropical regions. These diseases not only lead to the death of cattle but also cause reduced milk production, poor weight gain, and decreased fertility rates. The impact of tick-borne diseases on livestock health is profound, as it results in both direct and indirect economic losses. The costs associated with treating these diseases and managing their spread further burden local farmers, many of whom cannot afford the necessary veterinary care.

In addition to the health risks posed by ticks, the use of ineffective control measures, such as limited access to acaricides (chemicals used to kill ticks) or incorrect tick control methods, exacerbates the problem. This situation is further complicated by poor livestock management practices and inadequate extension services, which leave farmers struggling to cope with the spread of tick-borne diseases.

While several challenges affect livestock production in Murewa, tick-borne diseases have emerged as a primary concern. The high prevalence of ticks and the diseases they transmit make this issue a critical one for both the economic sustainability and food security of the district. In many rural

areas, the loss of cattle to tick-borne diseases can lead to financial instability, reduced income, and diminished social capital for farmers.

Tick-borne diseases not only affect the immediate health of the cattle but also have long-term effects on the productivity and viability of livestock farming in Murewa. As such, addressing the impact of these diseases is crucial for ensuring the continued welfare of livestock farmers in the district.

Livestock plays a pivotal role in Zimbabwe's economy and food security, especially in rural areas where agriculture forms the backbone of the economy. Cattle, in particular, are a significant asset for smallholder farmers, contributing not only to household livelihoods but also to national economic development

Livestock is an integral part of Zimbabwe’s agricultural sector, especially in terms of crop production. Cattle are used for draught power, providing farmers with the ability to plow fields, transport goods, and prepare for planting, especially in areas with limited access to mechanized farming equipment. This contributes directly to crop yields, which are vital for food security and further economic activity.

The livestock sector also creates employment opportunities for a range of people, including farmers, herders, veterinarians, traders, and those working in meat processing industries. The value chain surrounding livestock – from breeding to slaughtering to retailing – supports numerous jobs in both rural and urban areas. Livestock and livestock products, particularly beef, play an important role in Zimbabwe’s export sector. Zimbabwe has historically exported beef to markets such as the European Union, South Africa, and regional markets within Southern Africa. The livestock export industry contributes to foreign exchange earnings, which are essential for the country’s economic growth. The livestock export sector also attracts investment, helping to strengthen trade relations and diversify the country's income sources.

Cattle are also vital in the informal economy, where they are used as part of the social exchange system, such as paying for dowries or performing other cultural exchanges, especially in communities where cash flow is limited.

Livestock farming contributes significantly to household incomes in Zimbabwe, particularly for rural communities. Cattle are raised for both direct and indirect income generation, Farmers can sell cattle for slaughter, milk production, or the sale of calves. Beef and milk products are sold in local and regional markets, creating economic value. The income generated from cattle sales is used to improve livelihoods, purchase goods and services, and support other agricultural activities.

By-products such as hides and skins, which are used in leather production, also provide an additional source of income. The wool from sheep and goats, as well as the manure for fertilization, are further contributors to the rural economy.

Livestock farming, particularly cattle farming, plays a significant role in food security by providing essential sources of protein, fats, and other vital nutrients. The milk and meat from cattle are staples in the diets of many households, providing a significant proportion of the calories and proteins consumed in rural and urban areas. Beef is a major source of animal protein, which is vital for human health, while milk is an important source of calcium and other nutrients for children and adults alike.

In Zimbabwe, where many people rely on agriculture for sustenance, access to affordable and nutritious food is vital. Livestock helps to address this need by supplementing diets and improving overall nutritional intake, particularly in areas where crop yields may be inconsistent due to climate challenges, pests, or other factors.

Livestock acts as a safety net for households during periods of crop failure or food scarcity. In Zimbabwe, where rural communities are vulnerable to droughts, floods, and other environmental stresses, cattle provide a reliable source of food and income. When crops fail due to adverse weather conditions, farmers can sell livestock to purchase food or other necessities. Livestock thus serves as a form of insurance against environmental shocks and contributes to household resilience.

In addition to providing food, livestock is crucial for the sustainable management of agricultural land. Manure from livestock, especially cattle, is an important source of organic fertilizer, which helps to improve soil fertility and supports crop production. This is especially beneficial in areas where access to synthetic fertilizers is limited or where soil quality has been degraded over time.

Livestock thus supports a sustainable farming system by improving soil health and promoting ecological balance.

In many rural communities in Zimbabwe, livestock ownership, particularly cattle, provides women with the opportunity to improve their economic and social status, Moyo .et.al (2015) Women often have primary responsibility for the care and management of livestock, and they rely on livestock products for household food security. By increasing their control over livestock, women can enhance their household's food security, improve their income, and gain more decision-making power within the community.

This study aims to highlight the effects of tick-borne diseases on cattle production in Murewa District and offer solutions to mitigate their impact, thus contributing to the broader efforts of enhancing the role of livestock in the country's economy and food security.

1.2 Problem statement

"Despite the importance of livestock production in Zimbabwe, tick-borne diseases (TBDs) remain a major constraint to cattle productivity, causing significant economic losses and compromising animal health .Cattle are a vital source of income, food and cultural significance in this region. However, the prevalence of tick-borne diseases has led to decreases productivity there is reduced milk yield, increased morbidity and mortality rates among livestock, weight loss .Farmers in ward 23 report substantial economic losses due to reduced productivity .The lack of effective tick control measures and insufficient knowledge about disease prevention strategies exacerbate the situation. Furthermore, the socio-economic implications of these diseases extend beyond individual farms affecting overall agricultural productivity of the region.

Despite the critical importance of the cattle sector in local economies, there is limited research focusing specifically on the effects of tick-borne in this area. This gap in knowledge hinders the development of targeted interventions and policies to mitigate the impact of these diseases .Consequently, there is an urgent need to assess the prevalence of tick-borne understand their effects on cattle health and productivity and evaluate direct and indirect economic burden on farmers in ward 23.This investigation aims to provide a comprehensive understanding of the effects of tick-borne diseases on cattle production in ward 23 Murewa district ,to inform effective

management practices and policy recommendations that can enhance cattle health and improve the economic stability of local farmers.

1.3 Objectives

Main objective

To investigate the effects of tick –borne diseases (TBDS) on cattle production in ward 23 Murewa district, Zimbabwe

Specific objectives

a. To determine the prevalence of tick-borne disease outbreaks in ward 23 Murewa District

b. To assess the economic impact of tick-borne diseases on cattle production and smallholder livelihoods in Ward 23 Murewa District.

c. To provide evidence-based recommendations for improving tick-borne disease prevention and control strategies in the local context.

1.4 Research questions

- What are the most common tick-borne diseases affecting cattle in Murewa ward 23
- What are the economic impacts of tick-borne diseases on cattle production in Murewa ward 23
- What are the current methods of tick control used by cattle farmers in Murewa ward 23
- How do tick-borne diseases affect the welfare and productivity of cattle

1.5 Research hypothesis

Null hypothesis: Tick-borne diseases do not have a significant impact on cattle production in Murewa ward 23 district Zimbabwe

Alternative hypothesis: Tick-borne diseases have a significant impact on cattle production in Murewa ward 23 district Zimbabwe, resulting in reduced cattle productivity, increased mortality rates and decreased economic returns for farmers.

1.6 Assumptions

The study assumes that the sample of cattle selected for the study is representative of the larger population of cattle in ward 23 Murewa and that the conditions in which the cattle are kept is constant and do not change over time.

1.7 Justification of the study

Tick-borne diseases are a significant threat to cattle production in Zimbabwe .These diseases can cause significant economic losses to farmers as well as have a negative effect on productivity.

Cattle are a vital source of income and food security for many people, particularly in developing countries. Tick-borne diseases can cause significant economic losses, reducing cattle productivity and profitability, Sunungurai .et.al.(2018) Tick-borne diseases can also have significant public health implications, as some of these diseases can be transmitted to humans. For example, tick-borne relapsing fever is a significant public health concern in some parts of the world.

Despite the significant impact of tick-borne diseases on cattle, there is limited research on the prevalence, transmission, and control of these diseases, particularly in developing countries.

The control of tick-borne diseases is critical to reducing the economic and public health impacts of these diseases. However, effective control measures require a thorough understanding of the epidemiology of these diseases, which is currently lacking. By understanding the effects of tick-borne diseases on cattle, it may be possible to develop effective control measures that can improve cattle productivity and reduce the economic and public health impacts of these diseases.

1.8 Limitations

Limitations refers to the constrains or restrictions that are inherent in a research study ,limitations can affect the validity ,reliability and generalizability of the findings .The limitations of this study includes**,** the sample size of the study is limited, which could affect the generalizability of the findings. The study may be limited by funding constraints, which could affect the scope and quality of the research.

1.9 Delimitations

Delimitations refers to the intentional boundaries or restrictions that are imposed on a research study to focus the investigation, define the scope and establish the parameters of the study. They can be defined as self –imposed limitations that a researcher sets to ensure that the study is manageable, feasible and relevant to the research question or hypothesis. The delimitations of this study includes the study will focus specifically on cattle, and will not consider other livestock or animals that may be affected by tick-borne diseases. The study will focus on specific tick-borne diseases, such as theileriosis, anaplamosis and babesiosis, and will not consider other tick-borne diseases. The study will be conducted over a limited time frame, which could affect the ability to capture seasonal or annual variations in tick-borne disease prevalence. The study will be conducted in a specific study area, which could limit the generalizability of the findings to other areas.

Chapter 2

Literature review

Cattle play a central role in the livelihoods of rural communities in Zimbabwe, especially in districts such as Murewa. Besides providing meat, milk, and draught power, cattle are also a store of wealth and a cultural asset. However, the livestock sector faces significant threats from tick-borne diseases (TBDs), which compromise cattle health and productivity. These diseases are spread primarily by ticks and can lead to widespread mortality, economic hardship, and social disruptions. Tick-borne diseases (TBDs) represent a significant threat to livestock health and productivity, particularly in tropical and subtropical regions where ticks are prevalent. In Zimbabwe, tick-borne diseases have long been recognized as a major constraint in the cattle industry, leading to substantial economic losses due to reduced productivity, mortality, and veterinary treatment costs this literature review explores the prevalence of TBDs in Murewa, their transmission dynamics, the impact on cattle production, and ongoing control efforts.

2.1 overview of ticks

Ticks are significant ectoparasites in Murewa District, Zimbabwe, and other regions in Sub-Saharan Africa, where they pose a major threat to cattle health and productivity. In this context, ticks not only cause direct harm by feeding on cattle, but they also act as vectors for various pathogens that lead to tick-borne diseases (TBDs), severely affecting the cattle industry. These diseases, including anaplasmosis, babesiosis, theileriosis, and heart water (cowdriosis), contribute to substantial economic losses in the region through reduced milk yield, weight loss, mortality, and increased veterinary costs. There are various species of ticks the primary tick species that impact cattle production belong to the families Ixodidae (hard ticks) and Argasidae (soft ticks). The main species include:

Rhipicephalus (Boophilus) microplus: This species is particularly important in the transmission of anaplasmosis and babesiosis. Rhipicephalus microplus is widely distributed in Murewa, and its role in the transmission of these diseases makes it a key vector in cattle production systems. These ticks are highly adaptive to environmental changes and are resistant to some acaricides (tick control chemicals), which complicates their control.

Amblyomma species, Ticks of the Amblyomma genus are also found in Murewa District, with Amblyomma variegatum being a significant vector for heart water and theileriosis. Amblyomma ticks are known for their large size and long attachment periods, allowing them to transmit pathogens over extended feeding periods. These ticks have become more prevalent in Murewa in recent years, particularly after land reform initiatives, which have changed local agricultural practices.

Ixodes species, though less prevalent in Murewa compared to other regions in Zimbabwe, Ixodes ticks are also important vectors of Lyme disease in other parts of the world and may play a role in disease dynamics in areas with similar environmental conditions.

Lifecycle and Feeding Behavior of Ticks

Ticks follow a four-stage lifecycle: egg, larva, nymph, and adult. The lifecycle is influenced by environmental factors, such as temperature and humidity, which are prevalent in the warm, tropical climate of Murewa District. Eggs are laid in the environment by adult female ticks, typically in shaded, moist areas, such as tall grass or under trees in pastures. Larvae (6-legged) hatch from eggs and seek their first blood meal from a host, which is typically a small animal, bird, or cattle. After feeding, the larvae drop off the host, molt into the nymph stage (8-legged), and seek a second blood meal. Nymphs can feed on larger animals, including cattle. Adults (8-legged) are the reproductive stage of ticks. Female ticks require a large blood meal to reproduce, often attaching to the cattle for several days to a week. The engorged females then detach and lay thousands of eggs, completing the cycle.

Ticks transmit pathogens while feeding. As they pierce the host's skin with their hypostome (barbed mouthparts), they inject saliva that contains anticoagulants, allowing them to feed uninterrupted for several days. During this process, pathogens such as Anaplasma marginale (anaplasmosis), Babesia bovis (babesiosis), and Theileria parva (theileriosis) can be introduced into the cattle's bloodstream, resulting in disease transmission.

2.2 Tick-Borne Diseases in Cattle

Prevalence and distribution

Theileriosis, caused by theileria parva, is the most prevalence TBD in Zimbabwe, particularly affecting cattle in communal areas .A study by Sungirai et,al (2017) identified Amblyoma hebraeum and Rhipicephalus decoloratus as the primary vectors of T.parva in Zimbabwe. The distribution of these tick species correlates with the prevalence of the disease, with higher incidences observed in areas with dense tick populations. The disease causes significant weight loss, poor growth rates, and reduced milk production. In severe cases, it can lead to death. Furthermore, it can result in reproductive issues, such as abortion and reduced fertility (OIE, 2019).

Tick-borne diseases in cattle are caused by various pathogens including bacteria, protozoa, and viruses, which are transmitted by ticks. In Zimbabwe, besides theileriosis some of the most common tick-borne diseases affecting cattle include anaplasmosis, babesiosis, , tick paralysis, and heartwater (cowdriosis). These diseases can have severe effects on cattle health, reducing growth, milk production, and fertility, which, in turn, results in significant economic losses for farmers.

Other common tick-borne diseases

Anaplasmosis:

Anaplasmosis is caused by Anaplasma marginale, a bacterium that infects red blood cells, leading to anemia and death in severe cases. It is primarily transmitted through ticks, especially Rhipicephalus species (e.g., Rhipicephalus (Boophilus) microplus), but can also be spread via contaminated needles and other vectors .Symptoms include fever, lethargy, anemia, and pale mucous membranes. The disease results in decreased productivity, including reduced weight gain, milk production, and fertility, and can lead to significant losses in herd performance (Baker et al., 2014).

Babesiosis:

Caused by Babesia bovis and Babesia bigemina, babesiosis leads to fever, anemia, jaundice, and in severe cases, death. The protozoan parasites infect red blood cells, impairing oxygen transport and leading to tissue damage.

Transmission occurs through ticks, particularly Rhipicephalus species. The disease results in a decrease in milk yield, weight loss, and in fertility, with young or naïve cattle being particularly vulnerable (Opara et al., 2017).

Tick Paralysis:

Caused by neurotoxins produced by female ticks of Dermacentor species, tick paralysis leads to progressive paralysis, starting from the hind limbs and potentially spreading to the respiratory system, causing death. The condition is associated with significant economic losses due to cattle mortality and veterinary costs for tick management (George, 2020).

Heartwater (Cowdriosis):

Caused by Ehrlichia ruminantium, heartwater is transmitted by ticks, particularly Amblyomma species. The disease manifests as high fever, neurological symptoms, and respiratory failure, leading to death if untreated. Infected cattle experience reduced fertility and milk production, leading to economic losses in dairy and beef production sectors (Bonsu et al., 2019).

2.3 Tick-Borne Disease Prevalence in Murewa District, Zimbabwe

Murewa District, located in Mashonaland East Province of Zimbabwe, has been significantly affected by the increasing prevalence of tick-borne diseases. The district's geographical and climatic conditions are conducive to tick infestations, which contribute to the high incidence of these diseases.

Recent studies have highlighted a changing tick species distribution in Murewa, particularly after the land reform initiatives that altered land use patterns. A study by Dhliwayo et al. (2014) noted an increase in the prevalence of Amblyomma species in southern parts of the district, a shift from the pre-land reform period when these ticks were less common. This shift in tick populations has resulted in increased risks of diseases like cowdriosis (heartwater) and theileriosis, both transmitted by Amblyomma ticks.

Reports from the Ministry of Agriculture and local veterinary services indicate that Murewa, along with neighboring areas, is experiencing high morbidity and mortality rates due to tick-borne diseases. For example, between November 2017 and May 2018, Mashonaland East Province, which includes Murewa, recorded over 2,698 cases of tick-borne diseases, leading to the death of 1,441 cattle. Theileriosis was the primary cause of these losses (Zimbabwe Veterinary Services, 2018).

Additionally, anaplasmosis has been identified as a significant issue in the region. Similar to other parts of Zimbabwe, Murewa suffers from outbreaks of anaplasmosis, especially in areas where tick control measures are inadequate (Chisi et al., 2015). The disease has caused notable economic losses, including reduced cattle weights, milk production, and fertility.

2.4 Factors contributing to disease transmission

There are various factors contributing to transmission of tick borne diseases which includes inadequate dipping practices, irregular dipping due to high acaricides costs and limited access to dipping facilities exacerbate tick infestations and disease transmission (Taylor 2018).There is also environmental conditions which plays a vital role the temperatures and rainfall create a favorable conditions for tick survival and pathogen transmission. Warm and humid conditions in Murewa, the climate provides favorable conditions for tick survival and reproduction, leading to increased tick population and higher transmission rates of tick borne diseases. Sharing grazing areas also contribute to disease transmission through the mixing of animals from different herds facilitating the spread of ticks and disease across herds Moyo .et.al (2015).

2.4.1 Socio-economic factors

High costs of acaricides make regular dipping unaffordable for many communal farmers. This financial constraint hampers effective tick control measures, limited access to veterinary services and extension support in rural areas of Murewa affects timely diagnosis and treatment of tick borne diseases, leading to higher mortality rates.

2.4.2 Farmer knowledge and practices

Lack of knowledge about tick borne and proper tick control methods among farmers contributes to persistence and spread of diseases .Training and awareness programs are essential to improve control practices .There are also traditional beliefs and practices which influence farmer’s willingness to adopt recommended tick control measures ,affecting the overall effectiveness of diseases management strategies

2.5 Effects of tick borne diseases on Cattle Health and Production in Murewa

Tick-borne diseases (TBDs) significantly compromise cattle productivity by reducing the health, working capacity, reproductive efficiency, and survival of livestock. In Zimbabwe, especially in communal farming systems such as in Murewa District, these effects are compounded by limited access to veterinary care and inconsistent tick control practices.

2.5.1 Mortality and Morbidity

TBDs are a major cause of cattle mortality, especially in young, non-immune, or newly introduced animals. Theileriosis (commonly known as January disease) is particularly devastating. According to Chikura et al. (2022), over 61.6% of cattle deaths in Zimbabwe's Bindura District were attributed to TBDs, with theileriosis being the primary cause. Similar mortality patterns are expected in Murewa, where tick infestations are prevalent, especially during the rainy season when tick activity increases .Mortality leads to direct loss of investment in livestock and affects the genetic progress of breeding programs, as productive animals are often the most vulnerable due to stress or movement.

2.5.2 Reduced Milk Production

Milk production is adversely affected by TBDs such as anaplasmosis and babesiosis. These diseases cause fever, anorexia, and lethargy, leading to a decline in appetite and metabolic activity. As noted by Mapiye et al. (2009), infected cows often experience 25–50% reductions in milk yield, which has direct implications for household nutrition and income, especially in smallholder dairy systems. Milk yield declines not only due to illness but also as a result of the chronic effects of tick infestations, including skin damage and stress, which further reduce the animal’s productive potential. . The disease's physical toll on the cattle, along with reduced appetite and general weakness, directly affects their milk yield (Nicolau et al., 2020).

2.5.3 Loss of Draught Power

In communal farming communities, cattle are used extensively for draught power, especially for ploughing and transporting goods. TBDs compromise muscle strength, coordination, and endurance due to fever and systemic infections. Chawatama et al. (2003) emphasized that loss of draught animals during the farming season delays land preparation and lowers crop yields. In Murewa, where mechanization is limited, the loss of even a single ox can critically affect a household's agricultural output.

2.5.4 Reproductive Losses

Though less visible, reproductive problems caused by TBDs are a significant productivity issue. Babesiosis and anaplasmosis are associated with abortion, infertility, and reduced conception rates (Minjauw & McLeod, 2003). These effects are especially damaging in small herds, where every calf represents a significant portion of future productivity. . This leads to lower herd productivity and economic losses for cattle farmers (Hassan et al., 2018).

2.5.5 Increased Veterinary and Management Costs

Outbreaks of TBDs lead to increased spending on, Acaricides, Antibiotics, Veterinary services, Labour for treatment or tick removal. This financial burden is especially hard on communal farmers with low income. According to FAO (2021), many households are forced to sell cattle prematurely or at low prices to cover veterinary costs, perpetuating poverty and reducing herd resilience.

2.5.6 Psychological and Social Impact

Beyond the economic dimension, the psychological stress caused by repeated cattle losses impacts farmer morale. In communal cultures where livestock symbolize wealth, status, and security, TBD-related deaths can affect social standing and family well-being (Chawatama et al., 2003

The effects of tick-borne diseases on cattle health and productivity in Murewa District are substantial. Cattle affected by these diseases show reduced growth rates, lower milk yields, and poor reproductive performance. Additionally, affected animals often require extensive veterinary treatment, which increases the financial burden on farmers.

Moreover cattle infected with tick-borne pathogens often suffer from anemia, fever, and general debilitation. The compromised immune systems of these animals make them more susceptible to

secondary infections, further exacerbating the health problems. Infected cattle experience weight loss and poor growth rates due to the reduced feed intake, fever, and the energy demands of fighting off the infection. This reduces the overall productivity of the herd and hampers economic returns (Sivakumar et al., 2021).

2.5.7 Poor Body Condition and Weight Loss

Chronic TBD infections often lead to poor body condition due to prolonged fever, appetite loss, and reduced grazing activity. This, Decreases market value of animals, affects meat quality and carcass yield, reduces resistance to other diseases, Minjauw & McLeod (2003) noted that subclinical infections reduce average daily weight gain significantly, particularly in beef production systems.

2.5.8 Reduced Calving and Weaning Rates

TBDs not only reduce conception but also affect calf survival. Cows infected during pregnancy may deliver weak calves or fail to nurse effectively. Calves may also suffer from Trans placental infections or fail to thrive due to poor maternal health. Tick infestations can directly weaken calves through blood loss. Jonsson et al. (2008) found that heavy tick infestations reduced calf survival and increased pre-weaning mortality in endemic areas.

2.6 Economic impacts of tick borne diseases

The economic burden of tick borne diseases in Murewa is twofold, compromising direct and indirect impacts that collectively threaten rural livelihoods .The economic impacts includes the following. Loss of Draught Power

In communal farming systems such as those in Murewa District, cattle serve a dual purpose—not only are they a source of meat and milk, but they also provide essential draught power for plowing fields and transporting goods. When cattle fall ill or die due to tick-borne diseases like theileriosis or babesiosis, households lose this critical labor resource. The absence of draught power can delay land preparation and crop planting, thereby reducing agricultural productivity and food security.

This disruption has a cascading effect on household income, as farmers may be forced to hire alternative labor or rent draught animals at a high cost.

2.6.1Increased Cost of Replacement Stock

The loss of cattle due to TBDs often compels farmers to purchase replacement animals to rebuild their herds. However, sourcing healthy cattle can be financially burdensome, especially in regions where livestock prices spike during disease outbreaks due to demand pressures. Many communal farmers lack access to formal livestock markets or credit systems, making restocking difficult. In some cases, replacement cattle may be of inferior quality or genetically less adapted to local conditions, leading to further losses in productivity. Moyo .et.al (2015)

2.6.2 Loss of Genetic Resources

Outbreaks of tick-borne diseases can also lead to the irreversible loss of valuable genetic material, especially among well-adapted indigenous or crossbred cattle. These animals often carry traits for disease resistance, drought tolerance, or superior milk yield. The death of such genetically valuable animals undermines local breeding programs and long-term herd improvement strategies. This genetic erosion is a silent but significant economic cost, reducing the resilience of livestock systems over time.

2.6.3 Disruption of Livestock Trade

Tick-borne disease outbreaks often trigger government-imposed movement restrictions, including livestock quarantines and temporary market closures. These measures, although necessary for disease control, severely restrict the ability of farmers to sell their animals, Sunungurai .et.al.(2018). Livestock traders may avoid regions affected by TBDs, leading to reduced market access and declining cattle prices. Farmers in affected areas suffer economic losses not only from reduced animal health but also from lost income opportunities due to trade disruption.

2.6.4 Reduced Investment in Livestock

The recurrent nature of TBDs and the associated uncertainty discourage many smallholder farmers from investing in improved cattle breeds, better feeding practices, or veterinary care. Instead, some opt to diversify into lower-risk, but also lower-return, livelihood strategies such as poultry keeping or crop farming. While this reduces their exposure to risk, it also limits income potential and stunts the growth of the livestock sector, which is vital for rural economic development in Zimbabwe.

2.7 Social impacts of tick borne diseases on cattle production

Cattle are essential to household food security through milk production and income generation. When herds are affected by TBDs, families may struggle to meet daily nutritional and financial needs. The loss of income can also force farmers to sell productive assets or reduce spending on health and education (FAO, 2022). Tick-borne diseases (TBDs) also exert significant social impacts, particularly in rural and resource-limited communities where livestock is central to livelihoods and cultural practices.

In many African communities, cattle are not just a source of income but also serve as a form of savings, a status symbol, and a key component in social transactions such as dowries and ceremonies. Losses due to TBDs, therefore, have profound consequences beyond economics, leading to food insecurity, loss of social status, and disruptions in traditional practices (Sungirai et al., 2016).

A study in Zimbabwe revealed that communal farmers experienced serious hardships as TBDs led to cattle deaths, affecting their ability to pay school fees, afford basic necessities, and maintain their cultural practices involving livestock (Sungirai et al., 2016). As cattle are often a family's most valuable asset, the impact of TBDs can cause psychological stress, contribute to poverty cycles, and even lead to rural-urban migration as households seek alternative livelihoods (McLeod & Kristjanson, 1999).

Moreover, in areas where veterinary services are limited, the burden of disease management often falls disproportionately on women, who are primary caregivers for livestock, thus adding to gender-based social stress (McLeod & Kristjanson, 1999).

2.7.1 Psychological and Emotional Stress

The emotional toll of losing livestock to disease is often overlooked in policy and academic discourse. In communities where cattle represent not only economic wealth but also family legacy and social status, their sudden loss can lead to profound psychological distress. Farmers report feelings of helplessness, despair, and anxiety—particularly when they lack access to veterinary services or cannot afford treatments. This mental burden can affect decision-making and reduce engagement in livestock-related activities.

2.7.2 Erosion of Traditional Social Structures

Cattle hold a central place in Zimbabwean rural culture. They are used for paying bride price (lobola), settling disputes, and performing traditional ceremonies. The loss of cattle due to TBDs disrupts these cultural practices, weakening social ties and eroding traditional customs. Families unable to meet cultural obligations may face social exclusion or stigma, which further marginalizes already vulnerable households.

2.7.3 Increased Gender Inequality

Women are particularly affected by TBD outbreaks, as they are often responsible for routine livestock care, including feeding, milking, and administering medications. When cattle fall ill, the burden of care increases, and women must spend more time managing sick animals. This additional unpaid labor often comes at the expense of income-generating activities or girls' education. Moreover, the loss of milk income, which is frequently managed by women, reduces their financial independence and bargaining power within the household. Sungirai et.al.(2016)

2.7.4 Migration and Labor Shifts

When livestock-dependent households lose their herds, younger family members—particularly men—may be forced to migrate to urban areas in search of alternative income sources. This trend contributes to rural depopulation and reduces the labor force available for agricultural activities. In the long term, this labor shift undermines rural development and increases the socio-economic vulnerability of households left behind, often composed of women, children, and the elderly.

2.7.5 Dependency on External Aid

In cases of severe or prolonged outbreaks, affected communities may become dependent on external assistance for food, restocking, and recovery support. This dependency, while often necessary in the short term, can erode self-reliance and strain government or NGO resources. Moreover, repeated dependence on aid can reduce the incentive for communities to invest in long-term, sustainable tick control practices, perpetuating a cycle of vulnerability.

2.8 Tick control measures

Zimbabwe has made efforts to control TBDs through regular dipping programs, public awareness campaigns, and government partnerships with agencies like the FAO. In 2022, the country launched an integrated national tick and tick-borne disease control strategy focusing on sustainable

dipping, acaricide rotation, and farmer training (FAO, 2022). Despite these initiatives, challenges remain—including limited funding, acaricide resistance, and poor infrastructure. Some researchers suggest incorporating indigenous knowledge, promoting tick-resistant breeds, and improving veterinary extension services as part of a more holistic approach (Moyo et al., 2022).

Tick Control Programs: Regular dipping programs, which involve treating cattle with acaricides to kill ticks, have been a traditional approach in Zimbabwe. However, challenges such as tick resistance to chemicals and environmental concerns have led to calls for alternative control methods, such as the use of biological control agents (Roe et al., 2020). Vaccines against certain tick-borne diseases, such as Anaplasma and Babesia, are available and should be integrated into cattle health management strategies in Murewa (Brady et al., 2016).Farmers are encouraged to implement good herd management practices, including rotational grazing, providing adequate nutrition, and managing cattle stress to reduce susceptibility to diseases.

Tick-borne diseases pose a serious threat to cattle production in Murewa District, Zimbabwe, leading to substantial economic losses in terms of reduced productivity, increased veterinary costs, and cattle mortality. The prevalence of these diseases is influenced by changing tick species distribution, inadequate tick control measures, and the high vulnerability of cattle to infection. Effective disease management, including tick control, vaccination, and improved herd management, is essential to reduce the impact of these diseases and improve the sustainability of cattle production in Murewa.

Chapter 3

Methodology

This chapter outlines the research methodology used to investigate the effects of tick-borne diseases (TBDs) on cattle production in Ward 23, Murewa District, Zimbabwe. The chapter presents the research design, study area, target population, data collection methods, sampling techniques, data analysis procedures, and ethical considerations. The aim of this chapter is to provide a clear explanation of how the data was gathered and analyzed to achieve the research objectives.

3.1 Research Design

This study follows a descriptive cross-sectional research design, which allows for the collection of data at a single point in time. The design is suitable for understanding the prevalence of tick-borne diseases, assessing their economic impact on cattle production, and identifying risk factors associated with transmission. A descriptive cross-sectional design helps in identifying patterns and associations within the study area, making it an appropriate choice for this research.

3.2 Study Area

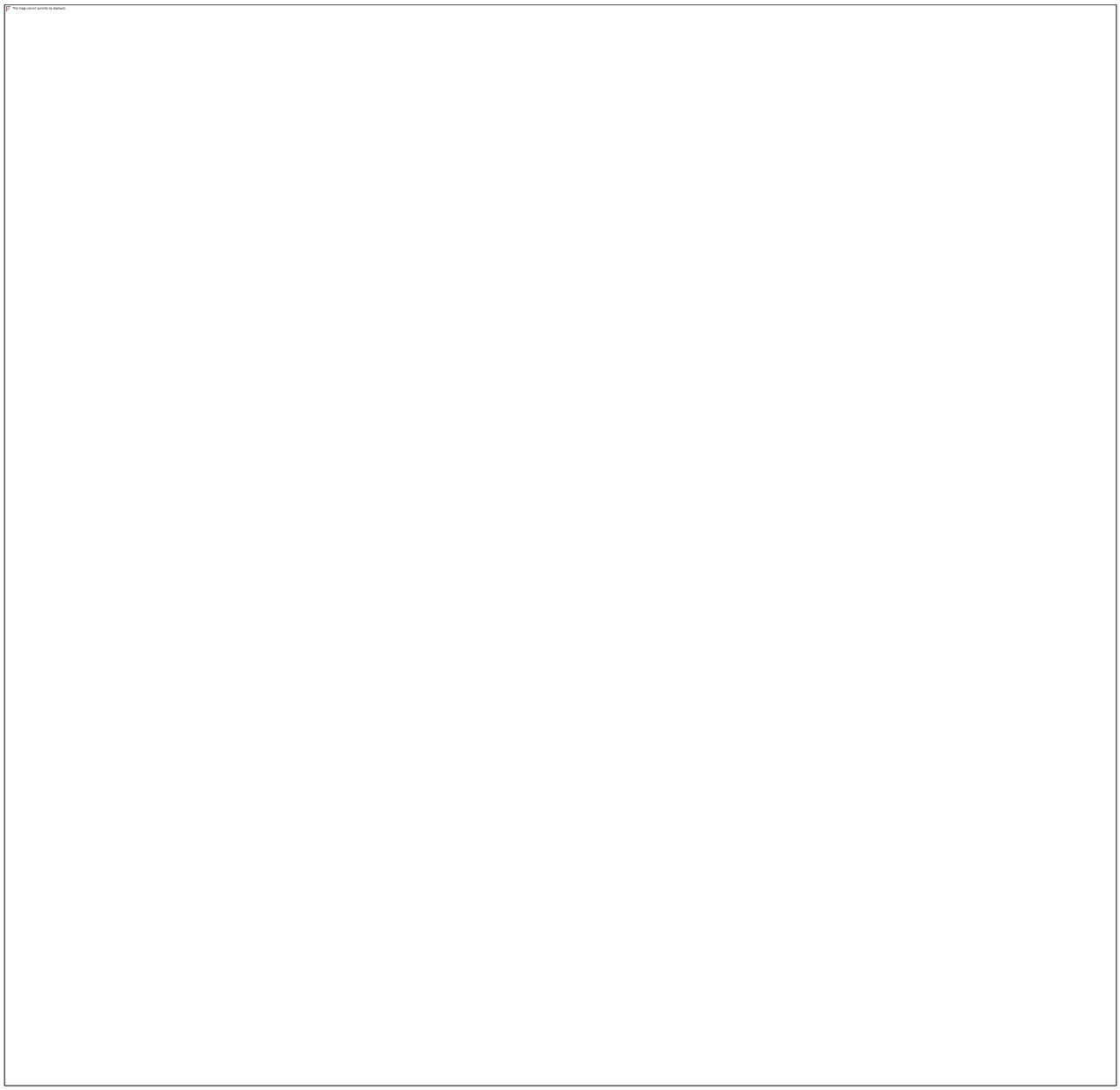

Figure 1 Map of Murewa district showing the study area

The research was conducted in Ward 23, Murewa District, located in Mashonaland East, Zimbabwe. This district is characterized by its agricultural-based economy, with livestock, especially cattle, being central to the livelihoods of the local smallholder farmers. Murewa is also known for its warm and humid climate, which creates favorable conditions for tick populations.

As such, tick-borne diseases are a significant issue affecting cattle health and productivity, making it an ideal location for this study. Murewa experiences a moderate rainfall pattern typical of the central part of Zimbabwe. The region receives an average annual rainfall of 600mm to 800mm. The rains occur mainly during the summer months (from November to March), and these periods are critical for the agricultural activities, including cattle grazing and crop production.

Temperature: The average temperatures in Murewa range from 20°C to 30°C during the hot season (October to March). During the cooler months (April to September), the temperatures can drop to between 10°C and 20°C. These fluctuating temperatures, combined with the presence of both dry and wet periods, significantly affect tick survival and proliferation, making tick-borne diseases a major concern for local livestock .Humidity: The area experiences moderate humidity, especially during the rainy season, which further enhances the breeding conditions for ticks and other pests that transmit tick-borne diseases

The vegetation in Murewa District falls under the Miombo woodland ecosystem, typical of Zimbabwe's central and northern regions. The vegetation is mostly characterized by the following types: Woodland Vegetation: Miombo woodlands dominate the region, consisting of a variety of trees such as Brachystegia species, Julbernardia species, and Isoberlinia species. These trees are deciduous, shedding their leaves in the dry season, which influences the grazing resources available for livestock. Grasslands: Alongside the woodlands, there are extensive areas of grassland that support grazing for cattle during the wet season. However, during the dry season, these grasslands dry out, reducing the availability of fodder for livestock, which can lead to increased susceptibility to tick-borne diseases? The vegetation in the region plays a crucial role in determining cattle grazing patterns and the exposure of livestock to ticks.

Murewa District, including Ward 23, is predominantly a communal farming area, meaning the land is primarily used by local smallholder farmers for subsistence agriculture and livestock production. In communal farming areas. Land is usually owned communally, with individuals having access to land based on local customary practices. Farmers in the area engage in mixed farming, growing crops such as maize, millet, and groundnuts, and raising livestock, particularly cattle, goats, and poultry. Cattle are highly valued as a source of income, cultural prestige, and a buffer against food insecurity.

While there are some commercial farms in the broader Murewa District, Ward 23 remains largely a communal farming area with limited access to formal commercial farming enterprises. This rural setting contributes to the prevalence of tick-borne diseases, as smallholder farmers often lack the resources and infrastructure to implement effective tick control measures, such as veterinary services and dipping facilities.

3.3 Target Population

The target population for this research includes:

Cattle owners in Ward 23, Murewa District, particularly smallholder farmers who rely on cattle for income, food, and as a source of manure for crop farming. These individuals are most impacted by tick-borne diseases, as these diseases directly affect their cattle's health, productivity, and overall livelihoods.

Veterinary professionals and agricultural extension officers who possess expert knowledge on tick-borne diseases and livestock management. These individuals will provide additional insights into the control measures and challenges related to tick-borne diseases.

3.4 Sampling Techniques

A multi-stage sampling approach was used to select the study participants:

Stage 1 – Selection of Villages: Ward 23 was divided into different villages. From these, five villages were randomly selected to represent the different agro-ecological zones within the ward. Stage 2 – Selection of Respondents: A stratified random sampling technique was employed to ensure a diverse representation of smallholder farmers. The sample was stratified by factors such as gender, age, and farm size. 20 farmers were selected from each of the five villages, resulting in a sample size of 100 farmers. Stage 3 – Key Informants- Purposive sampling was used to select key informants, such as veterinarians and extension officers, who have knowledge of tick control methods and the prevalence of tick-borne diseases in the area. These individuals provide expert insights into the nature of the problem and available control strategies.

3.5 Data Collection Methods

Data was collected using both quantitative and qualitative methods, allowing for a comprehensive understanding of the effects of tick-borne diseases on cattle production.

Surveys/Questionnaires: Structured questionnaires were administered to cattle farmers to gather quantitative data. The questionnaire covered the following topics:

Prevalence of tick-borne diseases in cattle, including symptoms, affected animals, and frequency of outbreaks .Economic impact of tick-borne diseases on cattle production, including veterinary costs, loss of livestock productivity, and related expenses. Control measures being used by farmers.

Key Informant Interviews: Semi-structured interviews were conducted with veterinarians, agricultural extension officers, and local agricultural officers. These interviews explored. Local knowledge and perceptions of tick-borne diseases and their transmission. The challenges and limitations of managing tick-borne diseases in the study area. The effectiveness of current prevention and control strategies.

Focus Group Discussions (FGDs): FGDs were held with groups of 10 cattle farmers in each of the selected villages. The discussions aimed to understand: Farmers' personal experiences with tick-borne diseases, including symptoms, treatments, and prevention. Community-level responses to managing tick infestations, including shared knowledge and practices. The economic consequences of tick-borne diseases and their effects on smallholder livelihoods.

Field Observations: The researcher conducted direct field observations to assess the cattle management practices, tick control measures (e.g., dipping facilities), and environmental conditions that may influence the spread of tick-borne diseases.

3.6 Data presentation and Analysis

3.6.1 Data presentation

The researcher will use tables, pie charts and graphs as analytical tools for laying out findings from the research and the only filled in responses from farmers will be taken into considerations for presentation

3.6.2 Tables

According to Gupta .(2008) a table is a logical listing of related quantitative data in vertical columns and horizontal rows of numbers with sufficient qualifying word phrases and / statements in the form of tittle, headings and notes to bring out clearly the full meaning of data and its origin.

3.6.3 Pie charts

A pie chart gives a reasonable impression of the breakdown of one data into categories. It is divided into proportional segments according to the share each has of the total value and it is used to show the proportion of occurrences of categories or values for one variable (Saunders Lewis and Thornhill, (2009).

The data was analyzed using both quantitative and qualitative techniques to address the research objectives.

Quantitative Data Analysis: The data from the surveys and questionnaires was analyzed using descriptive statistics, including frequencies, percentages, and means. These statistics helped to identify the prevalence of tick-borne diseases and the economic impacts on cattle production. Statistical software such as SPSS was used Qualitative Data Analysis: The qualitative data from key informant interviews and FGDs was analyzed using thematic analysis. This method involves identifying common themes, patterns, and categories from the interview transcripts and focus group discussions.

3.7 Ethical Considerations

Ethical considerations are critical to ensuring the integrity of the research and the protection of participants. The following ethical principles were adhered to:

Informed Consent: All participants were fully informed about the nature, purpose, and significance of the study. Written and verbal consent was obtained from participants prior to their involvement in the study. Confidentiality, All information provided by participants was kept confidential. Personal details were anonymized to protect the identity of respondents. Participation in the study was voluntary. Participants will have the right to withdraw from the study at any time

without facing any consequences. The study was approved by a relevant ethical review committee or institutional review board before data collection begins.

Chapter 4 Data collection

RESULTS

In total 120 questionnaires were prepared and given to farmers in ward 23 ,65 were handled out at the dip sites and 55 were given at the community gathering (dare).Of the 120 questionnaires distributed ,100 were successfully returned ,resulting in a response rate of 83.3%.The respondents included both male and female participating in the survey .This gender distribution allowed for a balanced represented of perspectives on the issue at hand.Most of the respondents in Murewa are male ,they constituted of 58.8% of the total farmers surveyed and women were 41.2% of the total farmers.

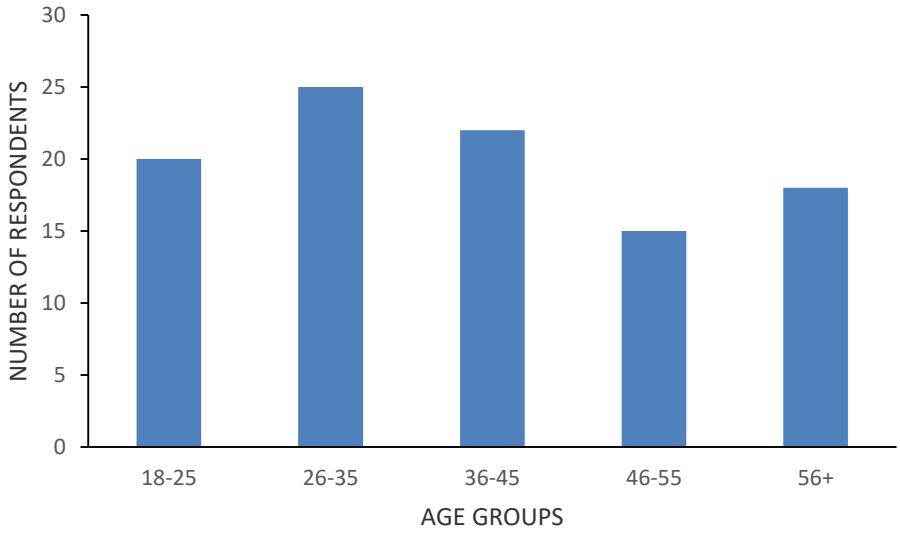

Figure 1 Showing distribution of respondents by age

distribution of the respondents reveals a diverse range of participants across different age groups. The largest proportion of respondents falls within the 26–35 age group, comprising 25% of the total sample. This is followed closely by the 36–45 age group, which accounts for 22%. Respondents aged 18–25 make up 20% of the sample, indicating a significant representation of younger adults. The 56 and above age group constitutes 18%, while the 46–55 age group is the least represented, comprising 15% of the total respondents. This distribution suggests a relatively balanced sample, with slightly higher participation among individuals in their late twenties to mid-thirties.

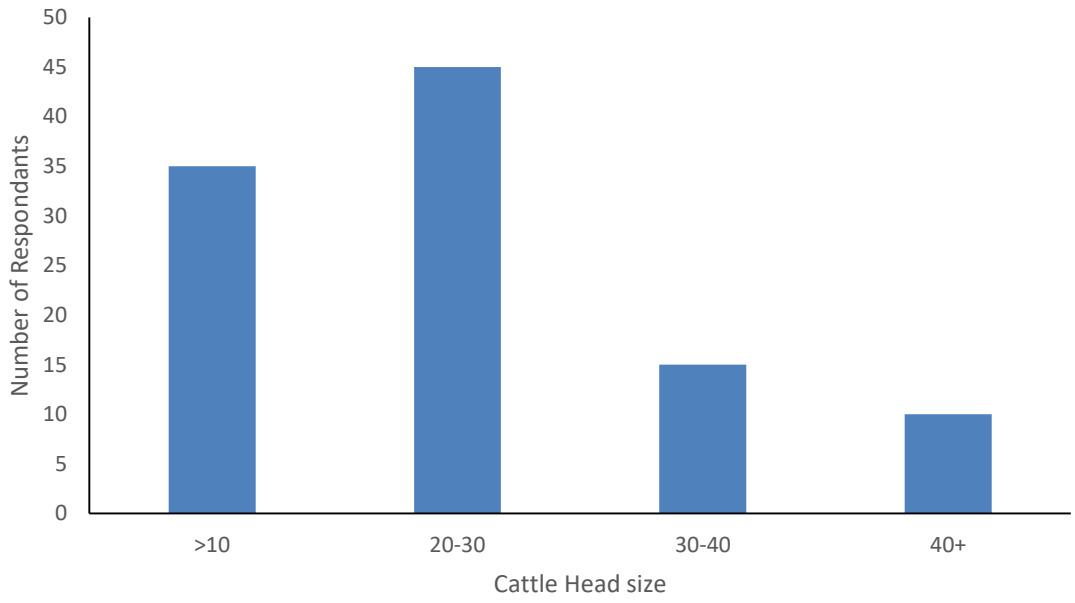

Figure 2 distribution of respondents by herd size

The majority of respondents reported keeping between 20 to 30 cattle, representing 45% of the total sample. This is followed by those who keep fewer than 10 cattle, accounting for 35%. A smaller proportion, 15%, maintain herds ranging from 30 to 40 cattle, while only 10% of respondents keep more than 40 cattle. These figures indicate that most respondents are small- to medium-scale cattle owners, with relatively few operating on a larger scale.

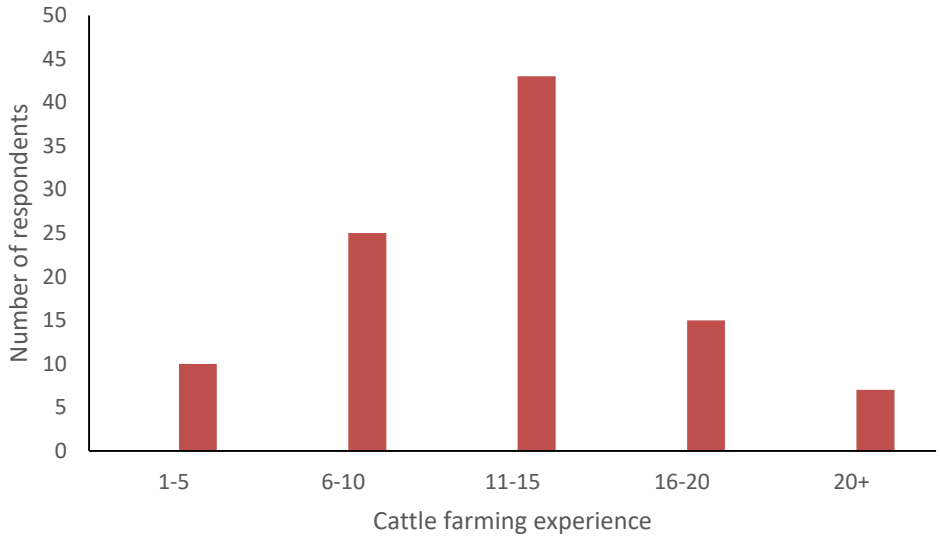

Figure 3 Cattle farming experience of respondents

The data shows that the largest group of respondents, 43%, have between 11 to 15 years of experience in cattle farming, indicating a strong presence of moderately experienced farmers. This is followed by 25% who have been involved in cattle farming for 6 to 10 years. Those with 16 to 20 years of experience make up 15%, while only 10% have 1 to 5 years of experience. The smallest group, 7%, consists of respondents with over 20 years of experience. Overall, the findings suggest that most participants have a considerable amount of experience in cattle farming, with relatively few being either new entrants or long-term veterans in the field.

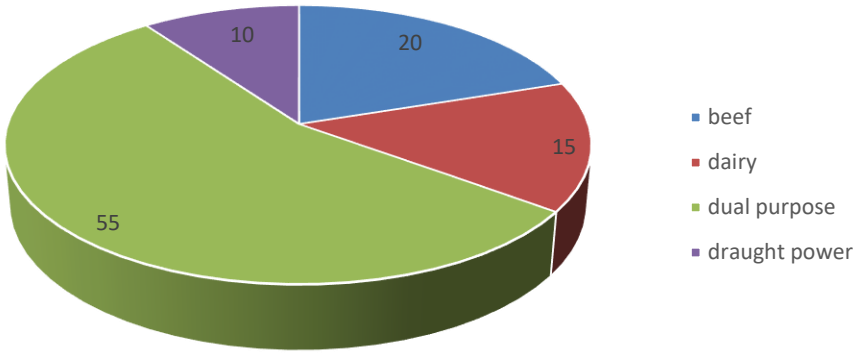

Figure 4 Showing purpose of keeping cattle

The primary purpose for keeping cattle among respondents is dual-purpose use, accounting for 55% of the sample. This group likely engages in both dairy and draught power activities or beef and draught power. The second most common purpose is for beef production, with 20% of respondents focusing on raising cattle for meat. A smaller proportion, 15%, keep cattle primarily for dairy production, while 10% use their cattle mainly for draught power. These figures suggest that the majority of respondents maintain cattle for multiple purposes, with a significant number also involved in beef production.

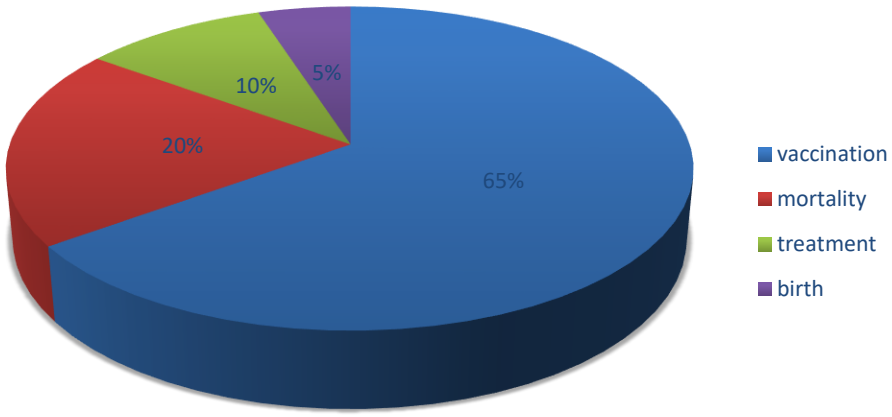

Figure 5 Showing records kept by farmers

The majority of respondents, 65%, maintain records related to vaccination, indicating a strong focus on animal health and disease prevention. Mortality records are kept by 20% of respondents, highlighting the importance of tracking livestock losses. A smaller proportion, 10%, keep treatment records, which may reflect the need for monitoring and managing livestock health on a case-by-case basis. Only 5% of respondents keep records related to births, suggesting that reproductive tracking is less prioritized compared to other aspects of cattle management. These figures demonstrate that the primary focus of record-keeping is on vaccination, followed by monitoring mortality and treatment.

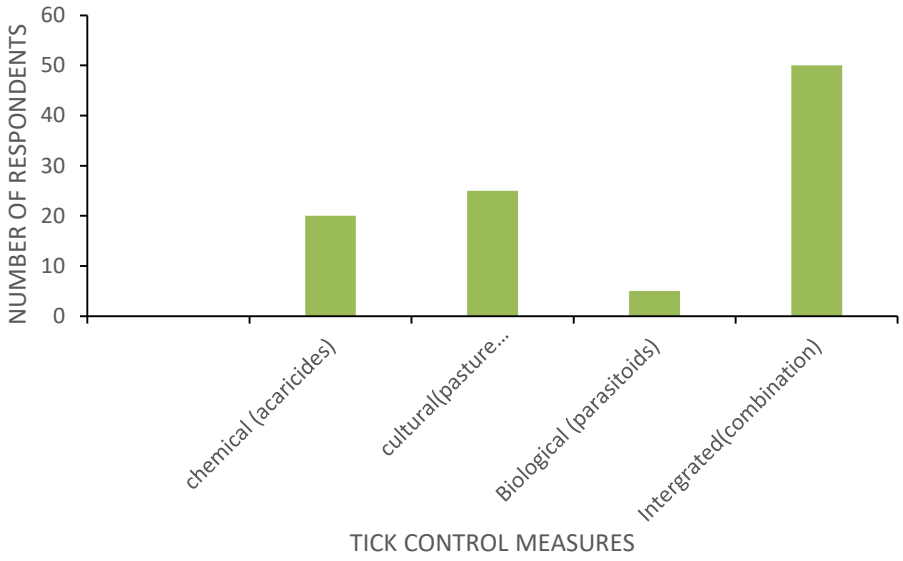

Figure 6 Showing tick control measures

The most commonly used tick control approach among respondents is an integrated combination of all available measures, reported by 50% of the participants. This suggests a comprehensive strategy aimed at effectively managing tick infestations. Cultural methods, such as pasture management, are employed by 25% of respondents, reflecting a reliance on traditional and sustainable practices. Chemical control using acaricides accounts for 20%, indicating moderate use of synthetic tick control products. Only 5% of respondents utilize biological control methods, suggesting limited adoption of environmentally friendly or natural alternatives. Overall, the data reflects a preference for integrated and cultural approaches Fig

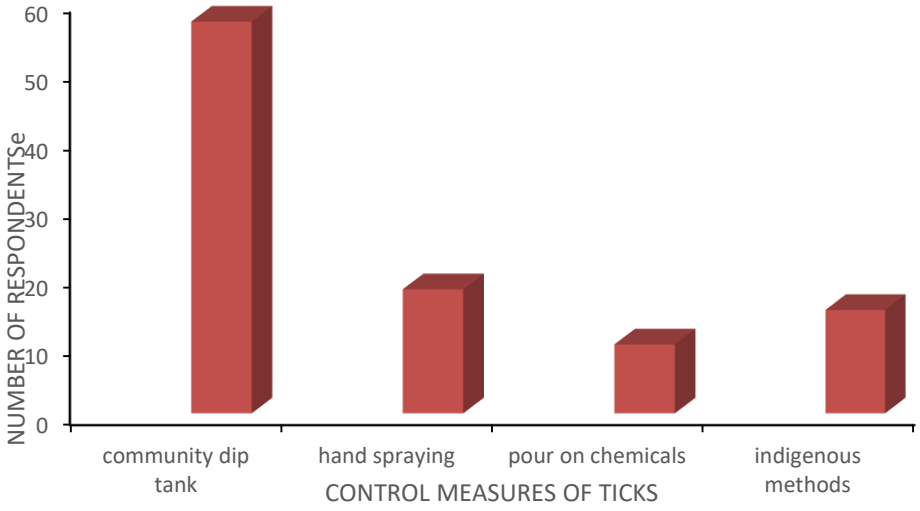

Figure 7 Showing control measures of ticks

The findings indicate that community dip tanks are the most commonly used method, cited by 57% of respondents. This is followed by hand spraying at 18%, indigenous methods at 15%, and pour-on chemicals at 10%. Dipping times

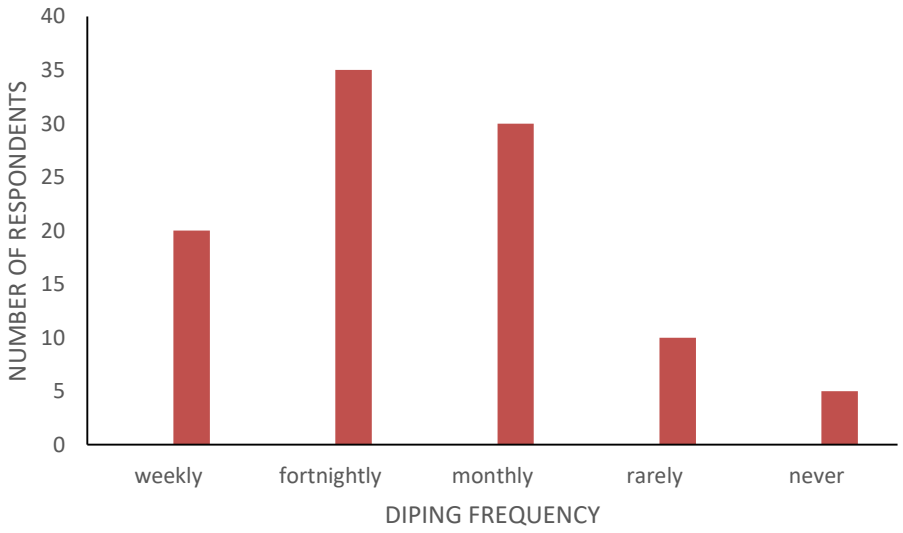

Figure 8 Showing distribution of dipping frequency

Approximately 20% of the farmers reported dipping their cattle weekly, while 35% practiced fortnightly dipping. A further 30% dipped their cattle monthly, whereas 10% of respondents dipped their cattle rarely. Notably, 5% of the farmers indicated that they never dip their cattle.

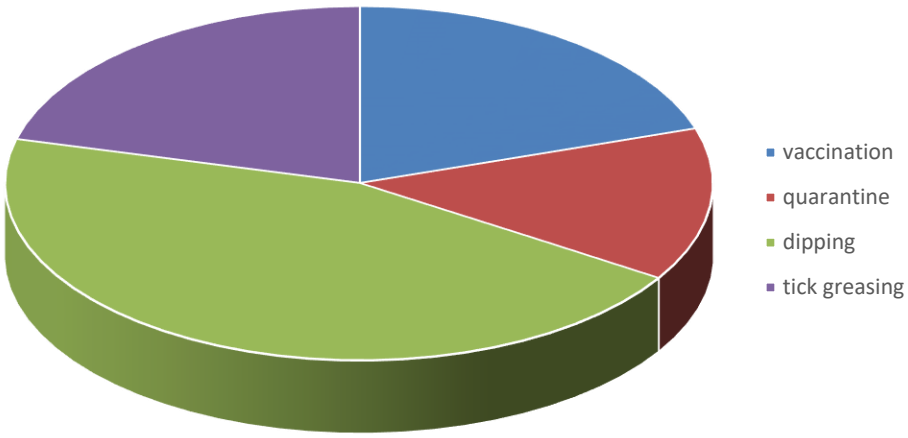

Figure 9 Showing distribution of biosecurity measures

The findings revealed that the most commonly implemented biosecurity practice was dipping with 45% of respondents utilizing this method to control external parasites such as ticks .Tick greasing as practiced by 21% of farmers typically as a localized method for individual animals. Vaccination ,a crucial preventive measure against infectious diseases , was reported by 20% of the respondents .The least practiced measure was quarantine with only 14% of farmers isolating new or sick animals before integrating them into the herd .These results highlight the varying levels of adoption and awareness of biosecurity practices among livestock keepers in the study area

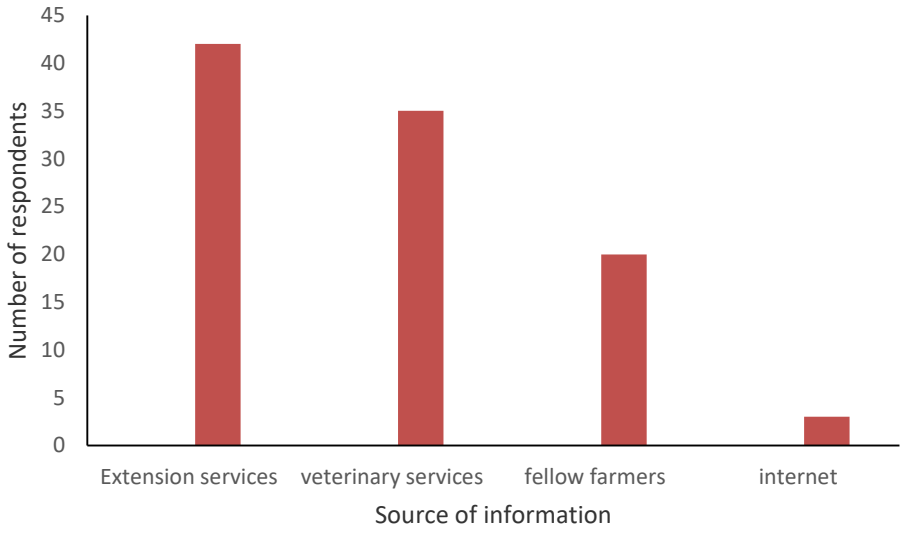

Figure 10 Showing distribution of source of information

Extension services are the most frequently utilized source of information and support among respondents, with 42% indicating reliance on them. Veterinary services follow closely, accounting for 35%, which highlights the importance of professional animal health care in cattle management. Fellow farmers are consulted by 20% of respondents, showing that peer-to-peer knowledge sharing still plays a significant role in the farming community. The internet, however, is the least used source at only 3%, suggesting limited access to or trust in digital platforms for livestock-related information. This distribution indicates a continued dependence on formal support systems, with minimal integration of modern digital tools.

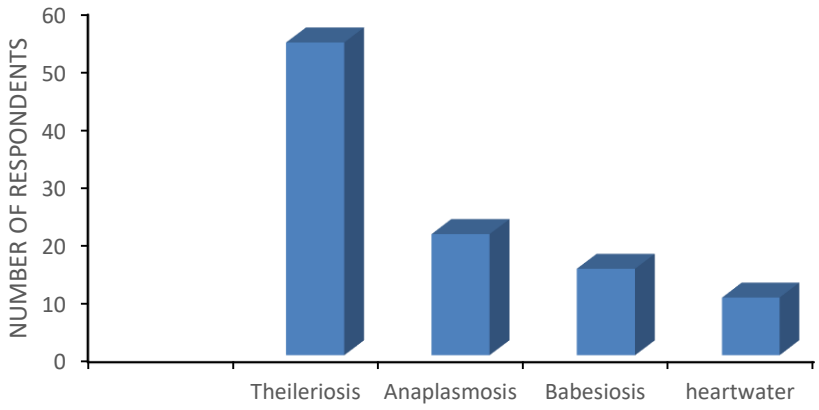

Figure 11 Showing distribution of tick borne diseases prevalence in Murewa

Theileriosis, also known as January disease, is the most prevalent tick-borne disease in Murewa District, reported by 54% of respondents. This high percentage highlights its significant impact on cattle health and productivity in the area. Anaplasmosis accounts for 21% of the reported cases, followed by babesiosis at 15%. Heart water is the least reported, with 10% of respondents identifying it as a concern. These findings indicate that while multiple tick-borne diseases affect the region, Theileriosis poses the greatest threat, necessitating targeted control and prevention strategies

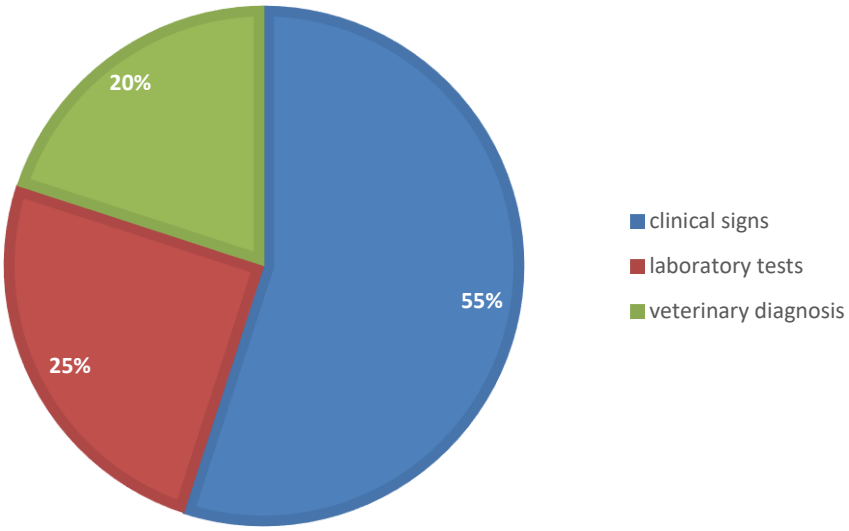

Figure 12 diagnosis of tick borne diseases by farmers

The majority of farmers in Murewa District diagnose livestock diseases based on clinical signs, with 55% relying on visible symptoms such as changes in behavior, appetite, or appearance. Laboratory diagnosis is used by 25% of respondents, reflecting moderate access to or utilization of diagnostic facilities. Meanwhile, 20% depend on veterinary professionals for disease diagnosis. This distribution suggests that while some farmers seek expert or scientific input, most still rely on their own observations, which may affect the accuracy and timeliness of disease management.

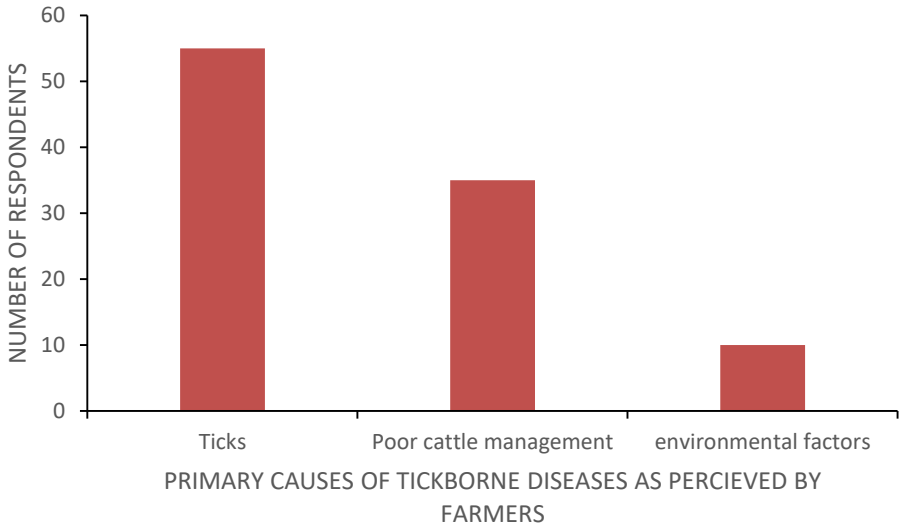

Figure 13 Showing primary causes of tick borne diseases

Ticks are identified by the majority of respondents (55%) as the primary cause of tick-borne diseases, underscoring their direct role in disease transmission. Poor cattle management is cited by 35% of respondents, indicating that inadequate practices such as irregular tick control, poor housing, or feeding may contribute significantly to disease outbreaks. Environmental factors, such as climate and vegetation, are considered by 10% of the participants to influence disease occurrence. These perceptions highlight the need for a multifaceted approach to disease prevention, focusing on both vector control and improved management practices.

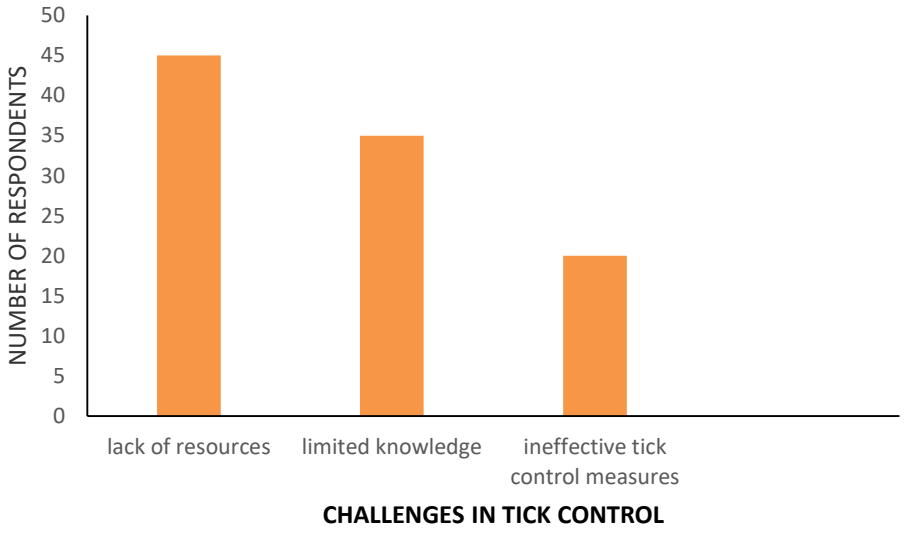

Figure 14 Showing challenges in controlling tick borne diseases

The most significant challenge reported by respondents in controlling tick-borne diseases is the lack of resources, accounting for 45%. This includes limited access to veterinary drugs, equipment, and financial constraints. Limited knowledge on disease prevention and control is the second major challenge, cited by 35% of respondents, suggesting a need for more education and training among cattle farmers. Ineffective tick control measures are mentioned by 20%, indicating that some farmers struggle with the application or reliability of current control methods. Overall, these challenges highlight the importance of improving resource availability, enhancing farmer education, and promoting effective tick management strategies.

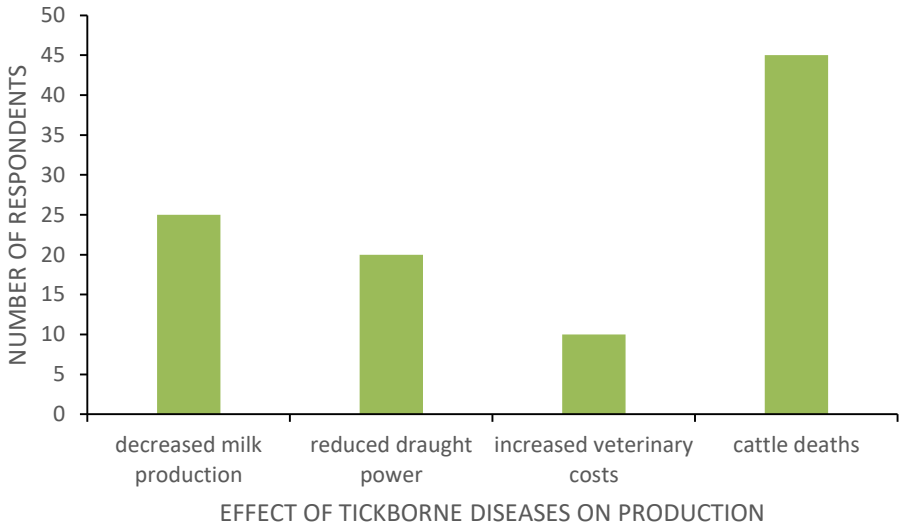

Figure 15 Showing effects of tick borne diseases on production

The study sought to determine the specific impacts of tick-borne diseases on cattle productivity in Murewa District. Respondents reported a range of effects associated with these diseases. The most commonly reported impact was cattle deaths, cited by 45% of respondents. This was followed by decreased milk production (25%), reduced draught power (20%), and increased veterinary costs (10%).

Chapter 5

DISCUSSION

5.1 DEMOGRAPHIC information

The study sample comprised 58% male and 42% female respondents. This male-dominated participation aligns with trends observed in similar studies within Zimbabwe, where male farmers often have greater access to resources and decision-making power in livestock management. For instance, a study in Bindura district found that male farmers were more likely to engage in regular dipping practices, potentially due to better access to resources and information (Sibanda et al., 2019). This gender disparity may influence the implementation and effectiveness of tick-borne disease control measures, as male farmers might have more opportunities to attend training sessions and access veterinary services (Chavunduka & Chideme, 2021).

The educational background of respondents was diverse: 15% had no formal education, 21% had primary education, 49% had secondary education, and 15% had tertiary education. The predominance of secondary education suggests a moderately literate population, which is crucial for understanding and implementing disease control strategies. However, the 15% with no formal education may face challenges in comprehending technical information related to tick-borne diseases and their management. Previous studies have highlighted that farmers with higher education levels tend to adopt better livestock management practices, including effective tick control measures (Moyo & Ncube, 2020; Chikodzi et al., 2018).

The age distribution was as follows: 20% were aged 18–25 years, 25% were 26–35 years, 22% were 36–45 years, 15% were 46–55 years, and 18% were 56 years and above. The majority of respondents were within the economically active age groups (18–45 years), which is advantageous for the adoption of new technologies and practices. Younger farmers, in particular, may be more receptive to training and innovation in tick control methods. Conversely, older farmers might possess traditional knowledge but may be less inclined to adopt new practices (Mushunje & Chikozho, 2019).

The demographic profile of the respondents suggests a population that is moderately educated and predominantly male, with a significant proportion in the economically active age groups. These

characteristics can influence the adoption of tick control measures. For instance, the availability of training and resources tailored to these demographics can enhance the effectiveness of tick-borne disease management strategies. Additionally, understanding the gender dynamics and age-related preferences can inform the design of more inclusive and effective interventions (Moyo & Ncube, 2020).

The majority of respondents (45%) owned between 20–30 cattle, followed by 30–40 cattle (15%), over 40 cattle (10%), and fewer than 10 cattle (30%). This distribution suggests that cattle farming in Murewa District is predominantly small to medium-scale, which is typical in communal areas of Zimbabwe where access to land and resources may limit large-scale operations. This pattern is consistent with other studies in similar rural areas of Zimbabwe, where communal farmers face challenges related to land size and resources that influence the scale of their operations (Mushunje & Chikozho, 2019; Chikodzi et al., 2018).

5.2 Purpose for keeping cattle

The primary purposes for keeping cattle were dual-purpose (beef and draught power) at 55%, followed by beef production (20%), dairy (15%), and draught power alone (10%). This aligns with findings from the FAO, which highlight that smallholder farmers in Zimbabwe often keep cattle for multiple purposes, including meat, milk, and draught power, due to economic constraints and the multifunctional role of cattle in rural livelihoods (FAO, 2020). The multifunctionality of cattle provides a safety net for farmers and contributes to their resilience, particularly in rural and communal settings where access to other resources is limited (Moyo et al., 2021).

5.3 Records kept

Record-keeping among respondents was as follows: vaccination (65%), mortality (20%), treatment (10%), and birth (5%). The high percentage of farmers keeping vaccination records indicates a proactive approach to disease management, which is crucial for controlling tick-borne diseases (TBDs). However, the lower percentages for treatment and birth records suggest that there may be gaps in tracking other important aspects of livestock health, which could impact the effectiveness of tick control strategies. Previous studies have shown that proper record-keeping is vital for

monitoring livestock health and improving disease control (Moyo & Ncube, 2020; Moyo et al., 2021).

5.3 Control measures

Only 20% of respondents reported using chemical acaricides for tick control. This low adoption rate may be due to factors such as the high cost of acaricides, inconsistent supply, and potential resistance development (Chikodzi et al., 2018). These challenges highlight the need for alternative or complementary control methods, particularly in resource-limited settings where the use of chemical control may not be sustainable in the long term (Sibanda et al., 2019).

A significant portion of respondents (25%) relied on cultural practices, such as pasture rotation and traditional dipping methods, for tick control. These methods are often employed due to their low cost and accessibility, but their effectiveness can be variable and may not provide comprehensive control of tick populations. Cultural practices have been widely recognized in similar studies as a common means of tick control, though they are sometimes less effective when compared to more modern interventions (Sibanda et al., 2019).

Only 5% of respondents utilized biological control methods, such as the use of natural predators or ethnoveterinary plants. While these methods are environmentally friendly and cost-effective, their adoption is limited by factors such as lack of awareness, knowledge, and research into their efficacy. Previous research has highlighted the potential of biological control methods, but also pointed out the need for more education and scientific validation to encourage wider adoption (Moyo et al., 2021).

The majority of respondents (50%) employed an integrated approach, combining chemical, cultural, and biological methods. Integrated tick management strategies are recommended for sustainable control of tick-borne diseases (TBDs), as they can reduce reliance on chemicals and mitigate issues related to resistance. Studies have shown that integrated approaches improve long-term effectiveness in tick control and help manage resistance to acaricides (Sibanda et al., 2019; Moyo et al., 2021).

The findings revealed that the majority of farmers (57%) in Murewa District rely on community dip tanks as their primary tick control method. This reflects the continued dependence on government-supported infrastructure for managing tick infestations. However, this reliance presents risks in cases where dip tanks are not functional or where acaricides are unavailable. These observations align with Moyo et al. (2015), who noted that the effectiveness of communal dipping is highly dependent on consistent chemical supply and infrastructure maintenance.

The use of hand spraying (18%) and pour-on chemicals (10%) indicates that some farmers are adopting private methods of tick control, which may offer more flexibility but are often constrained by cost and labor requirements (Chikerema et al., 2013). Meanwhile, 15% of respondents reported using indigenous methods, such as herbal preparations and manual removal of ticks. This demonstrates the role of traditional knowledge in animal health practices, especially in contexts where access to veterinary services is limited. As noted by Mapiye et al. (2009), although such methods can be helpful, they are not always effective for controlling severe tick infestations or preventing diseases like theileriosis.

These results support the conclusion that while farmers are generally aware of tick control methods, the effectiveness and consistency of application vary widely depending on access to resources, infrastructure, and information. Strengthening veterinary extension services and improving access to affordable tick control solutions could greatly reduce the burden of tick-borne diseases.

The study established that farmers in Murewa District use varied dipping schedules as a control measure against tick-borne diseases, with 20% dipping weekly, 35% fortnightly, 30% monthly, 10% rarely, and 5% never dipping their cattle. These findings suggest a significant portion of the farming community is not adhering to the recommended dipping intervals, which can compromise the effectiveness of tick control programs.

According to Zimbabwe's Department of Veterinary Services (DVS), cattle should be dipped weekly during the rainy season and at least fortnightly during the dry season to effectively break the tick life cycle and reduce transmission of diseases such as theileriosis (January disease), anaplasmosis, and babesiosis. However, the data from Murewa show that only 20% of farmers meet the weekly standard, while a combined 45% (monthly, rarely, or never) fall below recommended practices.

This irregular dipping is consistent with national trends reported by Moyo et al. (2015), who observed that dipping compliance in many communal areas is often disrupted by shortages of acaricides, water, or operational dip tanks. The World Organization for Animal Health (OIE) also notes that infrequent or inconsistent dipping can lead to increased tick resistance and outbreaks of deadly tick-borne diseases.

The 5% of farmers who reported never dipping their cattle are particularly vulnerable, as untreated herds can serve as reservoirs for ticks, undermining communal disease control efforts. Furthermore, monthly and rare dippers (40%) are at risk of sub-clinical infections in their herds, leading to reduced productivity even in the absence of visible symptoms.

5.4 Source of information

The study found that farmers in Murewa District primarily relied on extension services (42%) as their main source of information on tick control. This is consistent with findings in other regions, where extension services play a key role in disseminating knowledge about livestock management practices (Kawongolo et al., 2020). Extension workers are often a critical link between farmers and technical knowledge, providing practical advice on managing diseases like tick-borne diseases (TBDs).

Following extension services, veterinary services were the second most common source of information, accounting for 35% of respondents. Veterinary services are crucial for providing expert guidance on diagnosing and managing tick-borne diseases. However, the relatively lower percentage of farmers using veterinary services suggests potential gaps in access or affordability, which may limit the effectiveness of tick control measures (Hassan et al., 2022).

Fellow farmers were cited by 20% of respondents as a source of information. This highlights the importance of farmer-to-farmer knowledge transfer, especially in rural areas where formal sources may be scarce. However, reliance on peer knowledge can also result in the perpetuation of suboptimal practices, especially if the information shared is based on personal experience rather than scientific evidence (Mafongoya et al., 2021).

The least common source of information was the internet, with only 3% of respondents turning to online resources for tick control advice. This low usage reflects broader challenges in rural areas where internet access is limited and digital literacy may not be widespread. This finding suggests a missed opportunity for leveraging technology to improve livestock management practices, especially given the growing role of digital platforms in agricultural knowledge dissemination (Munyati & Chikozho, 2021).

5.5 Common tick borne diseases

The reported prevalence of tick-borne diseases (TBDs) among cattle in Murewa District reveals a concerning situation for livestock farmers in the region. The most prevalent TBD was Theileriosis, reported in 54% of cattle, followed by Anaplasmosis (21%), Babesiosis (15%), and Heartwater (10%).

The high prevalence of Theileriosis is consistent with findings in other parts of Zimbabwe, where Theileriosis remains one of the most widespread and damaging tick-borne diseases affecting cattle (Mukamuri et al., 2020). The impact of Theileriosis on cattle production can be significant, leading to high morbidity and mortality rates, and reducing productivity due to poor weight gain and decreased fertility (Mupfiga & Ramatsetse, 2019).

Anaplasmosis (21%) and Babesiosis (15%) are also major concerns, although they are less widespread than Theileriosis. The overlap of these diseases in the same cattle population highlights the compounded challenge of managing multiple tick-borne diseases concurrently, often requiring a multifaceted approach to control ticks and the pathogens they transmit (Mugabe et al., 2021).

Heartwater, affecting 10% of the cattle, is less common in Zimbabwe but still represents a potential risk, especially in areas with high tick populations. Heartwater is caused by the bacterium Ehrlichia ruminantium and is transmitted by Amblyomma ticks, which are less common than the Rhipicephalus ticks that transmit other diseases such as Theileriosis and Babesiosis. The presence of Heartwater may indicate regional variability in tick species and disease transmission (Chitambo et al., 2022).

The sources of information on tick control in Murewa District are diverse, but there is clear evidence that farmers heavily rely on extension and veterinary services for guidance. The

prevalence of tick-borne diseases in the district, particularly Theileriosis, underscores the need for targeted interventions. Increasing access to veterinary services and improving farmers' use of technology for information dissemination could play a significant role in reducing the impact of tick-borne diseases. Additionally, strengthening the role of extension services and fostering farmer-to-farmer knowledge exchange could help bridge gaps in tick control practices and disease management.

5.6 Methods of disease diagnosis by farmers

The methods used by farmers in Murewa District to diagnose tick-borne diseases (TBDs) reflect a reliance on observable symptoms rather than scientific or veterinary-based diagnostic tools. Clinical signs were the most commonly reported diagnostic method, with 55% of farmers relying on visual indicators such as fever, lethargy, and reduced milk production to identify TBDs. This approach aligns with previous studies in rural agricultural communities, where farmers often rely on their experience and observations to diagnose livestock diseases (Sengwe & Gudyanga, 2020). While recognizing clinical signs can be an important first step, it may lead to misdiagnosis or delayed treatment, especially given that symptoms of different TBDs can overlap.

Only 25% of respondents used laboratory tests for confirming TBDs. This relatively low percentage indicates potential barriers to accessing veterinary diagnostic services, including cost, availability, and transportation challenges, which are common in rural areas of Zimbabwe (Kawongolo et al., 2020). Laboratory diagnostics are essential for accurate disease identification and are critical for effective disease management and control. However, the low adoption of this method suggests the need for more accessible and affordable diagnostic tools or support for farmers to facilitate proper diagnosis.

A smaller proportion of farmers (20%) relied on veterinary diagnoses, which is ideal for accurate and timely disease identification. However, this percentage reflects an underutilization of veterinary expertise, possibly due to factors such as the distance to veterinary services, high consultation fees, or limited availability of veterinary professionals in the area (Mupfiga & Ramatsetse, 2019). This highlights the need to enhance access to veterinary services, particularly in remote regions.

5.7 Perceived primary causes of tick borne diseases

Farmers in Murewa District predominantly attributed tick-borne diseases to ticks (55%), which is consistent with their understanding of the primary vector for TBDs. This finding indicates that farmers are aware of the role of ticks in transmitting diseases, which is an important first step in controlling tick-borne diseases. However, a more nuanced understanding of tick biology, vector control strategies, and the role of ticks in disease transmission could enhance farmers' control efforts (Mugabe et al., 2021).

In addition to ticks, poor cattle management was identified by 35% of farmers as a contributing factor to the prevalence of TBDs. This may include factors such as inadequate nutrition, poor pasture management, and failure to implement regular tick control measures like dipping. This suggests that farmers may recognize the importance of management practices but may need further education on how to integrate better management strategies with tick control measures to reduce the incidence of TBDs (Sibanda et al., 2021).

Only 10% of respondents identified environmental factors as a cause of TBDs. This lower percentage may indicate a lack of awareness about the role of environmental factors such as climate, temperature, and humidity in influencing tick populations and disease transmission. Climate change, for example, could alter tick distribution patterns, potentially increasing the risk of TBDs. Increasing farmers' awareness of environmental influences on tick populations could contribute to more effective and proactive disease management strategies (Munyati & Chikozho, 2021).

The diagnostic methods used by farmers in Murewa District reflect a reliance on clinical observation, with limited use of laboratory tests or veterinary diagnoses. This highlights the need for improved access to veterinary services and diagnostic tools, which are essential for accurate and timely treatment of tick-borne diseases. Furthermore, while farmers recognize ticks as the primary cause of TBDs, there is also an acknowledgment of the role of poor cattle management. This suggests that a holistic approach that combines improved management practices with effective tick control measures could greatly enhance the control of tick-borne diseases in the region.

Farmers in Murewa District identified several significant challenges in controlling tick-borne diseases (TBDs), which are critical to understanding the barriers to effective management. The primary challenges were lack of resources (45%), limited knowledge (35%), and ineffective tick control measures (20%). These challenges point to a complex interplay of economic, educational, and technical factors that need to be addressed to improve tick management strategies.

5.8 Challenges in controlling tick borne diseases

A substantial 45% of farmers identified lack of resources as the primary challenge in controlling TBDs. This is a common issue in communal farming areas, where access to financial resources, veterinary services, and modern tick control products is often limited (Sibanda et al., 2021). The high cost of acaricides, limited availability of veterinary services, and inadequate access to appropriate tick control equipment, such as dipping facilities, make it difficult for farmers to implement effective control measures. Additionally, poor infrastructure and transportation challenges in rural areas may further hinder access to essential resources. The lack of resources also affects the ability of farmers to invest in alternative control strategies, such as integrated pest management or preventive health measures, ultimately leading to increased susceptibility to tick-borne diseases. Addressing resource constraints through government support, subsidies for tick control products, and improved infrastructure could play a key role in enhancing tick management efforts in the district.

Limited knowledge was identified as the second most significant challenge by 35% of farmers. While many farmers are aware of ticks as vectors of disease, their understanding of the full range of tick control measures and disease management strategies appears to be limited. This gap in knowledge can be attributed to insufficient training, limited access to extension services, and a reliance on traditional methods, which may not be entirely effective. The low percentage of farmers utilizing laboratory tests (25%) or seeking veterinary diagnoses (20%) also suggests that farmers may not fully understand the importance of accurate diagnosis or the benefits of modern, evidence-based control strategies. Increasing access to education and extension services, and providing farmers with up-to-date information on tick biology, disease transmission, and effective control

methods, would be critical in improving knowledge and practices in tick-borne disease management (Mugabe et al., 2021). Moreover, training farmers on the importance of an integrated approach to tick control could improve their overall management practices.

Twenty percent of respondents pointed out ineffective tick control measures as a key challenge. Despite the use of chemical, cultural, and biological control methods, farmers reported that these measures were not always effective. Factors such as the development of acaricide resistance, inadequate application of control measures, and the inconsistent use of tick management practices contributed to this issue. For instance, although 65% of farmers kept vaccination records, only 20% used chemical acaricides regularly, suggesting that even those who attempt chemical control may face barriers such as inconsistent access to products or lack of knowledge about proper application (Sengwe & Gudyanga, 2020).

The reliance on traditional methods like pasture rotation and dipping (25%) could also be less effective if not implemented consistently or appropriately. In addition, the low adoption of biological control methods (5%) reflects limited awareness and research on environmentally sustainable and cost-effective alternatives. Strengthening the effectiveness of tick control measures may require a more integrated approach that combines modern chemical, cultural, and biological control strategies with a focus on consistent and appropriate application, as well as continuous monitoring for tick resistance (Kawongolo et al., 2020)

The challenges in controlling tick-borne diseases in Murewa District are multifaceted, involving a combination of resource limitations, knowledge gaps, and the inefficacy of current control measures. The primary challenge, identified by nearly half of the farmers, is the lack of resources, which directly affects their ability to access and implement effective tick control methods. Limited knowledge among farmers further exacerbates the problem, as many are unaware of the most effective and modern disease management practices. Additionally, ineffective control measures, partly due to inconsistent implementation and resistance to chemicals, underscore the need for a more integrated and sustainable approach to tick management. Addressing these challenges requires a comprehensive strategy that includes resource mobilization, improved access to veterinary services, better training programs, and the promotion of integrated tick management practices.

The farm management practices and biosecurity measures adopted by farmers in Murewa District reflect a mix of traditional and modern approaches to tick control and disease prevention. The most common practices reported were dipping (45%), tick greasing (21%), vaccination (20%), and quarantine (14%). These measures aim to reduce the incidence of tick-borne diseases (TBDs) and protect the health of cattle, but the adoption rates and effectiveness of these practices highlight both strengths and areas for improvement in biosecurity strategies.

The practice of dipping was the most widely adopted, with 45% of farmers using it as a primary tick control method. Dipping is a traditional and widely recommended practice for tick management, involving the immersion of cattle in acaricide solutions to eliminate ticks. It is a cost-effective method for controlling tick populations when done properly, and it can reduce the transmission of tick-borne diseases. However, the success of dipping can be influenced by various factors, including the correct use of acaricides, frequency of dipping, and the infrastructure available for such practices.

Inadequate dipping facilities or inconsistent dipping schedules could limit the effectiveness of this practice. The widespread use of dipping indicates that farmers are aware of its importance, but it may also suggest that they rely heavily on chemical methods without fully integrating other complementary strategies (Moyo et al., 2015; Munyua et al., 2018).

Tick greasing, reported by 21% of respondents, is another commonly used practice in tick management. This involves the application of grease or oil-based substances to the cattle, which can suffocate or repel ticks. While this practice is low-cost and easily accessible, its effectiveness can vary. Greasing may only target visible ticks and might not address ticks that are less accessible or in more advanced stages of development. Additionally, this practice may not be sufficient as a standalone tick control measure, especially in high tick challenge areas. However, it is still a valuable tool when combined with other management strategies, particularly in the absence of more expensive acaricide-based treatments (Chigusa & Mtetwa, 2019; Gukurume et al., 2017).

Vaccination against tick-borne diseases was reported by 20% of farmers, making it one of the less commonly employed biosecurity measures. Vaccination is an essential tool in preventing diseases like Theileriosis and Anaplasmosis, which are transmitted by ticks. Despite its importance, the relatively low adoption of vaccination may be due to factors such as the cost of vaccines, limited

access to veterinary services, and a lack of awareness about the benefits of vaccination. Increasing the availability of vaccines and providing training to farmers on the importance of vaccination could improve the overall health and productivity of cattle, reducing the burden of tick-borne diseases (Chitambo et al., 2020; Mushonga et al., 2021).

Quarantine practices, reported by 14% of farmers, involve isolating newly introduced or sick cattle to prevent the spread of disease to healthy animals. This is a critical biosecurity measure, especially in preventing the introduction of new diseases to the herd. However, quarantine practices may not be as widely adopted due to limited space, lack of knowledge, or logistical constraints in rural farming settings. Additionally, some farmers may prioritize other practices, such as dipping or tick greasing, over quarantine due to perceived urgency or resource limitations. Promoting better understanding of quarantine's role in disease prevention and offering support for its implementation could improve biosecurity and reduce disease transmission within herds (FAO, 2017; Phiri et al., 2018).

The farm management practices and biosecurity measures reported by farmers in Murewa District indicate a blend of traditional and modern approaches to tick control. While practices like dipping and tick greasing are commonly used, their effectiveness could be enhanced through better integration of vaccination and quarantine measures. The relatively low adoption of vaccination and quarantine suggests the need for increased awareness and access to veterinary services, as well as better infrastructure to support these measures. For sustainable tick management and disease prevention, it is crucial to promote integrated biosecurity strategies that combine chemical, biological, and management practices (Chigusa & Mtetwa, 2019; Moyo et al., 2015; Phiri et al., 2018).

5.9 Effects on production

The high percentage of cattle deaths is a significant concern and is consistent with findings by the Food and Agriculture Organization (FAO), which reported that theileriosis (commonly known as January disease) alone accounted for thousands of cattle deaths in Zimbabwe during recent outbreaks (FAO, 2022). These losses directly undermine rural livelihoods, as cattle are often a primary source of income, food, and agricultural labour. TBD cause substantial cattle losses,

severe enough to wipe out nearly half of a farmer's herd causing thousands of dollars in lost capital per farmer. Respondents reported that they lost more than 9 cattle per herd ,each head of cattle is valued at $300 (typical local market value , the values increases depending with the type of breed and stage of growth .Loss per farmer is estimated to be $2700 ,this loss directly affects the farmer's capital ,breeding stock and ability to generate income.

Milk production dropped (25%) affecting both household nutrition and income, especially among smallholder dairy farmers. According to Mapiye et al. (2009), tick-borne infections such as anaplasmosis and babesiosis reduce milk yield due to fever, loss of appetite, physiological stress from tick infestations, including anemia and general systemic weakness in affected cattle contribute to this decline. TBD damage leads to damage to red blood cells reduces oxygen transport, affecting tissue function, including the mammary glands. Some pathogens also directly cause mastitis, further reducing milk yield and quality.

In smallholder dairy systems in Zimbabwe a healthy indigenous or crossbred cow typically produces an average of 8-12 litres of milk per day under good management (FAO, 2022)In Murewa district farmers reported that they get an average of 10litres of milk per day However ,farmers affected by TBD reported an average decline of 25% in milk yield ,reducing dairy output to 7.5 litres .This represents a loss of 75 litres per cow per month translating to an income loss of $75 per cow since the milk is sold a $1 per I litre for a farmer with five milking cows. Over a year, this equates to $4500 a significant economic setback for small holder households that depend on milk for both nutrition and income.

Reduced draught power (20%) also represents a major setback for communal farmers who depend on cattle for land preparation. Tick-borne diseases significantly impair the physical capacity of cattle used for draught power in Murewa District. Diseases such as theileriosis (January disease), anaplasmosis, and babesiosis cause symptoms including fever, anemia, weight loss, and joint pain, which directly reduce the strength and stamina of affected animals. In this study, 20% of farmers reported a noticeable reduction in the ability of their animals to perform tasks such as ploughing and cart transport.

In a typical smallholder system in Murewa, oxen are the primary source of draught power used for land preparation, particularly before the onset of the rainy season. When one or both animals in a pair become ill, the result is a 50% or more reduction in field work efficiency. This has serious consequences in a region where farming is time-sensitive and largely rain-fed. A delay in ploughing and planting by even one or two weeks can result in. Lower germination rates due to missed optimal planting windows, reduced harvests, and a decline in food security and household income.

To illustrate, a farmer with a pair of oxen might normally plough 0.5 hectares per day. With reduced draught power, this may fall to 0.25 hectares/day. Over a 2-hectare field, this could double the time needed from 4 to 8 days, increasing labor pressure during peak seasons. Some farmers attempt to compensate by hiring tractor services, but this comes at a high cost—typically $60–$80 per hectare—which is unaffordable for many communal farmers. One farmer in Murewa said "When my ox got sick from January disease, I couldn't plough in time. I had to borrow a neighbor's team or hire a tractor. That set me back by two weeks and cost me $120 I didn't have." – Farmer, Ward 14, Murewa. Reduced draught power increases the cost of production, delays farm operations, and reduces crop productivity, further entrenching poverty in livestock-dependent communities.

Although increased veterinary costs (10%) were the least cited, they still represent a financial burden, particularly for resource-limited farmers who must purchase acaricides or seek veterinary care. These costs may discourage consistent tick control, creating a vicious cycle of reinfection and economic loss.

Overall, the results clearly demonstrate that TBDs negatively affect multiple aspects of cattle production, threatening food security, income, and labor efficiency in the district. Addressing these issues requ Prior to frequent outbreaks of TBDs, farmers typically spent an average of $15–$20 per month on basic animal health needs, mainly for routine dipping. However, during and after outbreaks, this figure rises sharply to $30–$50 per month, depending on the size of the herd and severity of infection. This equates to an annual increase of $180–$360 per household, a significant

burden in a district where most smallholder farmers operate on very tight budgets. . These costs cut directly into household income, forcing many to delay or avoid treatment, which worsens animal health outcomes. In some cases, this leads to preventable cattle deaths or prolonged disease spread within the herd.

Moreover, the limited availability and high cost of veterinary drugs in rural areas such as Murewa increases dependence on government-run dipping facilities, many of which suffer from irregular operation or chemical shortages. This situation undermines the effectiveness of disease prevention programs and leaves many farmers vulnerable to repeat infections,

The increased veterinary burden also has long-term economic implications: as farmers divert more income to emergency treatments, they reduce investment in herd improvement, nutrition, or other productivity-enhancing practices. This perpetuates a cycle of vulnerability and low productivity in the communal livestock sector. One farmer responded that "I used to dip my cattle once every two weeks, but now I'm buying injectable drugs every month—it's costing me too much. Sometimes I skip treatment just to save money." – Farmer, Ward 23, Murewa.

5.10 Role of Veterinary and Extension Services in Tick Control

In addition to data gathered from farmers, insights from veterinary and extension workers highlighted key challenges and gaps in the control of tick-borne diseases in Murewa District. Veterinary officers noted that irregular supply of acaricides, non-functional dip tanks, and low farmer participation in dipping programs were among the main barriers to effective disease control

Extension workers emphasized that lack of farmer education on tick-borne disease symptoms and the importance of regular dipping contributes to the spread and recurrence of infections. They also reported that resource constraints (e.g., insufficient staffing, transport, and outreach materials) limit the effectiveness of veterinary services in remote areas.

These professional observations reinforce the study's findings that inconsistent dipping and low adoption of preventive measures are major contributors to high cattle mortality and reduced productivity. As Chikerema et al. (2013) also observed, effective tick control in Zimbabwe requires a strong, well-resourced veterinary extension system to support farmers with timely information, vaccinations, and disease surveillance.

The incorporation of veterinary and extension perspectives suggests that improving farmer training, veterinary outreach, and government investment in animal health infrastructure could greatly enhance the control of tick-borne diseases and ultimately improve cattle production outcomes.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

CONCLUSION

This study sought to investigate the effects of tick-borne diseases (TBDs) on cattle production in Murewa District, Zimbabwe, a rural area where livestock farming plays a crucial socio-economic role. Drawing on a combination of field data, interviews with farmers, veterinary reports, and existing literature, the research has revealed the multifaceted and detrimental impact that TBDs have on cattle health, productivity, and the livelihoods of rural farmers in the region.

Tick-borne diseases such as anaplasmosis, babesiosis, theileriosis (commonly referred to as January disease in Zimbabwe), and heartwater were found to be among the most prevalent and devastating in the district. These diseases lead to high morbidity and mortality rates among cattle, which not only decreases the number of productive animals but also incurs substantial costs in terms of treatment, prevention, and lost income. Farmers consistently reported reduced milk yield, stunted growth, reproductive failure, and in severe cases, death of cattle — all of which undermine food security and economic resilience.

A major finding of the study is that there exists a strong correlation between poor tick control practices and the prevalence of TBDs. Many communal farmers in Murewa rely on irregular dipping due to financial constraints, breakdowns of dip tanks, and insufficient supply of acaricides. This irregularity leads to uncontrolled tick infestations, which in turn facilitates the spread of TBDs. The lack of access to veterinary extension services further compounds the problem, as many farmers are unable to accurately diagnose or appropriately treat affected cattle. Traditional remedies, although widely used, often prove ineffective and sometimes harmful.

Moreover, the research revealed that the socio-economic implications of tick-borne diseases are far-reaching. For many households, cattle represent a source of wealth, social status, draught power, manure, and income from sales. TBDs compromise all these functions, leading to increased poverty levels, food insecurity, and reduced agricultural productivity. The death or illness of a

single cow can have ripple effects across the entire farming operation, including delayed land preparation, decreased crop yields, and failure to meet school fees or medical expenses.

However, the study also highlighted some positive community-led efforts and opportunities for intervention. Some farmers are engaging in local cooperative systems to maintain dipping infrastructure, while others are open to adopting more sustainable and integrated tick control strategies — provided adequate training and support are given. Importantly, the willingness of farmers to learn and improve their practices provides a foundation upon which government and development partners can build effective disease control programs.

Based on the findings, it is evident that tick-borne diseases pose a significant threat to cattle production in Murewa District, and by extension, to rural livelihoods. Tackling this problem requires a multi-pronged approach: improving access to veterinary services, revitalizing dipping programs, promoting awareness and education on TBDs, and encouraging public-private partnerships in animal health. Policy interventions must be context-sensitive and inclusive, targeting both immediate disease control and long-term resilience-building among smallholder farmers.

In conclusion, the research underscores the urgent need for coordinated efforts to combat tick-borne diseases in Murewa District. Without meaningful intervention, the continued prevalence of TBDs threatens to undermine not only cattle production but the overall economic and social stability of the region. The findings of this study contribute to a broader understanding of animal health challenges in Zimbabwe and provide a basis for future research, policy formulation, and community-based solutions aimed at sustainable livestock development.

RECOMMENDATIONS

Based on the findings of this study, it is evident that effective control of tick-borne diseases (TBDs) is crucial for enhancing cattle production in Murewa District. The recommendations provided here aim to address the root causes of TBD prevalence, improve animal health, and strengthen the socio-economic well-being of farmers in the region.

Firstly, there is an urgent need to revitalize and expand tick control infrastructure, particularly the communal dip tanks that serve as the first line of defense against tick infestations. Many of these facilities are either non-functional or poorly maintained, resulting in irregular dipping schedules or reduced efficacy of control measures. Government agencies, in partnership with local authorities and donor organizations, should prioritize the rehabilitation of dip tanks and ensure a consistent supply of effective acaricides. These interventions must be complemented by a reliable monitoring and maintenance program to sustain their long-term functionality.

In addition, improved veterinary extension services are essential. Many farmers in Murewa lack adequate knowledge on the identification, treatment, and prevention of tick-borne diseases. As such, it is critical that veterinary officers increase their outreach efforts through regular community visits, mobile clinics, and farmer training sessions. These programs should focus on building farmers' capacity to recognize early symptoms of TBDs, administer first-line treatments when appropriate, and implement preventive measures. The establishment of farmer field schools or peer education networks could also play a significant role in promoting knowledge-sharing and community-based disease management.

Another key recommendation is the promotion of integrated tick management practices. Over-reliance on chemical dipping alone may not be sustainable in the long run due to acaricide resistance, cost barriers, and environmental concerns. Integrated approaches may include pasture management (e.g., rotational grazing to disrupt tick life cycles), biological control (such as using natural predators or fungi), and selective breeding for tick-resistant cattle breeds. The Department of Veterinary Services, in collaboration with agricultural research institutes, should support studies into local tick ecology and explore alternative, cost-effective solutions tailored to the Murewa environment.

To enhance the resilience of smallholder farmers, it is also recommended that the government and NGOs provide financial and material support mechanisms, particularly targeting resource-poor households. This could take the form of subsidized acaricides, microcredit schemes for livestock inputs, or voucher systems for veterinary services. Encouraging community-based savings and credit associations focused on livestock health could also empower farmers to pool resources for disease control efforts. Moreover, timely compensation schemes for losses due to TBD outbreaks should be developed to cushion affected farmers and prevent the collapse of livelihoods.

Another critical area for improvement is data collection and disease surveillance. At present, there is limited real-time data on the incidence and spread of tick-borne diseases in Murewa District. Establishing a robust surveillance system that includes regular reporting by veterinary officers, local health workers, and farmers themselves can help in early detection and rapid response to outbreaks. The use of mobile technology and digital tools for reporting and mapping disease hotspots should be explored as a cost-effective solution in resource-constrained settings.

In addition, there is a need to promote policy reforms that prioritize livestock health and allocate adequate funding to veterinary services. The Ministry of Lands, Agriculture, Fisheries, Water and Rural Development should integrate tick-borne disease control into its broader rural development strategies. This could include aligning livestock programs with climate adaptation strategies, as changes in temperature and rainfall patterns may influence tick population dynamics and disease transmission.

Lastly, community participation and ownership should be central to any intervention. Farmers are more likely to adopt and sustain control measures if they are involved in the planning, implementation, and monitoring processes. Community livestock committees, where they exist, should be strengthened or revived to serve as focal points for coordination between farmers, veterinary staff, and local authorities. Awareness campaigns through local radio stations, community meetings, and schools can also foster a culture of proactive disease management.

In summary, controlling tick-borne diseases in Murewa District requires a multi-faceted and inclusive approach. By strengthening infrastructure, building farmer capacity, promoting integrated tick control, supporting vulnerable households, enhancing disease surveillance, reforming policy frameworks, and ensuring community participation, significant progress can be made. These recommendations, if implemented collectively, have the potential to improve cattle productivity, safeguard rural livelihoods, and contribute to sustainable agricultural development in Zimbabwe.

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APPENDIX 1

RESEARCH QUESTIONNAIRE

My name is Jean Jowa a student at Bindura University studying Animal Science, and I am conducting a research study on the effects of tick-borne diseases on cattle production in Ward 23, Murewa District, and Mashonaland east Zimbabwe. The purpose of this study is to investigate how tick-borne diseases have affected cattle production, and to identify strategies for effective management and control of these diseases.

Your participation in this study is voluntary, and your responses will be kept confidential. The information gathered from this study will contribute to a better understanding of the effects of tick-borne diseases on cattle production, and will help inform strategies for improving cattle health and productivity in Ward 23, Murewa District.

Please answer the questions honestly, and to the best of your ability. If you have any questions or concerns, please do not hesitate to ask.

Section 1**: Farmer Information**

1. Name: Pamela Manyange_____

2. Age: 18-25 [ ] 26-35 [ ] 36-45 [*] 46-55 [ ] 56+ [ ]

3. Gender: Male [ ] Female [*]

4. Education level: None [ ] Primary [ ] Secondary [*]

5. Farm size (hectares): 5 ha

6. Number of cattle: 1-10 [*] 11-50 [ ] 51-100 [ ] 101+ [ ]

7. Years of cattle farming experience: 1-5 [ ] 6-10 [*] 11-15 [ ] 16-20 [ ] 20 + [ ]

Section 2**: Cattle Production Information**

8. What breed(s) of cattle do you keep? _Mashona breed_____

9. What is your primary purpose for keeping cattle? (Tick one)

Beef: [ ] Dairy: [ ] Dual purpose:[*] other specify:

10. Do you keep records of cattle health and production? [*] Yes [ ] No

11. If yes, what records do you keep? (Tick all that apply)

Vaccination records: [*] Mortality records: [ ] Other Specify: [ ]

Treatment records: [ ] Birth records: [ ]

Section 3**: Tick Control Measures**

12. Do you use tick control measures? [*] yes [ ] No

a. If yes, what methods do you use? (Tick all that apply)

Chemical tick control (acaricides): [ ] Cultural tick control (pasture management: [ ]

Biological tick control (parasitoids): [ ] Integrated tick management (combination): [*]

Other (specify): _____

13. How often do you apply tick control measures? ___monthly_____

14. What is your primary source of information on tick control? (Tick one)

Extension services [ ] Veterinary services [*] Fellow farmers [ ] Internet [ ]

Other (specify _____

Section 4: **Tick-Borne Disease Information**

15. Have you experienced any tick-borne disease outbreaks in the past 12 months? YES [*] [NO]

16. If yes, which diseases have you encountered? (Tick all that apply)

Theileriosis [*] Anaplasmosis [ ] Babesiosis [ ] Heartwater [ ]

Other (specify) _____

17. How do you diagnose tick-borne diseases? (Tick all that apply)

Clinical signs [ ] Laboratory tests [ ] Veterinary diagnosis [*]

Other (specify) _____

Section 5**: Economic Impact**

18. How many animals did you lose in 2024? ___5_____

19. How do tick-borne diseases affect your cattle productivity? List at least 5 ways in which tick-borne diseases have affected your productivity

-Reduced milk production -death of cattle -low fertility

-Reduced draught power -low growth rate

20. Do you have any insurance coverage for cattle losses? [ ] YES [*] NO

Section 6**: Knowledge and Perceptions**

21. What do you think is the primary cause of tick-borne diseases? (Tick one)

Ticks [ ] Poor cattle management [*] Environmental factors [ ]

Other (specify) _____

22. What challenges do you face in controlling tick-borne diseases? (Tick all that apply)

Lack of resources [ ] Limited knowledge [ ] Ineffective tick control measures [ ]

Other (specify) _____

Section 7**: Farm Management Practices**

Biosecurity measures: (Tick all that apply)

Vaccination [*] Quarantine [ ] Sanitation [ ] Other [ ]

Section 08**: Farmer Knowledge and Awareness**

1. Sources of information on tick-borne diseases: (Tick all that apply)

Extension services [*] Veterinary services [ ] Internet [ ] Fellow farmers [ ]

Other _____

COMMENTS

THANK YOU