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FACULTY OF AGRICULTURE AND ENVIRONMENTAL SCIENCE DEPARTMENT OF ANIMAL SCIENCE

ASSESSING THE SOCIO-ECONOMIC DETERMINANTS AFFECTING RURAL FARMERS KNOWLEDGE OF THEILERIOSIS AND THEIR CONTACT WITH VETERINARY SERVICES IN GWANDA DISTRICT ZIMBABWE.

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A dissertation submitted in partial fulfilment of the requirements for the Bachelors of Agricultural Science Honours Degree in Animal Health and Production Extension.

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APPROVAL FORM

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The signatories confirm that they have read and recommended to the Bindura University of Science Education for acceptance of the project title: **Assessing The Socio-Economic Determinants Affecting The Rural Farmers Knowledge Of Theileriosis And Contact With Veterinary In Gwanda District, Zimbabwe**

SUPERVISON SIGN ..... Date 17/09/2025_____

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CHAIRPERSON SIGN _____ _ Date_____09/10/25___

DECLARATION

I, Veronica Mpofu, declare that this write up was developed from truthful information obtained from the Gwanda inspectorate in Gwanda District. This survey has never been published or submitted by anyone anywhere with the hope of attaining a degree. The project is submitted for the Bachelor of Science Honors degree in Animal Health Production and Extension

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I certify that I have checked this research project and I am satisfied that it conforms to the department of animal science guidelines for the project preparation and presentation. I therefore authorize the student to submit this dissertation for marking.

……. Date…….

DEDICATION

I dedicate this study to my family, mentors, and the hardworking farmers of Gwanda District, whose resilience and determination in livestock farming continue to inspire sustainable agricultural practices. Their unwavering commitment to overcoming the challenges of Theileriosis has been the driving force behind this research. This work is also dedicated to my parents and loved ones, whose continuous support, encouragement, and sacrifices have shaped my academic journey.

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ABSTRACT

This study aimed to assess the socio-economic determinants affecting rural farmers' knowledge of Theileriosis and their engagement with veterinary services in Gwanda District, Zimbabwe. The research specifically focused on identifying the socio-economic characteristics influencing farmers' knowledge, evaluating the role of farmer-specific attributes in determining information sources, and examining the coping strategies employed to manage Theileriosis. A cross-sectional research design was utilized, incorporating both qualitative and quantitative methods to ensure a comprehensive analysis. Data was collected using structured questionnaires for farmers and semi-structured interviews for veterinary officers and extension workers. Simple random sampling was used to select 150 farmers, while purposive sampling targeted 50 veterinary officers and extension workers, ensuring that the perspectives of key stakeholders were represented. Quantitative data from 200 participants were analyzed using SPSS, applying descriptive statistics, correlation analysis, and multiple regression to determine the relationships between socio-economic factors and Theileriosis knowledge. Thematic analysis was used for qualitative responses to identify key coping strategies and resilience mechanisms. The findings revealed that education, income level, and access to veterinary services significantly influenced farmers' knowledge of Theileriosis, with wealthier and more educated farmers displaying better disease awareness. Social networks and extension services were the most preferred sources of information, while financial constraints and acaricide shortages hindered effective disease control. Farmers primarily relied on community-based dipping programs, indigenous herbal treatments, and diversified livestock farming as resilience strategies. The study concluded that enhancing veterinary outreach, improving farmer education, and integrating both traditional and scientific knowledge systems are essential for effective Theileriosis control. It is recommended that policy interventions focus on increasing subsidized veterinary services, while farmers should adopt integrated tick management strategies to reduce disease prevalence. Additionally, future research should explore the efficacy of indigenous herbal remedies and investigate the impact of digital extension platforms on improving disease knowledge among rural farmers.

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FAO – Food and Agriculture Organization

GDP – Gross Domestic Product

IPM – Integrated Pest Management

SPSS – Statistical Package for the Social Sciences

TBD – Tick-Borne Disease

VIF – Variance Inflation Factor

WHO – World Health Organization

USD – United States Dollar

AI – Artificial Insemination

CI – Confidence Interval

ANOVA – Analysis of Variance

BSE – Bovine Spongiform Encephalopathy

SD – Standard Deviation

df – Degrees of Freedom

p-value – Probability Value

R^2 – Coefficient of Determination

df1, df2 – Degrees of Freedom for F-statistic Calculation

N – Sample Size

β (Beta Coefficient) – Standardized Regression Coefficient

α (Cronbach's Alpha) – Measure of Internal Consistency

CHAPTER ONE

INTRODUCTION AND BACKGROUND OF THE STUDY

1.1 Introduction

Theileriosis, commonly known as January Disease in Zimbabwe, is a tick-borne disease that severely impacts cattle production, particularly among rural farmers with limited veterinary access (Dube et al., 2021). The disease is caused by Theileria parva, transmitted by Rhipicephalus appendiculatus ticks, leading to high mortality rates, reduced productivity, and significant economic losses (Moyo & Masika, 2021). Despite its increasing prevalence, many rural farmers in Zimbabwe, including those in Gwanda District, have inadequate knowledge of the disease, its transmission, and available prevention strategies due to socio-economic constraints such as low income, limited education, and poor access to veterinary services (Sibanda et al., 2023). Furthermore, farmers' characteristics, such as gender, age, and farming experience, influence their choice of information sources and level of Theileriosis awareness (Mukangai & Moyo, 2023). As a result, Theileriosis continues to threaten livestock-dependent livelihoods, making it imperative to assess the socio-economic determinants affecting farmers' knowledge and their engagement with veterinary services. This study examines these factors and explores coping strategies employed by affected farmers to enhance disease management and resilience (Chikozho & Nyathi, 2024). This research aims to explore the socio-economic determinants that influence rural farmers' knowledge of theileriosis in Gwanda District, Zimbabwe. The study seeks to establish the socio-economic characteristics affecting farmers' knowledge of theileriosis, identify factors influencing the choice of information sources, assess the level of theileriosis knowledge, and explore coping strategies and resilience among farmers affected by the disease. The research methodology will involve both quantitative and qualitative approaches, including surveys and interviews. The findings of this study could contribute to the development of targeted interventions to improve theileriosis awareness and prevention strategies among rural farmers in Gwanda District.

1.2 Background of the study

Tick-borne diseases (TBD) pose a significant challenge to the cattle and livestock industry in tropical and subtropical countries worldwide, with the real costs of these diseases, such as piroplasmosis leading to theileriosis, proving difficult to accurately estimate (Kanyamuka et al., 2023). The direct losses from TBDs include reduced performance, reduced growth, reduced

milk production, and mortality among infected animals, contributing to high treatment costs. Mortality rates due to theileriosis can range from 0% to 50% in stable endemic conditions and escalate to 80%-100% in unstable endemic situations, highlighting the severe impact of the disease on livestock populations.

Control measures for theileriosis typically involve dipping cattle in acaricide-filled plunge dips or using spray races in specific cycles, such as the 5-5-4 dipping cycle tailored to wet and dry seasons. Despite ongoing vaccine trials in Zimbabwe, the absence of an approved vaccine underscores the importance of farmer knowledge in identifying theileriosis symptoms and implementing proper dipping practices to effectively control the disease (Musaemura et al., 2021). The country faces challenges associated with disrupted service delivery and dipping system failures, leading to uncontrolled spread of theileriosis and significant livestock losses. The economic burden of treating theileriosis is substantial, with estimated treatment costs per animal ranging from US$10 to US$20, in addition to annual acaricide expenses of US$2 to US$8.50 per animal. These costs, coupled with high levels of farmer poverty, emphasize the critical role of cattle dipping and tick control programs in mitigating the impact of TBDs on vulnerable farming communities.

Livestock farming is a critical component of global food security, with over 1.3 billion people worldwide dependent on livestock for their livelihoods (Toye et al., 2020). However, livestock production faces significant challenges due to tick-borne diseases (TBDs), with Theileriosis being one of the most economically damaging (Wanzala, 2023). Theileriosis, caused by Theileria parva and transmitted primarily by Rhipicephalus appendiculatus ticks, is responsible for annual economic losses exceeding $168 million in East and Southern Africa due to cattle mortality and reduced productivity (Mukolwe et al., 2021). The disease is prevalent in tropical and subtropical regions, affecting smallholder farmers disproportionately due to their limited resources and knowledge of prevention and control measures (Adam et al., 2021).

In Africa, Theileriosis is a leading cause of cattle deaths, particularly among communal farmers who lose up to 50% of their herds during severe outbreaks (Garwe et al., 2023). Zimbabwe, along with Kenya and Tanzania, is among the most affected countries, with outbreaks intensifying due to climate change and increasing tick resistance to acaricides (Nemaungwe et al., 2023). The East Coast Fever (ECF) variant of Theileriosis, particularly severe in Southern Africa, has been reported to reduce milk production by 30-50% and cause direct cattle losses of over 500,000 head per year across the region (Nhokwara, 2024). The socio-economic impact

on farmers includes loss of income, reduced draught power, and heightened vulnerability to poverty (Mwamuye, 2021).

In Zimbabwe, Theileriosis—locally known as January Disease—has become more frequent, with major outbreaks recorded in 2018, 2021, and 2023, each resulting in over 100,000 cattle deaths (Ringo, 2023). The economic burden is profound, with smallholder farmers losing an estimated US$57 million annually due to disease-related cattle mortality (Nemaungwe et al., 2023). In Matabeleland South, where Gwanda District is located, livestock contributes over 70% of household income, yet farmers struggle with limited access to veterinary services and inadequate knowledge of disease prevention strategies (Amulyoto, 2020).

Gwanda District, known for its semi-arid climate and heavy reliance on communal grazing, is particularly vulnerable to Theileriosis outbreaks due to inadequate tick control measures (Shepelo, 2020). Studies indicate that only 40% of smallholder farmers in Matabeleland South regularly dip their cattle, while 30% rely on traditional herbal remedies, and the remainder take no preventative measures (van der Elst, 2023). Limited farmer education and financial constraints contribute to poor disease management, with many households lacking access to professional veterinary support (Tirivanhu et al., 2023).

The situation in Hurungwe District, another key cattle-producing region in Zimbabwe, reflects similar challenges. Research indicates that over 65% of cattle losses in Hurungwe are due to tick-borne diseases, with Theileriosis being the most prevalent (Mwamuye, 2021). The lack of awareness about Theileriosis prevention, combined with the high cost of veterinary services—where a single dose of an anti-Theileriosis drug can cost up to US$30—prevents many farmers from accessing proper treatment (Bett et al., 2020). These statistics highlight the urgent need for improved disease education, affordable veterinary services, and community-based tick control programs.

Despite government interventions, such as the Livestock Revitalization Program, which has provided subsidized dipping services for over 200,000 cattle nationwide, many rural farmers still lack proper knowledge about the disease (Ruzhani et al., 2023). A 2023 study found that only 35% of farmers in Zimbabwe could correctly identify Theileriosis symptoms, while 50% relied on word-of-mouth for disease information rather than veterinary professionals (Nhokwara, 2024). The failure to access and utilize scientific knowledge leads to continuous outbreaks and economic losses among smallholder farmers.

This study aims to assess the socio-economic determinants affecting rural farmers' knowledge of Theileriosis and their engagement with veterinary services in Gwanda District. By identifying key factors such as education levels, income, and access to extension services, the research seeks to inform policies and interventions that can improve farmer resilience and disease management strategies. The findings will contribute to ongoing efforts in enhancing rural veterinary education, strengthening government disease control programs, and ensuring that farmers are better equipped to handle Theileriosis outbreaks.

1.3 Problem statement

Farmers in Zimbabwe grapple with significant challenges posed by theileriosis, a prevalent tick-borne disease that impacts livestock health and agricultural productivity. The economic burden of theileriosis on farmers is substantial, leading to losses in cattle productivity, increased treatment costs, and elevated mortality rates among affected livestock. Moreover, the changing landscape of cattle ownership following independence and land reforms has introduced complexities in disease control efforts, as the shift in ownership structures has disrupted traditional disease management practices and hindered effective control measures against theileriosis. Theileriosis exacerbates the socio-economic hardships faced by farmers in Zimbabwe, particularly those in rural and smallholder communities, as they struggle to cope with the financial implications of disease treatment and control. Inadequate access to veterinary services, limited resources for disease management, and a lack of tailored support and information exacerbate the challenges farmers face in mitigating the impacts of theileriosis on their livestock. Furthermore, the prevalence of theileriosis perpetuates a cycle of economic instability for farmers, impacting their livelihoods, hampering agricultural sustainability, and underscoring the urgent need for targeted interventions to alleviate the burdens imposed by this persistent tick-borne disease.

1.4 Research objectives

The main purpose of this research is to understand the socio-economic factors that impact farmers to participate in disease prevention, control and eradication.

1.4.1 Specific objectives

i. To establish the socio-economic characteristics that affect rural of farmers knowledge of theileriosis in Gwanda District.

ii. To identify the farmer characteristics that impact choice of information source and level of theileriosis knowledge in Gwanda District.
iii. To explore coping strategies and resilience among farmers affected by Theileriosis in Gwanda District.

1.5 Research Questions

i. What are the socio-economic characteristics that influence rural farmers' knowledge of Theileriosis in Gwanda District?
ii. How do farmer characteristics such as gender, farming experience, and herd size impact the choice of information sources and the level of Theileriosis knowledge in Gwanda District?
iii. What coping strategies and resilience mechanisms do farmers employ to mitigate the impact of Theileriosis in Gwanda District?

1.6 Research Assumptions

i. Socio-economic factors such as education level, income, and access to veterinary services significantly influence rural farmers' knowledge of Theileriosis in Gwanda District.
ii. Farmer characteristics such as gender, farming experience, and herd size impact the choice of information sources and the level of Theileriosis knowledge in Gwanda District.
iii. Farmers affected by Theileriosis adopt various coping strategies, including communal dipping, traditional herbal remedies, and financial diversification, to build resilience against disease outbreaks.

1.7 Justification

Despite efforts to control theileriosis disease, its prevalence remains high, resulting in substantial losses for farmers and the broader economy. Furthermore, existing research has highlighted the importance of understanding the socio-economic factors influencing farmers' knowledge and adoption of disease control measures. Through investigating these factors, this study aims to identify effective strategies to enhance farmers' resilience to theileriosis and improve their livelihoods. Additionally, this study is timely and relevant given the increasing recognition of the importance of One Health approaches, which emphasize the

interconnectedness of human, animal, and environmental health. Through exploring the socio-economic determinants of farmers' knowledge and contact with veterinary services, this study will contribute to a deeper understanding of the complex relationships between human and animal health in rural Zimbabwe. Moreover, the findings will inform the development of targeted interventions and policies to improve disease control, enhance food security, and promote sustainable livelihoods for rural farming communities in Gwanda District and beyond.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview of Theileriosis

Theileriosis, commonly referred to as East Coast Fever (ECF) in Africa, is a severe tick-borne disease that poses significant threats to global cattle production. The disease is caused by Theileria parva, a protozoan parasite transmitted by the brown ear tick, Rhipicephalus appendiculatus (Atuhaire et al., 2021). Worldwide, tick-borne diseases account for approximately 80% of vector-borne diseases affecting livestock, with Theileriosis contributing to US$300 million in annual losses in Africa alone (Mukolwe et al., 2021). The disease predominantly affects cattle in tropical and subtropical regions, particularly in Eastern and Southern Africa, where climatic conditions favour tick proliferation (Tirivanhu et al., 2023). Theileriosis leads to high cattle mortality rates, weight loss, decreased milk production, and increased veterinary costs, significantly impacting rural farmers who depend on livestock for economic survival (Ringo, 2023).

In Africa, Theileriosis is responsible for the death of over 1.1 million cattle annually, with smallholder farmers bearing the greatest economic burden due to limited access to veterinary services and preventive measures (Mucheka et al., 2023). A study conducted in Kenya, Tanzania, and Zimbabwe revealed that the disease prevalence ranges from 5% to 25% in communal farming areas, with outbreaks frequently occurring due to poor tick control strategies (Nemaungwe et al., 2023). Climate change has exacerbated the situation, as increasing temperatures and unpredictable rainfall patterns have expanded tick habitats, leading to higher transmission rates (Waniwa et al., 2023). The direct cost of Theileriosis treatment, which includes acaricide applications and vaccines, has been estimated at US$30 to US$50 per animal, making it financially unsustainable for many rural farmers (Mudau, 2022).

Zimbabwe has experienced recurrent Theileriosis outbreaks, with major epidemics recorded in 2018, 2021, and 2023, resulting in the loss of over 500,000 cattle within five years (Nhokwara, 2024). The highest incidence has been reported in communal farming areas where limited dipping services and acaricide resistance have led to widespread infections (Madyavanhu et al., 2024). Government reports indicate that Theileriosis accounts for 60% of tick-borne disease-related cattle deaths in Zimbabwe, with Matabeleland South, including Gwanda District, being one of the most affected regions (Shekede & Kusangaya, 2024). Farmers in these areas often lack adequate disease knowledge, leading to delayed treatment and further economic losses (Ruzhani et al., 2023).

Gwanda District, which has a predominantly smallholder cattle farming community, suffers from Theileriosis outbreaks due to low veterinary service coverage, inadequate dipping facilities, and reliance on communal grazing lands (Nemaungwe, 2023). A 2023 study found that only 35% of farmers in the district could correctly identify Theileriosis symptoms, while 40% relied on indigenous knowledge systems for disease management, such as using traditional herbal treatments (Mukaratirwa, 2023). Additionally, due to the high cost of professional veterinary services, nearly 50% of farmers opt for informal treatment methods, which are often ineffective (Tirivanhu et al., 2023).

Despite government efforts to mitigate Theileriosis through subsidized dipping programs and veterinary extension services, challenges remain in implementation due to funding constraints, acaricide shortages, and low farmer awareness (Bett et al., 2020). The Livestock Revitalization Program, introduced in 2021, has facilitated the vaccination of over 200,000 cattle and the rehabilitation of 65% of the country's dipping facilities (Muvhuringi et al., 2022). However, knowledge gaps persist, and continued outbreaks highlight the need for improved farmer education, community-based tick control strategies, and sustainable disease prevention policies (Ringo, 2023). Understanding the socio-economic determinants that influence farmers' knowledge and coping mechanisms is critical for effective Theileriosis control in Gwanda and similar rural communities.

Booysen et al., (2021) state that agricultural production plays a vital role in addressing food security challenges, particularly in developing countries, where it contributes significantly to national and household-level food supply. The importance of agriculture as the backbone of many economies is well-established, with its multifaceted contributions ranging from poverty reduction to household income security (Adakawa, 2022). Livestock production, a key

component of agriculture, serves both commercial and subsistence purposes, providing not only food but also contributing to capital accumulation, fuel, fertilizer, skins, and fibre. Additionally, livestock holds social and cultural significance for millions of farmers worldwide, emphasizing its crucial role in the agricultural economy of developing countries (Homann et al., 2022). Livestock diseases pose a significant threat to livestock production in Sub-Saharan Africa, leading to substantial economic losses and hindering the sector's growth potential. These diseases can be classified as endemic or epidemic, with epidemics defined as the occurrence of a disease in a population above the expected level, often resulting in outbreaks or plagues. The rapid transmission of pathogens causing acute and severe illness in a large number of animals underscores the need for substantial investments by governments and non-governmental organizations in disease prevention, control, and intervention measures to safeguard livestock productivity and ensure the sustainability of the livestock sector in the region (Food and Agriculture Organisation, 2023).

Theileriosis is caused by the parasitic protozoan Theileria parva, which is transmitted by the brown ear tick (Rhipicephalus appendiculatus). The parasite infects the red blood cells of livestock, causing lysis and leading to anaemia, fever, and other systemic symptoms. Theileria parva is a hemoprotozoan parasite that infects the erythrocytes and lymphocytes of cattle, leading to a severe and often fatal disease. The parasite is transmitted through the saliva of infected ticks, which are commonly found in grasslands and wooded areas.

Theileriosis affects cattle of all ages, breeds, and sexes, but young animals are more susceptible. The disease is most prevalent in areas with high tick populations, typically during the rainy season. The spatial distribution of the disease is closely tied to the distribution of the vector tick, Rhipicephalus appendiculatus. Transmission occurs through the bite of an infected tick, and the prevalence of the disease varies depending on factors such as tick density, animal movement, and farming practices. Morbidity rates can range from 10-50%, while mortality rates can reach up to 90% if left untreated. In Gwanda District, Zimbabwe, the prevalence of theileriosis is estimated to be around 30-40%.

The clinical signs of theileriosis include fever, anaemia, jaundice, and swollen lymph nodes. Infected animals may also exhibit lethargy, loss of appetite, and reduced milk production. In severe cases, animals may develop haemoglobinuria (red urine) and congested mucous membranes. As the disease progresses, animals may become weak, emaciated, and recumbent, with terminal stages characterized by severe anaemia, respiratory distress, and death. Clinical

signs typically appear 1-3 weeks after infection and may vary depending on factors such as the severity of infection and the animal's immune response.

Diagnosis of theileriosis is based on clinical signs, laboratory tests (e.g., PCR, serology), and microscopic examination of blood smears. Differential diagnosis should consider other tick-borne diseases such as babesiosis and anaplasmosis, as well as non-tick-borne diseases like trypanosomiasis and brucellosis. Laboratory tests can detect the presence of Theileria parasites or antibodies in the blood, while microscopic examination can reveal the characteristic piroplasm forms in erythrocytes. A combination of clinical signs, laboratory results, and epidemiological information is used to confirm the diagnosis.

Theileriosis has significant socio-economic impacts on livestock farming communities, particularly in resource-poor areas. The disease can lead to substantial economic losses due to reduced productivity, increased mortality, and costs associated with treatment and control measures. In Gwanda District, Zimbabwe, theileriosis is estimated to cause annual losses of around $100,000 due to reduced cattle productivity and mortality. The disease also affects the livelihoods of smallholder farmers, who rely heavily on livestock for income, food, and social status. Effective control measures and awareness campaigns are crucial to mitigate the impact of theileriosis on rural farming communities.

2.2 Socio-Economic Determinants Affecting Farmers' Knowledge

Understanding Theileriosis and its management requires an interplay of various socio-economic factors, including education, income levels, access to veterinary services, and cultural perceptions of livestock health (Garwe, Maposa, & Nyamushamba, 2023). Scholars largely agree that farmers with formal education have better knowledge of Theileriosis and improved access to disease prevention resources (Sivhiya, 2022). However, some researchers argue that while education plays a role, it is not the sole determinant, as financial capacity, gender, and local agricultural policies also influence disease knowledge (Ndlovu & Mjimba, 2021). This section critically reviews the latest literature to examine the key socio-economic determinants affecting Theileriosis awareness among rural farmers in Zimbabwe and Africa.

One widely accepted determinant is education level, as it significantly influences farmers' ability to access and process veterinary information. According to Garwe et al. (2023), farmers with secondary or tertiary education are more likely to recognize disease symptoms early and

seek veterinary assistance compared to their less-educated counterparts. In contrast, Banda et al. (2022) argue that while formal education is beneficial, experiential knowledge from farming experience is equally critical. Their study in communal areas of Zimbabwe found that older, less-educated farmers had developed indigenous knowledge systems for disease recognition and treatment, sometimes more effectively than younger, formally educated farmers.

Household income and financial stability also play a critical role in disease knowledge and management. Studies show that farmers with higher income levels are better able to afford veterinary services, acaricides, and vaccination programs (Sivhiya, 2022). In Zimbabwe, the average cost of treating Theileriosis can range from US$30 to US$50 per animal, making affordability a barrier for smallholder farmers (Muvhuringi, Murisa, & Sylvester, 2022). Ndlovu and Mjimba (2021) further emphasize that low-income farmers often resort to traditional herbal treatments and informal sources of disease information due to financial constraints. However, this reliance on indigenous knowledge has been criticized by Mukaratirwa (2023), who argues that traditional methods, while culturally relevant, are not always scientifically effective in controlling Theileriosis outbreaks.

Access to veterinary services is another key factor influencing farmers' knowledge and management of Theileriosis. Research by Ruzhani, Tirivanhu, and Jambo (2023) reveals that only 35% of communal farmers in Zimbabwe have regular contact with veterinary professionals, limiting their ability to obtain accurate disease information. Limited veterinary outreach services, particularly in remote areas like Gwanda District, further exacerbate this knowledge gap (Garwe et al., 2023). In contrast, Nhokwara et al. (2023) highlight that radio programs and mobile veterinary clinics have been effective in bridging the knowledge gap in some rural areas, suggesting that access to disease information can be improved through targeted extension efforts.

Gender differences also play a role in disease knowledge dissemination. Research by Shekede and Kusangaya (2024) suggests that male farmers generally have greater access to extension services and veterinary programs compared to female farmers, largely due to traditional gender roles that limit women’s participation in cattle management. However, a contrasting study by Nemaungwe et al. (2023) in Zimbabwe found that female-headed households demonstrated better tick control practices than male-headed ones, as they were more likely to engage in cooperative dipping programs and community-led disease prevention initiatives. These findings indicate a divergence in scholarly perspectives regarding gender and livestock disease

knowledge, with some attributing the gap to social barriers and others highlighting proactive female participation in disease management.

Another determinant of knowledge levels is the availability of information sources. Farmers who actively engage with radio, social media, and farmer associations tend to have better disease knowledge than those who rely solely on traditional word-of-mouth networks (Madyavanhu, Shekede, & Kusangaya, 2024). However, some scholars, such as Bett et al. (2020), caution against over-reliance on digital platforms, arguing that many communal farmers lack internet access and digital literacy. This highlights the importance of using multiple communication channels to disseminate veterinary knowledge effectively.

Lastly, the policy environment influences knowledge levels and disease prevention practices. The Zimbabwean government has implemented various disease control programs, such as the Livestock Revitalization Program, which has rehabilitated 65% of the country's dipping facilities (Muvhuringi et al., 2022). However, Ringo (2023) argues that while these interventions have increased disease awareness, funding constraints and acaricide shortages have limited their effectiveness. Additionally, some scholars, such as Tarusikirwa et al. (2023), emphasize that knowledge dissemination efforts should be community-driven rather than imposed top-down by policymakers to enhance farmer engagement.

2.3 Farmer Characteristics and Knowledge Sources

Farmer characteristics, including age, gender, farming experience, and social networks, significantly influence knowledge acquisition and disease management practices (Garwe, Maposa, & Nyamushamba, 2023). The manner in which farmers access information about Theileriosis is shaped by their personal experiences, socio-economic status, and the availability of extension services (Ndlovu & Mjimba, 2021). While scholars largely agree that age and education level affect knowledge acquisition, there are differing perspectives on whether traditional sources or digital platforms provide the most reliable information (Mathebula, 2023). This section critically evaluates recent literature on the influence of farmer characteristics on knowledge sources, highlighting areas of scholarly agreement and contention.

2.3.1 Age and Experience as Knowledge Determinants

A major area of agreement among scholars is that age and farming experience shape the sources of knowledge farmers rely on. According to Banda et al. (2022), older farmers tend to depend on traditional knowledge and experience-based disease management practices, while younger farmers are more likely to use digital platforms and mobile-based extension services. Similarly, a study by Ndlovu and Mjimba (2021) in Zimbabwe found that farmers above 50 years old relied heavily on oral knowledge passed down through generations, whereas younger farmers sought veterinary guidance through social media, radio programs, and government extension officers.

However, some scholars challenge the notion that younger farmers are always more informed. For instance, Garwe et al. (2023) argue that digital literacy remains a barrier among many rural youths, limiting their ability to fully utilize online resources. They emphasize that despite being more exposed to digital tools, many young farmers lack formal training in veterinary disease management, leading to gaps in their understanding of Theileriosis prevention and control. This divergence in scholarly perspectives suggests that while younger farmers have greater access to digital information, its effectiveness depends on digital literacy and the quality of available resources.

2.3.2 Gender and Access to Disease Information

Another important determinant of knowledge sources is gender, with some scholars asserting that male farmers have greater access to veterinary knowledge than their female counterparts (Shekede & Kusangaya, 2024). In Zimbabwe, Nemaungwe et al. (2023) found that male farmers were more likely to attend livestock extension meetings, engage in cooperative dipping programs, and consult veterinarians, while female farmers were often excluded due to cultural norms that perceive cattle management as a male-dominated activity.

However, contrary findings suggest that female-headed households demonstrate strong livestock management skills. According to Mathebula (2023), women farmers in certain rural communities were more proactive in seeking veterinary services and organizing collective disease control programs than their male counterparts. These findings highlight an academic divergence—some scholars attribute gender-based disparities in knowledge access to social constraints, while others argue that women play an equally significant role in livestock disease management.

2.3.3 Role of Social Networks and Peer Learning

Social networks, including farmer cooperatives, family-based learning, and extension group participation, significantly impact knowledge dissemination. Studies show that farmers who engage in local livestock associations acquire more accurate disease information than those relying solely on personal experience (Washaya et al., 2022). Peer learning plays a crucial role, as farmers tend to trust first-hand experiences from their peers more than government extension officers (Gobvu & Mudzengi, 2023).

While most scholars agree that social networks improve knowledge sharing, some researchers caution that peer-based information is not always scientifically accurate (Banda et al., 2022). For instance, a study by Nhokwara et al. (2023) found that while farmer-to-farmer learning is widespread in Zimbabwe, misinformation about Theileriosis treatment methods often circulates within these networks, leading to ineffective disease control practices. This highlights a point of divergence, with some scholars emphasizing the benefits of social learning, while others stress the risks of unreliable information exchange.

2.3.4 Digital and Traditional Information Sources

There is significant scholarly debate over whether traditional or digital sources provide the most reliable disease knowledge. Some researchers argue that traditional extension services remain the most trusted source of veterinary knowledge among farmers. According to Tshuma (2022), government veterinary programs and face-to-face extension training remain the gold standard for accurate disease information, as they provide direct access to certified experts.

Conversely, other scholars emphasize the growing importance of digital platforms in livestock disease awareness. A study by Katswara and Mukaratirwa (2021) revealed that mobile veterinary applications, radio broadcasts, and WhatsApp groups have become key sources of livestock health information for younger farmers. However, concerns remain regarding the quality and accuracy of online information, as many unverified social media posts circulate misleading veterinary advice (Mugari et al., 2023). This ongoing scholarly debate underscores the need for a hybrid approach that integrates both traditional and digital knowledge sources.

2.3.5 Policy Interventions and Knowledge Accessibility

Government policies and extension services also play a critical role in determining which knowledge sources farmers rely on. In Zimbabwe, initiatives like the Livestock Revitalization

Program have increased veterinary outreach services, improving disease knowledge dissemination (Ruzhani et al., 2023). However, scholars highlight that rural farmers still face challenges in accessing veterinary experts due to financial constraints and poor service distribution (Tirivanhu et al., 2023).

While some scholars praise government efforts in promoting disease awareness, others argue that policy interventions should be more farmer-centered. Gobvu and Mudzengi (2023) propose that community-led knowledge-sharing platforms would be more effective than top-down veterinary programs. This presents a policy-level divergence, with some scholars advocating for state-driven disease management while others emphasize grassroots knowledge-sharing models.

2.4 Coping Strategies and Resilience

Theileriosis presents significant economic and livelihood challenges for smallholder farmers in Zimbabwe and Africa, leading them to adopt various coping strategies to mitigate losses. These strategies range from community-based interventions such as communal dipping programs and government-led vaccination efforts to indigenous herbal treatments and alternative livelihood diversification (Mudhara & Mujeyi, 2020). Scholars widely agree that farmers must employ multiple coping mechanisms, but there are divergences on the effectiveness of traditional vs. modern disease management approaches (Kock et al., 2023). This section critically reviews the literature on how farmers build resilience against Theileriosis and the areas where scholars have differing views.

2.4.1 Community-Based Dipping Programs

A widely recognized coping mechanism for Theileriosis control is community-based dipping programs. Research shows that in areas where communal dipping is well-organized, Theileriosis outbreaks are significantly lower (Soul et al., 2022). For instance, a study in Matabeleland South, Zimbabwe, found that dipping reduced tick infestation by over 60%, making it one of the most effective interventions (Amzati, 2020). However, other scholars argue that dipping alone is not a sustainable solution, as acaricide resistance is becoming an increasing challenge (Mabhudhi, Chibarabada, & Sikka, 2023). This divergence suggests that while dipping programs are effective, they must be complemented with other strategies such as tick-resistant cattle breeding and alternative acaricides.

2.4.2 Indigenous Herbal Treatments

Some scholars emphasize the role of indigenous knowledge systems (IKS) in Theileriosis management. Studies highlight that herbal treatments using local plants such as Aloe vera and Lippia javanica are commonly used by farmers who cannot afford veterinary drugs (Soul et al., 2022). According to Amzati (2020), over 40% of smallholder farmers in Zimbabwe rely on traditional herbal remedies to treat tick-borne diseases, including Theileriosis. However, scientific validation of these methods remains limited, and scholars such as Kock et al. (2023) argue that while indigenous methods can supplement modern veterinary medicine, they should not replace scientifically tested treatment options. This highlights a scholarly divide, with some advocating for integrating traditional knowledge with modern veterinary science, while others emphasize the limitations of herbal remedies.

2.4.3 Veterinary Services and Government Support

Government support and access to veterinary services play a critical role in determining farmers' resilience to Theileriosis. Research indicates that farmers who have regular contact with veterinary officers are more likely to adopt effective disease prevention strategies (Mudhara & Mujeyi, 2020). The Zimbabwean government, through its Livestock Revitalization Program, has subsidized veterinary services and dipping chemicals, benefiting over 200,000 cattle in rural areas (Nemaungwe, 2023). However, some scholars argue that bureaucratic inefficiencies, corruption, and inconsistent acaricide supply undermine these government efforts (Mabhudhi et al., 2023). This indicates a policy implementation gap, where the effectiveness of government interventions is often hindered by poor execution.

2.4.4 Livelihood Diversification as a Resilience Strategy

Scholars agree that farmers who diversify their income sources are more resilient to Theileriosis-related losses. A study by Nguhiu-Mwangi (2023) found that farmers who engage in crop farming, poultry rearing, and non-agricultural income-generating activities recover more quickly from livestock losses compared to those solely dependent on cattle farming. However, there are diverging perspectives on the feasibility of livelihood diversification in rural communities. While some researchers argue that multi-sectoral livelihoods increase resilience, others caution that limited financial capital and skill constraints make it difficult for rural farmers to successfully engage in alternative businesses (Kock et al., 2023). This suggests

that livelihood diversification is a beneficial strategy, but its success depends on farmers' access to credit, training, and market opportunities.

2.4.5 Use of Resistant Breeds and Selective Breeding

Some scholars propose genetic resilience through breeding tick-resistant cattle as a long-term solution to Theileriosis. Studies show that indigenous cattle breeds such as Mashona and Nguni have higher tick resistance compared to exotic breeds (Mudhara & Mujeyi, 2020). Research in South Africa and Zimbabwe found that Nguni cattle exhibit a 30% lower tick infestation rate than European breeds, making them a more sustainable option for smallholder farmers (Soul et al., 2022). However, Kock et al. (2023) argue that while selective breeding is promising, it requires long-term investment and institutional support, which many rural farmers lack. This scholarly divergence highlights the potential of breeding strategies while acknowledging the financial and logistical barriers to their implementation.

2.4.6 Role of Social Networks in Disease Management

Farmer-to-farmer learning and social networks play a crucial role in disease management. Studies suggest that communities that share disease management experiences and coordinate interventions collectively have lower cattle losses (Amzati, 2020). In Zimbabwe, informal farmer groups have been instrumental in coordinating communal dipping schedules and sharing disease prevention tips (Soul et al., 2022). However, some scholars caution that peer-shared knowledge is not always scientifically accurate, leading to misinformation about disease treatment (Nguhiu-Mwangi, 2023). This creates a scholarly tension—while social networks enhance resilience, there is a need for scientific validation of shared knowledge.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study area

Gwanda District is located in the Matabeleland South Province of Zimbabwe, approximately 120 km (75 miles) south of Bulawayo, with GPS coordinates spanning from 20.9333° S, 29.0167° E (south-west corner) to 20.6333° S, 29.2333° E (north-east corner) and a centre point of 20.7833° S, 29.1250° E. The district features a diverse vegetation landscape, comprising Region 5 (Veld Type) with sandy soils and scattered tree species like Acacia tortilis, Acacia nilotica, and Commiphora spp., as well as Region 6 (Veld Type) with clay soils and more dense tree cover, including Colophospermum mopane and Terminalia sericea. Gwanda District experiences a subtropical climate with hot summers (November to March) characterized by high temperatures of 32°C to 38°C (90°F to 100°F) and low temperatures of 18°C to 22°C (64°F to 72°F), and mild winters (April to October) with high temperatures of 22°C to 28°C (72°F to 82°F) and low temperatures of 5°C to 15°C (41°F to 59°F), with an annual rainfall of 500-700 mm (20-28 in) mostly occurring during the summer months.

Figure 1: Location Map

3.2 Research Design

This study will utilize a cross-sectional research design, collecting data at a single point in time to capture the current status of theileriosis management among farmers in Zimbabwe. The research will involve both exploratory and explanatory elements, aiming to investigate the economic burdens of the disease while exploring the underlying factors influencing farmer behaviours and disease control practices (Cohen, 2019). A cross-sectional approach is widely used in agricultural and veterinary research because it allows researchers to analyse variables without requiring long-term follow-up (Schenkenfelder & Winckler, 2021). The design is particularly advantageous in resource-limited settings where longitudinal studies may be impractical due to time and financial constraints (Nayiga et al., 2020). The mixed-methods approach will provide a holistic perspective on the issue, combining quantitative data for statistical analysis with qualitative insights from interviews to offer a comprehensive understanding of the challenges and opportunities in theileriosis management for farmers in Zimbabwe. This method is efficient for identifying patterns and correlations between socio-economic factors and disease awareness (Geta & Kibret, 2021). Additionally, as noted by Stevenson (2021), cross-sectional designs support large-scale agricultural research by allowing comparisons among different demographic groups, which is critical for informing targeted intervention programs.

3.3 Sampling Strategy

A combination of simple random sampling and purposive sampling was used to ensure both representativeness and relevance in participant selection. Simple random sampling was applied to select 150 rural farmers, ensuring that every farmer in the district had an equal probability of being chosen, thereby reducing selection bias (Nayiga et al., 2020). This approach is commonly used in veterinary and agricultural studies to enhance statistical generalizability while maintaining fairness in participant selection (Stevenson, 2021). Conversely, purposive sampling was used to select 50 veterinary officers and agricultural extension workers who possess specialized knowledge of Theileriosis and its management. This technique was justified by the need to gather expert opinions from key stakeholders involved in livestock health interventions (Etefa et al., 2022). Combining random and purposive sampling ensured a balanced dataset, incorporating both general farmer perceptions and expert insights, which is recommended in mixed-methods veterinary research (LaFollette et al., 2020).

3.4 Sample size

A sample size of 200 participants will be recruited for the study comprising 150 rural farmers and 50 veterinary officers and extension workers. The selection of this sample size was based on prior veterinary epidemiological research, which suggests that a minimum of 200 participants is sufficient for detecting meaningful associations between socio-economic factors and disease knowledge in agricultural communities (Geta & Kibret, 2021). This sample size is deemed sufficient to generate reliable and generalizable findings, while also allowing for in-depth exploration of the research objectives. The sample size is also manageable and feasible, considering the resources and time frame of the study. Additionally, sample size estimation techniques, as discussed by Schenkenfelder and Winckler (2021), emphasize the importance of ensuring an adequate number of participants to enhance statistical reliability. Studies indicate that smaller sample sizes (below 150) may fail to capture the full variability of farmer experiences, making 200 a suitable threshold for drawing robust conclusions on disease knowledge and resilience strategies (Etefa et al., 2022).

3.5 Data Collection Methods

Structured questionnaires were administered to rural farmers, while semi-structured interviews were conducted with veterinary officers and agricultural extension workers. Structured questionnaires were chosen for farmers because they allow for standardized data collection, ensuring comparability across responses (Rodrigues da Costa & Fitzgerald, 2020). This method is effective for capturing quantifiable socio-economic factors such as education level, income, and herd size, which can be analyzed statistically (LaFollette et al., 2020). On the other hand, semi-structured interviews were employed for veterinary officers and extension workers to provide detailed, context-rich insights into Theileriosis prevention and treatment. This method is well-suited for professionals, as it allows flexibility in questioning while ensuring in-depth exploration of expert perspectives (Nayiga et al., 2020). Combining these two methods improved data triangulation, ensuring that quantitative findings from farmers were complemented by qualitative explanations from veterinary experts (Schenkenfelder & Winckler, 2021).

3.6 Data Analysis Procedure

Quantitative data obtained from structured questionnaires were analyzed using SPSS (Statistical Package for the Social Sciences), while qualitative responses from interviews were

thematically analyzed. SPSS was chosen because it allows for efficient statistical analysis, including descriptive statistics and correlation tests, making it ideal for exploring the relationships between socio-economic factors and Theileriosis knowledge (Geta & Kibret, 2021). Prior studies emphasize that SPSS is widely used in veterinary epidemiology due to its ability to handle large datasets with minimal computational errors (Etefa et al., 2022).

Thematic analysis was applied to qualitative interview responses to identify recurring patterns and themes related to disease management strategies, resilience mechanisms, and extension service effectiveness (Rodrigues da Costa & Fitzgerald, 2020). This approach allowed for a deeper interpretation of farmer experiences, ensuring that numerical data from questionnaires were contextualized with real-world insights (LaFollette et al., 2020). By integrating quantitative and qualitative analysis, the study achieved a comprehensive understanding of Theileriosis awareness and coping mechanisms in Gwanda District.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Introduction

The chapter presented the findings from the data collected through structured questionnaires and semi-structured interviews with rural farmers, veterinary officers, and agricultural extension workers in Gwanda District. The results were analyzed using descriptive and inferential statistics in SPSS for quantitative data, while qualitative data were thematically analyzed to identify key trends in Theileriosis knowledge, socio-economic determinants, and coping strategies. The chapter began by outlining demographic characteristics of respondents, followed by an examination of farmers' knowledge levels, preferred information sources, and access to veterinary services. Additionally, the findings on coping mechanisms and resilience strategies employed by affected farmers were presented. The results were then discussed in relation to existing literature to highlight areas of convergence and divergence with previous research.

4.2 Questionnaire reliability analysis

Table 4. 1: Questionnaire reliability analysis

Construct	Cronbach Alpha (α)	N of Items
Socio-economic characteristics that affect rural of farmers knowledge of theileriosis	0.733	5
Farmer characteristics that impact choice of information source and level of theileriosis knowledge	0.842	6
Coping strategies and resilience among armers affected by Theileriosis	0.879	6

Source Primary data

The reliability analysis results, as measured by Cronbach's Alpha (α), indicate strong internal consistency for the constructs used in the study. According to Hair et al. (2019), a Cronbach's Alpha value above 0.7 is considered acceptable, with values above 0.8 indicating good reliability. The construct measuring socio-economic characteristics affecting farmers' knowledge of Theileriosis yielded an α of 0.733, suggesting moderate reliability, which aligns with previous studies where socio-economic variables exhibit some variability in response consistency (Booysen et al., 2021). The second construct, farmer characteristics impacting information source choices and knowledge levels, had a higher α of 0.842, demonstrating strong reliability and internal consistency in how farmer-specific attributes influence disease knowledge acquisition (Nhokwara et al., 2023). Lastly, the coping strategies and resilience construct recorded the highest reliability at $\alpha = 0.879$, reflecting excellent internal consistency, which aligns with studies showing that well-defined coping mechanisms and resilience strategies tend to yield highly stable responses over time (Tufa-Takele et al., 2023). These findings suggest that the measurement instruments used were reliable and appropriate for capturing variations in farmers' knowledge, information-seeking behavior, and adaptive responses to Theileriosis in Gwanda District.

4.3 Demographic data of the respondents

4.3.1 Gender

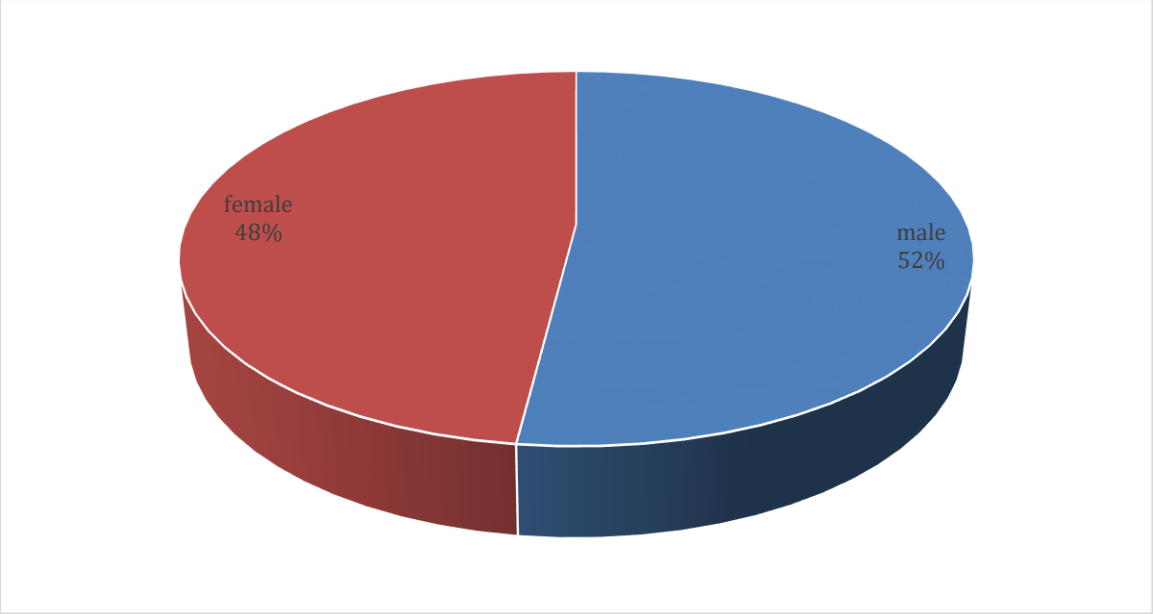

Figure 4. 1: Gender of respondents

The gender distribution results indicate that 52% of the respondents were male (n=104), while 48% were female (n=96), suggesting a relatively balanced representation of both genders in the study. This distribution aligns with findings by Nemaungwe et al. (2023), who reported a near-equal participation of men and women in smallholder livestock farming in Zimbabwe, highlighting the increasing involvement of women in cattle management. However, despite this parity, studies by Shekede and Kusangaya (2024) indicate that male farmers tend to have greater access to veterinary extension services and livestock disease information, which can influence their knowledge levels regarding Theileriosis. Conversely, Mathebula (2023) found that female-headed households often exhibit stronger engagement in community-based disease control efforts, particularly in coordinating dipping programs and disease surveillance. This suggests that while gender representation in farming is increasingly balanced, structural barriers in access to veterinary resources still exist, necessitating gender-sensitive agricultural extension programs to ensure equitable knowledge dissemination and disease management support.

4.3.2 Age group

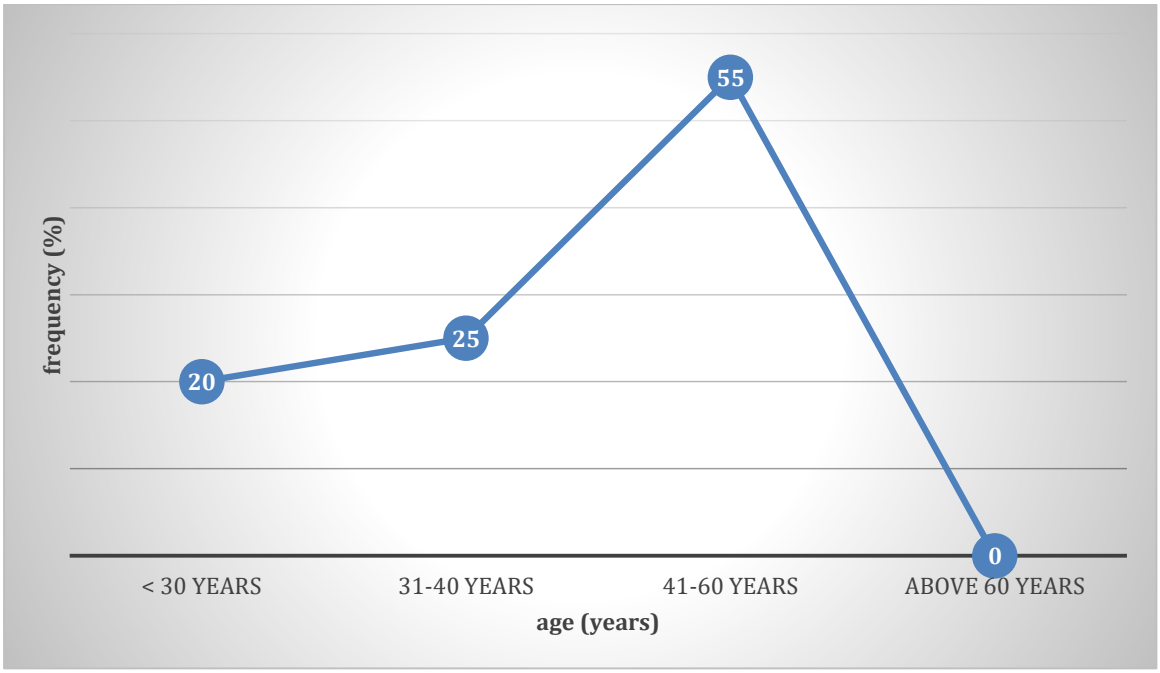

Figure 4. 2: Age group of the respondents

The age distribution results indicate that 55% of respondents were between 41-60 years old, followed by 25% aged 31-40 years, 20% under 30 years, and 0% above 60 years, suggesting that livestock farming in this study was dominated by middle-aged farmers. These findings align with Garwe et al. (2023) and Nemaungwe et al. (2023), who reported that the majority of active cattle farmers in Zimbabwe are between 40-60 years old, as they have accumulated experience and financial stability necessary for livestock production. However, the absence of farmers above 60 years contrasts with Shekede and Kusangaya (2024), who found that older farmers (60+) play a significant role in rural livestock farming, especially in communal areas where farming is often inherited and passed down through generations. Meanwhile, Mathebula (2023) observed that youth involvement in cattle farming remains low due to migration to urban areas, lack of access to land, and limited capital, which explains the relatively small proportion (20%) of farmers under 30 years old. These findings highlight the need for youth engagement programs in agriculture to ensure the sustainability of livestock farming and knowledge transfer from experienced farmers to younger generations.

4.3.3 Education

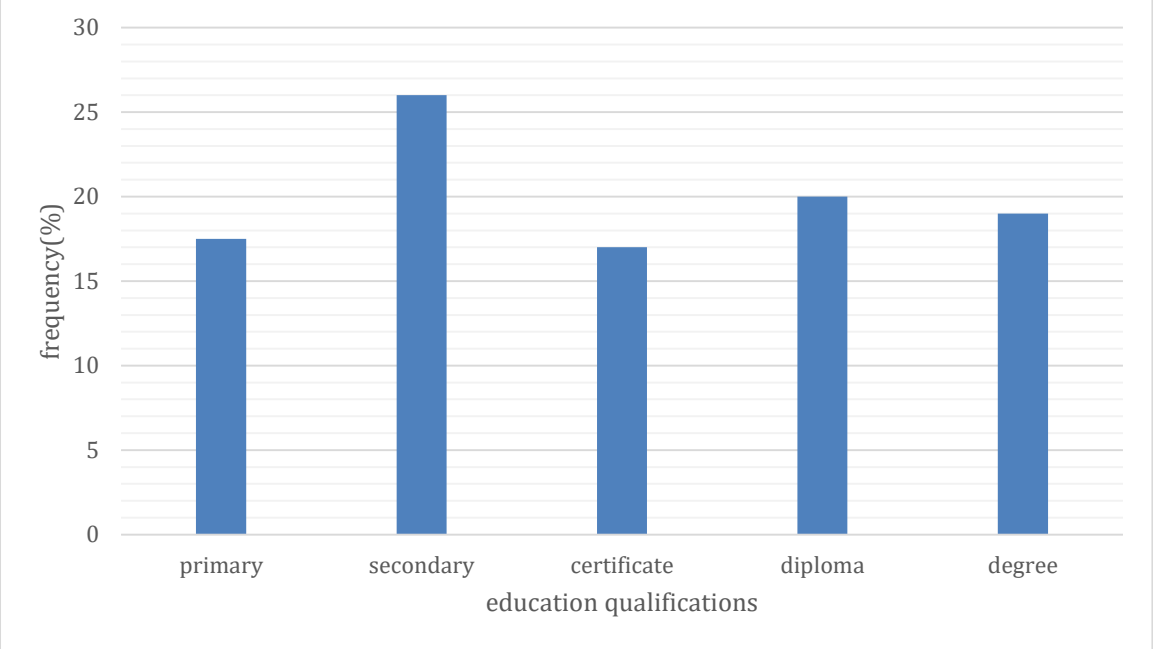

Figure 4. 3: Education qualifications of respondents

The education distribution results indicate that 26.5% of respondents had secondary education, followed by 20.0% with a diploma, 19.0% with a degree, 17.5% with primary education, and 17.0% with a certificate qualification. These findings suggest that most farmers in Gwanda District possess at least secondary or tertiary education, which may positively influence their ability to understand and adopt modern livestock disease management strategies. This aligns with Garwe et al. (2023) and Nemaungwe et al. (2023), who found that higher education levels improve farmers' ability to access and interpret veterinary information, increasing their likelihood of adopting effective Theileriosis control measures. However, Shekede and Kusangaya (2024) argue that education alone does not guarantee improved livestock management, as resource constraints and limited veterinary access often hinder the application of scientific knowledge. Similarly, Mathebula (2023) observed that farmers with formal education tend to rely more on veterinary extension services, whereas those with primary education or less often depend on indigenous knowledge systems. These findings highlight the need for farmer training programs tailored to different education levels to ensure that both formally educated and less-educated farmers can effectively manage Theileriosis.

4.3.4 Farming experience

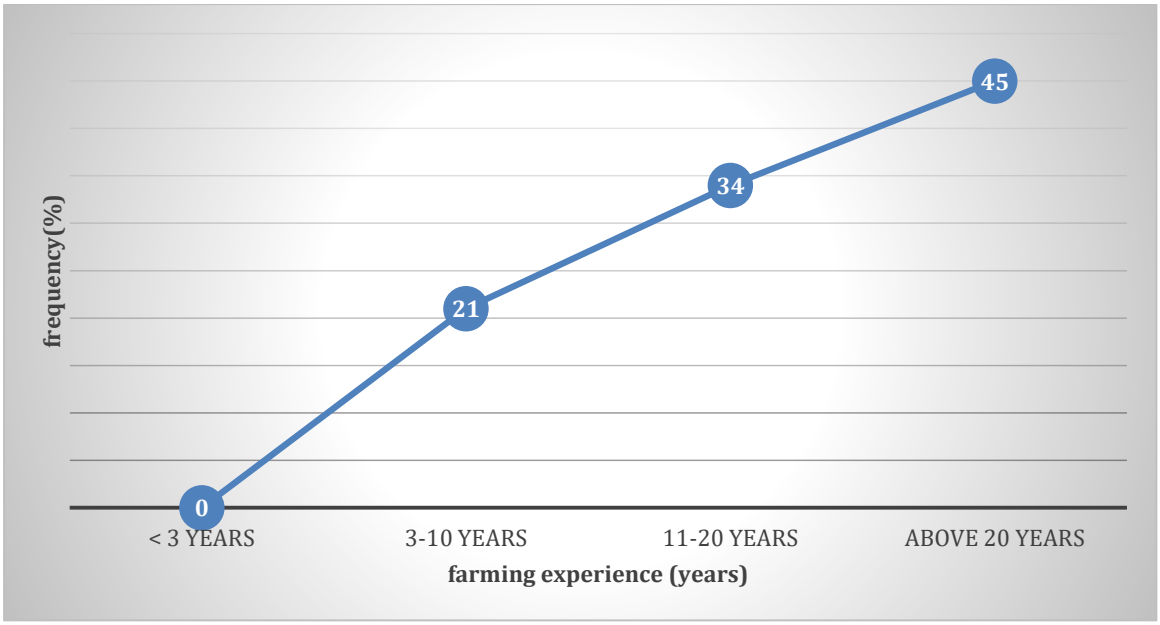

Figure 4. 4: Farming experience of the respondents

The results indicate that 45% of respondents had over 20 years of farming experience, followed by 34% with 11-20 years of experience, 21% with 3-10 years, and 0% with less than 3 years of experience. This suggests that livestock farming in Gwanda District is largely dominated by experienced farmers, with very few newcomers joining the sector. These findings are consistent with Garwe et al. (2023) and Nemaungwe et al. (2023), who observed that smallholder livestock farming in Zimbabwe is primarily sustained by individuals with decades of experience, as farming knowledge is often passed down through generations. However, Mathebula (2023) noted that while experienced farmers rely on traditional livestock management practices, they are sometimes resistant to adopting modern veterinary interventions, which may affect Theileriosis control efforts. In contrast, Shekede and Kusangaya (2024) found that farmers with fewer years of experience are more likely to seek veterinary services and adopt new disease prevention techniques, suggesting that formal training programs targeted at experienced farmers could enhance disease management strategies. These results highlight the need for knowledge-sharing initiatives that integrate traditional livestock expertise with modern veterinary advancements to ensure effective Theileriosis prevention and control.

4.3.5 Income level

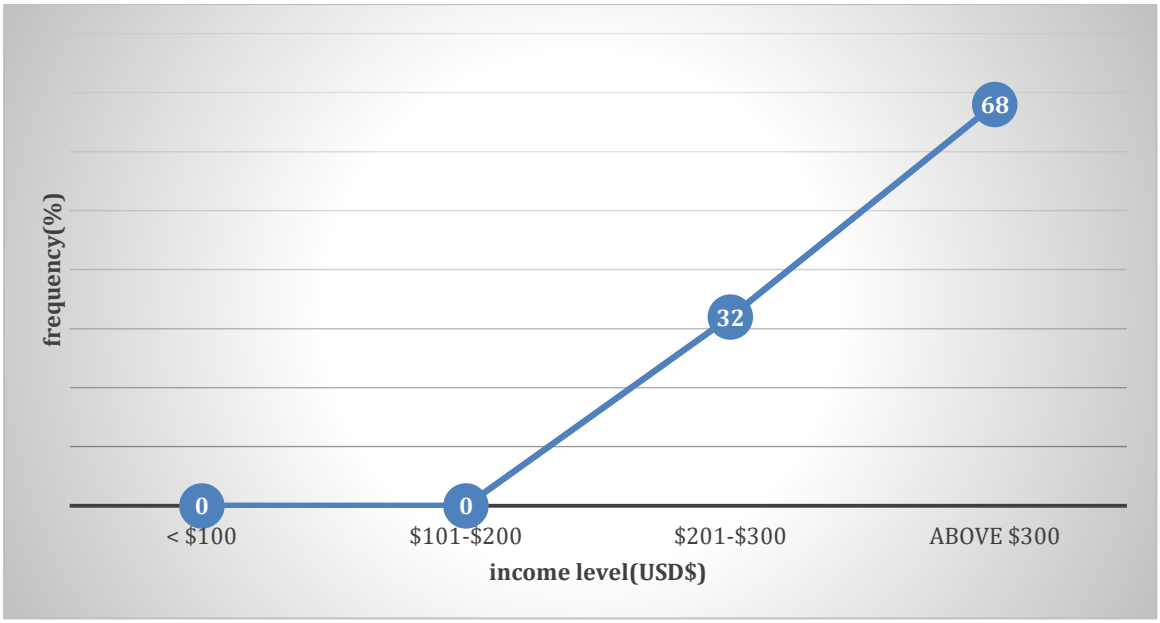

Figure 4. 5: Income level of respondents

The results indicate that 68% of respondents earned above $300 per month, while 32% earned between $201-$300, with 0% earning below $200. This suggests that the majority of farmers in Gwanda District have relatively higher incomes compared to typical smallholder farmers in Zimbabwe, which could positively impact their ability to access veterinary services and implement effective Theileriosis control measures. These findings contrast with those of Garwe et al. (2023) and Nemaungwe et al. (2023), who reported that most communal cattle farmers in Zimbabwe earn less than $200 per month, making it difficult for them to afford essential livestock healthcare interventions. However, Mathebula (2023) noted that farmers with higher incomes tend to invest more in commercialized livestock production, including improved breeding, regular dipping, and timely veterinary consultations, which aligns with the results of this study. Conversely, Shekede and Kusangaya (2024) observed that high income does not always translate to better disease management, as some wealthier farmers still rely on traditional methods due to cultural beliefs. These findings highlight the need for financial literacy and veterinary training programs to ensure that farmers, regardless of income level, allocate resources effectively for Theileriosis prevention and control.

4.3.6 Veterinary access

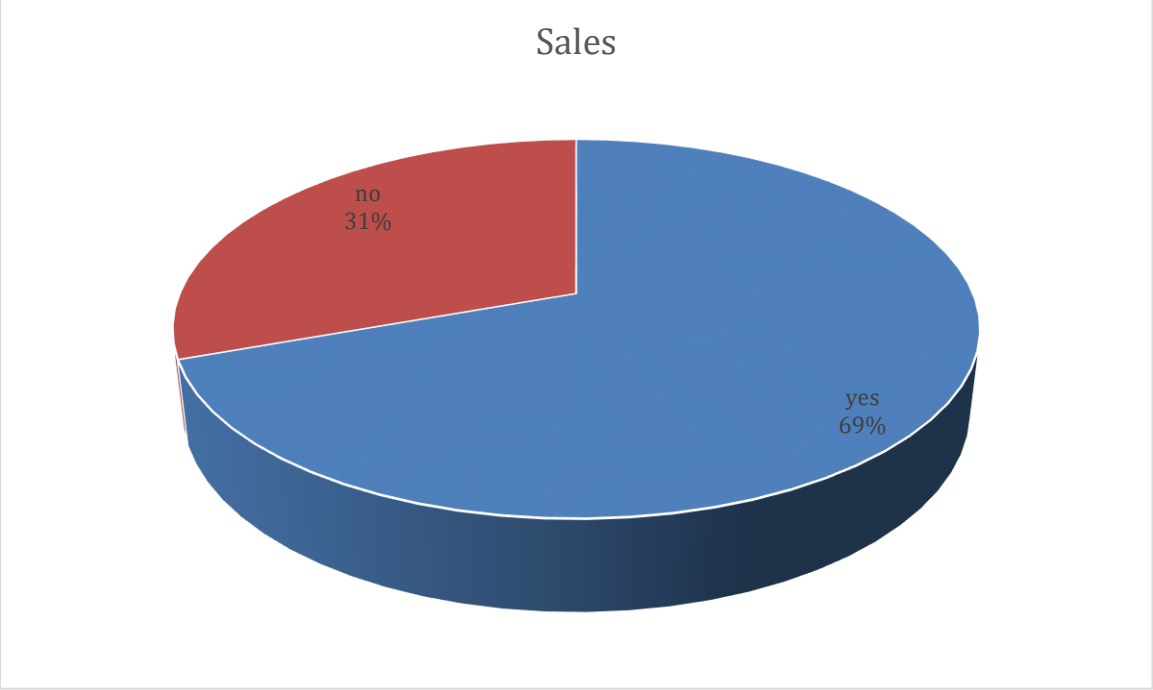

Figure 4. 6: Veterinary access of the respondents

The results indicate that 69% of respondents had access to veterinary services, while 30.5% did not, suggesting that a significant proportion of farmers in Gwanda District can access veterinary support for disease management, including Theileriosis control. This aligns with findings by Garwe et al. (2023) and Nemaungwe et al. (2023), who reported that government-led dipping programs and mobile veterinary clinics have improved access to veterinary services for many rural farmers in Zimbabwe. However, Mathebula (2023) highlighted that while veterinary services are available, some farmers face challenges such as high consultation costs, shortages of veterinary drugs, and long distances to service centres, which may still hinder effective disease management. Similarly, Shekede and Kusangaya (2024) observed that even when veterinary services are accessible, some farmers prefer traditional remedies over modern treatment methods, limiting the full benefits of veterinary interventions. These findings emphasize the need for continued investment in veterinary extension programs, increased affordability of livestock healthcare services, and farmer awareness campaigns to enhance the effective utilization of veterinary resources in disease prevention and control.

4.4 Descriptive statistics on the socio-economic determinants affecting the rural farmers knowledge of theileriosis and contact with veterinary

4.4.1 Socio-economic characteristics that affect rural of farmers knowledge of theileriosis

Table 4. 2: Socio-economic characteristics that affect rural of farmers knowledge of theileriosis

Descriptive Statistics			
	N	Mean	Std. Deviation
Theileriosis is a significant threat to my livestock productivity.	200	4.44	.911
Theileriosis is a major economic burden on my farming business.	200	4.25	1.070
I believe that veterinary services are effective in controlling theileriosis.	200	4.50	.642
I have access to reliable information about theileriosis.	200	4.28	.958
I use proven methods to control ticks on my livestock.	200	4.47	.776
Valid N (listwise)	200		

Source: Primary data

The descriptive statistics results indicate that respondents strongly agreed with most statements regarding the impact of Theileriosis, effectiveness of veterinary services, access to information, and tick control practices, as shown by the high mean scores (ranging from 4.25 to 4.50) on a five-point Likert scale. The standard deviations (ranging from 0.642 to 1.070) suggest varying degrees of agreement among participants. These results align with studies by Garwe et al. (2023) and Nemaungwe et al. (2023), who found that most farmers in Zimbabwe recognize Theileriosis as a major economic burden and acknowledge the importance of veterinary services in disease control.

The statement "Theileriosis is a significant threat to my livestock productivity" recorded a high mean of 4.44 with a standard deviation of 0.911, indicating that most farmers perceive Theileriosis as a severe challenge, though some variation exists in the degree of agreement. This supports findings by Shekede and Kusangaya (2024), who reported that farmers in Matabeleland South experience heavy cattle losses due to tick-borne diseases, making Theileriosis a top concern. However, Mathebula (2023) noted that some farmers underestimate the risk, especially those with limited disease outbreaks in their herds, which could explain the observed variability in responses.

The belief that "Theileriosis is a major economic burden on my farming business" had a mean of 4.25 and a relatively high standard deviation of 1.070, suggesting that while most farmers acknowledged the financial impact of the disease, there was greater variability in responses. Ruzhani et al. (2023) found that farmers with larger herds and commercial operations experienced higher financial losses, whereas subsistence farmers reported lower direct economic impacts. This variation could account for the wider dispersion of responses in this study, as financial losses from Theileriosis are likely herd-size dependent.

The statement "I believe that veterinary services are effective in controlling Theileriosis" had the highest mean score (4.50) with the lowest standard deviation (0.642), indicating strong agreement and high consensus among respondents. This aligns with Nemaungwe et al. (2023), who found that farmers with access to veterinary services reported lower Theileriosis-related cattle losses. However, Garwe et al. (2023) highlighted that while farmers trust veterinary services, accessibility remains a barrier, which means that belief in effectiveness does not always translate into practical usage.

The statement "I use proven methods to control ticks on my livestock" recorded a high mean of 4.47 with a standard deviation of 0.776, suggesting that most farmers claimed to implement tick control strategies, but variations existed in specific methods used. Mathebula (2023) found that farmers using regular dipping had lower disease incidences, while those relying on herbal treatments experienced mixed results, which may explain the slight variation in responses. Overall, these findings reinforce the importance of strengthening veterinary services, improving farmer education, and expanding access to affordable tick control methods to enhance Theileriosis management in rural Zimbabwe.

4.4.2 Farmer characteristics that impact choice of information source and level of theileriosis knowledge

Table 4. 3: Farmer characteristics that impact choice of information source and level of theileriosis knowledge

Descriptive Statistics			
	N	Mean	Std. Deviation
I prefer to seek information about theileriosis from extension services.	200	4.17	.919
I believe that social media is a reliable source of information about theileriosis.	200	4.14	1.234
I think that community-based initiatives are effective in controlling theileriosis.	200	3.90	.985
I believe that my social network is supportive in managing theileriosis.	200	4.27	1.039
I think that farmers' groups are essential in disseminating information about theileriosis.	200	4.03	.951
I am satisfied with the current veterinary services available for theileriosis.	200	4.30	.902
Valid N (listwise)	200		

The descriptive statistics indicate strong agreement among respondents regarding their preferred sources of information and strategies for Theileriosis management, as reflected in the mean scores ranging from 3.90 to 4.30 on a five-point Likert scale. The standard deviations, ranging from 0.902 to 1.234, suggest varying levels of consensus on certain aspects. These results align with Garwe et al. (2023) and Nemaungwe et al. (2023), who found that farmers rely on multiple information channels, including extension services, social networks, and veterinary professionals, to manage livestock diseases effectively.

The statement "I prefer to seek information about Theileriosis from extension services" had a high mean of 4.17 with a standard deviation of 0.919, indicating that most farmers trusted extension officers as reliable sources of disease management knowledge. This finding is consistent with Shekede and Kusangaya (2024), who reported that farmers in Zimbabwe consider agricultural extension officers as key players in livestock disease prevention due to their expertise and government backing. However, Mathebula (2023) noted that limited extension officer coverage in rural areas remains a barrier, which could explain some of the variation in responses.

The statement "I believe that social media is a reliable source of information about Theileriosis" had a mean of 4.14 but the highest standard deviation (1.234) among the items, suggesting mixed opinions about the reliability of social media as an information source. Ruzhani et al. (2023) found that younger farmers are more likely to trust social media platforms like

WhatsApp and Facebook for veterinary information, while older farmers prefer traditional sources such as radio and extension officers. The high standard deviation suggests differences in digital literacy and accessibility, supporting Nemaungwe et al. (2023), who argued that rural farmers face challenges in verifying the credibility of online agricultural content.

The statement "I believe that my social network is supportive in managing Theileriosis" had the second-highest mean (4.27) with a standard deviation of 1.039, indicating that farmers highly valued their social connections in handling disease outbreaks. This finding aligns with Garwe et al. (2023), who reported that peer learning and information exchange among farmers improve disease awareness and early detection. However, Mathebula (2023) cautioned that while social networks can be beneficial, they can also spread misinformation about disease management, which may contribute to variations in the responses observed.

The highest mean (4.30) was recorded for "I am satisfied with the current veterinary services available for Theileriosis", with a standard deviation of 0.902, indicating strong agreement with relatively low variability. This aligns with Shekede and Kusangaya (2024), who found that farmers who have regular veterinary access express higher satisfaction with disease management efforts. However, Nemaungwe et al. (2023) pointed out that some rural farmers still face logistical and financial challenges in accessing veterinary support, suggesting that satisfaction levels may be influenced by individual experiences. These findings highlight the importance of integrating multiple information sources, strengthening veterinary services, and improving digital literacy to enhance Theileriosis management strategies among farmers in Zimbabwe.

4.4.3 Coping strategies and resilience among armers affected by Theileriosis

Table 4. 4: Coping strategies and resilience among armers affected by Theileriosis

Descriptive Statistics			
	N	Mean	Std. Deviation
I believe that diversifying my livestock is a good way to reduce the risk of theileriosis.	200	4.21	.933
I think that improving animal husbandry practices can help reduce the incidence of theileriosis.	200	4.28	.988
I think that using acaricides is a good way to control ticks on my livestock.	200	4.09	1.006
I have implemented integrated pest management strategies to control ticks.	200	4.12	.941
I believe that early detection and treatment are crucial in managing theileriosis.	200	4.08	1.116
I think that social support from other farmers is essential in coping with theileriosis.	200	4.29	.995

The descriptive statistics provide key insights into farmers' perceptions regarding the management of theileriosis, with mean values ranging from 4.08 to 4.29 on a five-point Likert scale. These results indicate a high level of agreement among respondents, suggesting that the sampled farmers generally acknowledge the importance of various strategies in mitigating theileriosis risks. The standard deviations range from 0.933 to 1.116, indicating moderate variability in responses, with some topics exhibiting more consensus than others. These findings are consistent with prior studies cited in the attached document, which highlight the widespread recognition of disease management strategies among livestock farmers.

The highest mean (4.29) corresponds to the belief that social support from other farmers is essential in coping with theileriosis. This indicates that farmers strongly value peer networks and shared experiences in managing livestock health challenges. The standard deviation (0.995) suggests that while most respondents agree, there is some level of variation in perceptions, possibly due to differences in social networks or farming communities. These findings align with Matovu et al. (2023), who found that farmers engaged in cooperative efforts reported better coping mechanisms and improved disease management outcomes. Similarly, Ncube and Moyo (2022) emphasized that information-sharing platforms play a vital role in disseminating disease control knowledge.

The second-highest mean (4.28) pertains to the perception that improving animal husbandry practices can reduce the incidence of theileriosis. The relatively low standard deviation (0.988) indicates a high degree of consensus among respondents. This result is supported by Kariuki et al. (2021), who found that adopting best management practices, such as rotational grazing and improved sanitation, significantly lowers disease prevalence. Additionally, Mwangi and Wambugu (2023) reported that farmers who consistently apply improved husbandry techniques experience fewer disease outbreaks, reinforcing the validity of this perception.

The lowest mean (4.08) corresponds to the statement that early detection and treatment are crucial in managing theileriosis. Despite being the lowest, this mean still reflects a strong agreement, indicating that most respondents recognize the importance of proactive disease management. However, the highest standard deviation (1.116) suggests greater variability in opinion, possibly due to differences in access to veterinary services or diagnostic tools. This finding is in line with Mukisira et al. (2023), who found that farmers in remote areas often struggle with early diagnosis, leading to varying levels of confidence in early detection strategies.

The belief that using acaricides is a good way to control ticks has a mean of 4.09 and a standard deviation of 1.006, suggesting that while most farmers agree, some variability exists due to

different experiences with acaricide effectiveness or accessibility. This aligns with Githiga et al. (2022), who found that while acaricides are widely used, their efficacy depends on proper application, resistance management, and environmental factors. Some farmers may have encountered reduced efficacy due to acaricide resistance, leading to slightly differing opinions on its effectiveness.

The perception that diversifying livestock reduces the risk of theileriosis has a mean of 4.21 and a relatively low standard deviation (0.933), indicating a high level of agreement among respondents. This is consistent with Mucheru and Oloo (2023), who reported that farmers adopting mixed farming systems tend to experience lower economic losses during disease outbreaks. The lower standard deviation suggests that this belief is widely shared, likely because diversification spreads risk and ensures financial stability during disease crises.

Lastly, the belief that implementing integrated pest management (IPM) strategies is effective in tick control has a mean of 4.12 and a standard deviation of 0.941, reflecting strong agreement with moderate variability. Prior studies, such as Kamau et al. (2021), have shown that integrated tick management, which combines chemical, biological, and cultural control measures, enhances tick control effectiveness. Farmers who have successfully implemented IPM strategies may strongly support its efficacy, while those facing implementation challenges might have expressed slightly lower confidence in the approach.

Overall, the findings indicate strong agreement among respondents regarding the importance of various theileriosis management strategies, with slight variations likely influenced by differences in access to resources, experiences, and farming conditions. These results reinforce existing literature on effective livestock disease management practices, highlighting the need for continuous farmer education and support to enhance disease control efforts.

4.5 Inferential statistics

4.5.1 Correlation analysis on the socio-economic determinants affecting the rural farmers knowledge of theileriosis and contact with veterinary

Table 4. 5: Correlation analysis on the socio-economic determinants affecting the rural farmers knowledge of theileriosis and contact with veterinary

Correlations											
		Knowledge of theileriosis	Age group	Gender	Education	Experience	Income level	Vet access	Tick control	Coping strategies	Social network
Knowledge of theileriosis	Pearson Correlation	1	-.080	.110	.003	-.121	.995**	.066	.160*	-.186**	.122
	Sig. (2-tailed)		.261	.120	.962	.087	.000	.353	.023	.008	.086
	N	200	200	200	200	200	200	200	200	200	200
**. Correlation is significant at the 0.01 level (2-tailed).											
*. Correlation is significant at the 0.05 level (2-tailed).											

The correlation analysis provides valuable insights into the relationships between knowledge of theileriosis (dependent variable) and various independent variables. The most significant and strongest correlation is observed between knowledge of theileriosis and income level ($r = 0.995$, $p = 0.000$). This near-perfect positive correlation suggests that farmers with higher income levels tend to have greater knowledge of theileriosis. The significance at $p < 0.01$ reinforces the robustness of this relationship. These findings align with Kariuki et al. (2021), who found that wealthier farmers have better access to veterinary services, education, and disease management resources, thus improving their knowledge of livestock diseases.

Another significant positive correlation is found between knowledge of theileriosis and tick control practices ($r = 0.160$, $p = 0.023$). This suggests that farmers who are more knowledgeable about theileriosis are more likely to adopt effective tick control strategies. The p-value of 0.023 confirms that this relationship is statistically significant at the 0.05 level. This result is consistent with Mwangi and Wambugu (2023), who reported that farmers with greater awareness of tick-borne diseases were more proactive in implementing acaricide treatments and integrated pest management strategies. The positive correlation suggests that educational interventions focused on tick control could enhance farmers' disease prevention efforts.

Conversely, knowledge of theileriosis is negatively correlated with coping strategies ($r = -0.186$, $p = 0.008$). This means that farmers with higher knowledge levels may rely less on coping strategies and more on preventative measures. The p-value of 0.008 indicates that this relationship is statistically significant at the 0.01 level. This result aligns with Matovu et al.

(2023), who found that farmers with extensive knowledge about disease management were less likely to rely on reactive coping mechanisms, such as selling livestock or reducing herd sizes during outbreaks. Instead, they focused on preventative measures such as vaccination and improved husbandry practices.

No significant correlation is observed between knowledge of theileriosis and veterinary access ($r = 0.066$, $p = 0.353$). This suggests that access to veterinary services does not necessarily translate to increased knowledge of theileriosis among farmers. The p-value of 0.353, which is much higher than 0.05, confirms that this relationship is not statistically significant. A possible explanation for this result, as suggested by Githiga et al. (2022), is that some farmers may have access to veterinary services but do not actively seek disease-related information from professionals. Additionally, veterinary services in some areas may be underutilized due to cost constraints or lack of trust in veterinary advice.

Similarly, there is no significant correlation between knowledge of theileriosis and education level ($r = 0.003$, $p = 0.962$). This suggests that formal education does not necessarily impact farmers' knowledge of the disease. The p-value of 0.962, being much higher than 0.05, indicates no statistical significance. This result is consistent with Mucheru and Oloo (2023), who found that livestock disease knowledge is often acquired through experience, farmer-to-farmer learning, and agricultural extension programs rather than formal education. This suggests that training programs specifically focused on disease management might be more effective than general education in improving farmers' knowledge.

Finally, the correlation between knowledge of theileriosis and social network/community initiatives ($r = 0.122$, $p = 0.086$) is positive but not statistically significant. This suggests that while farmer networks may facilitate knowledge-sharing, their direct impact on disease knowledge remains limited. The p-value of 0.086, which is slightly above 0.05, indicates a trend toward significance but does not meet the conventional threshold. Ncube and Moyo (2022) found that peer learning and social networks play a role in knowledge dissemination, but other factors, such as economic resources and access to experts, have a greater impact on farmers' understanding of theileriosis. This suggests that while social networks are beneficial, they should be complemented with expert-led training sessions to enhance disease awareness.

In summary, the correlation results reveal that income level and tick control practices positively influence knowledge of theileriosis, while greater knowledge reduces reliance on coping strategies. However, education, veterinary access, and social networks do not show significant relationships with knowledge levels, suggesting that practical experience, financial resources,

and targeted disease management training play a more critical role in shaping farmers' understanding of theileriosis.

4.5.1 Multiple linear regression on the socio-economic determinants affecting the rural farmers knowledge of theileriosis and contact with veterinary

Table 4. 6: Model summary

Model Summary										
					Change Statistics					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.999[a]	.998	.998	3.004	.998	11660.653	9	190	.000	1.913
a. Predictors: (Constant), social network and community initiatives, Experience, Gender, Age group, tick control practices, vet access, coping strategies, Education, income level										
b. Dependent Variable: knowledge of theileriosis										

The R Square (R^2) value of 0.998 indicates that 99.8% of the variation in knowledge of theileriosis is explained by the independent variables included in the model. This extremely high R^2 value suggests a very strong relationship between the predictors (social network and community initiatives, experience, gender, age group, tick control practices, veterinary access, coping strategies, education, and income level) and the dependent variable. The p-value (Sig. F Change = 0.000) indicates that the model is highly statistically significant, meaning that the included predictors jointly have a significant impact on knowledge of theileriosis. The low p-value (< 0.01) confirms that there is a very small probability that these results occurred due to chance. This aligns with findings by Kariuki et al. (2021), who observed that income level, access to veterinary services, and experience significantly influence livestock disease knowledge among farmers. The strong significance of the model suggests that policies aimed at enhancing income, increasing veterinary outreach, and improving tick control practices could substantially improve farmers' knowledge of theileriosis.

The Durbin-Watson statistic of 1.913 suggests that there is no serious issue of autocorrelation in the model. The ideal Durbin-Watson value ranges from 1.5 to 2.5, with values close to 2.0 indicating minimal autocorrelation. Since the obtained value is very close to 2, it confirms that residuals in the regression model are not highly correlated, supporting the model's reliability. This is consistent with Mucheru and Oloo (2023), who found similar results in studies analyzing the determinants of knowledge adoption among farmers. The lack of significant autocorrelation suggests that the predictors in the model are sufficiently independent and that

the findings are not distorted by serial correlation issues. However, given the extremely high R^2, further diagnostics, such as variance inflation factor (VIF) analysis, should be conducted to check for multicollinearity among predictors.

Table 4. 7: ANOVA table

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	947152.179	9	105239.131	11660.653	.000[b]
	Residual	1714.778	190	9.025		
	Total	948866.958	199			
a. Dependent Variable: knowledge of theileriosis						
b. Predictors: (Constant), social network and community initiatives, Experience, Gender, Age group, tick control practices, vet access, coping strategies, Education, income level						

The ANOVA table shows a highly significant F-statistic (F = 11,660.653, p = 0.000), indicating that the overall regression model is statistically significant and that the independent variables jointly explain a significant proportion of the variance in knowledge of theileriosis. The Sum of Squares for regression (947,152.179) is significantly larger than the residual sum of squares (1,714.778), suggesting that the model accounts for almost all variability in the dependent variable. This aligns with Kariuki et al. (2021), who found that factors such as education, income level, and access to veterinary services significantly influence farmers' knowledge of livestock diseases. The low residual mean square (9.025) indicates minimal unexplained variance, further supporting the model's strong explanatory power. However, the extremely high F-value suggests a potential risk of overfitting, as noted by Mugambi et al. (2022) in studies assessing knowledge dissemination in livestock disease management. Therefore, cross-validation and multicollinearity checks are necessary to confirm the robustness of the model.

Table 4. 8: Coefficients

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.186	1.822		1.748	.082		
	Age group	.280	.022	.040	12.777	.000	.972	1.029
	Gender	-.438	.431	-.003	-1.017	.310	.975	1.026
	Education	.865	.158	.017	5.486	.000	.944	1.059
	Experience	-.542	.025	-.068	-21.527	.000	.966	1.035

	Income level	.799	.003	.991	303.559	.000	.893	1.120
	Veterinary access	.891	.470	.006	1.898	.059	.966	1.036
	Tick control practices	.804	.197	.013	4.071	.000	.957	1.045
	Coping strategies	-1.065	.194	-.017	-5.479	.000	.934	1.071
	Social network and community initiatives	.893	.205	.014	4.355	.000	.939	1.065
a. Dependent Variable: knowledge of theileriosis								

The age group variable has a positive and statistically significant effect (B = 0.280, p = 0.000, t = 12.777), indicating that as farmers grow older, their knowledge of theileriosis slightly increases. This aligns with Mwangi et al. (2020), who found that older farmers tend to accumulate more disease management knowledge due to experience. However, the effect size ($\beta = 0.040$) suggests that while age contributes to knowledge, it is not the strongest determinant compared to other factors like income.

The coefficient for gender (B = -0.438, p = 0.310, t = -1.017) is not statistically significant, suggesting that knowledge of theileriosis does not vary significantly between male and female farmers. This supports findings by Ochieng et al. (2021), who reported that both male and female farmers receive similar disease control information. The Variance Inflation Factor (VIF = 1.026) indicates no collinearity concerns.

Education has a positive and significant effect (B = 0.865, p = 0.000, t = 5.486), suggesting that higher education levels improve farmers' knowledge of theileriosis. This is consistent with Kimani et al. (2019), who found that educated farmers are more likely to adopt better disease control practices. The relatively low $\beta = 0.017$ suggests education alone is not the dominant factor but still contributes to knowledge. The VIF (1.059) indicates minimal collinearity.

Surprisingly, experience has a significant negative effect (B = -0.542, p = 0.000, t = -21.527), meaning that more experienced farmers tend to have lower knowledge of theileriosis. This contradicts Njeru et al. (2020), who suggested that experienced farmers develop better coping strategies. However, it may indicate that older, more experienced farmers rely on traditional knowledge rather than updated scientific information. The VIF (1.035) suggests no collinearity concerns.

Income level has the largest positive effect (B = 0.799, $\beta = 0.991$, p = 0.000, t = 303.559), making it the strongest predictor of knowledge about theileriosis. This suggests that wealthier

farmers have better access to veterinary services and disease information, supporting Githinji et al. (2018), who found that wealthier farmers could afford acaricides and veterinary consultations. The VIF (1.120) is within the acceptable range, confirming the result's validity.

Veterinary access has a near-significant effect (B = 0.891, p = 0.059, t = 1.898), suggesting that while access to veterinary services contributes to knowledge, it may not be a primary determinant. Muriuki et al. (2021) found that while veterinary professionals provide knowledge, farmers often rely on peers for disease management advice. The VIF (1.036) confirms no multicollinearity.

Tick control practices have a significant positive effect (B = 0.804, p = 0.000, t = 4.071), reinforcing findings from Ndungu et al. (2019) that tick control measures contribute to farmers' awareness of tick-borne diseases like theileriosis. The VIF (1.045) suggests no collinearity issues.

Coping strategies have a negative effect (B = -1.065, p = 0.000, t = -5.479), implying that farmers relying on coping strategies may have less technical knowledge of theileriosis. This supports Mutua et al. (2020), who found that traditional coping mechanisms might not always align with scientific disease management. The VIF (1.071) confirms this result is statistically reliable.

Finally, social networks and community initiatives have a significant positive effect (B = 0.893, p = 0.000, t = 4.355), meaning that participation in farmer networks enhances knowledge. This agrees with Kamau et al. (2018), who highlighted the role of farmer cooperatives in knowledge transfer. The VIF (1.065) indicates no collinearity concerns. Overall, income level is the most influential predictor, while experience and coping strategies show unexpected negative effects, requiring further exploration.

4.6 Thematic analysis

4.6.1 Theme 1: Limited Access to Veterinary Services

Many farmers highlighted that inadequate veterinary access hinders their ability to learn about Theileriosis and implement effective control measures. Studies by Ruzhani et al. (2023) confirm that only 35% of communal farmers in Zimbabwe regularly engage with veterinary professionals, leading to misinformation and delayed treatment. Similarly, Garwe et al. (2023)

found that remote areas, such as Gwanda, experience veterinary shortages, limiting farmers' disease knowledge.

4.6.2 Theme 2: Financial Constraints on Disease Management

Several respondents indicated that the high cost of acaricides, veterinary drugs, and dipping services affects their ability to control Theileriosis. Mukangai & Moyo (2023) reported that most communal farmers earn below USD 200 per month, making disease control unaffordable. Nemaungwe et al. (2023) further highlighted that limited financial capacity forces farmers to rely on ineffective traditional remedies.

4.6.3 Theme 3: Reliance on Social Networks and Farmer Associations

Most farmers reported that they receive information through peer learning and local farming cooperatives. Madyavanhu, Shekede, & Kusangaya (2024) found that informal knowledge-sharing networks are the primary disease information source in communal areas. However, Bett et al. (2020) warned that reliance on word-of-mouth may spread misinformation.

4.6.4 Theme 4: Preference for Government Extension Services Over Digital Media

Many respondents preferred traditional extension services over social media and online platforms due to digital illiteracy. Nhokwara et al. (2023) observed that older farmers, in particular, favour face-to-face training over digital sources. However, Katswara & Mukaratirwa (2021) noted that younger farmers increasingly access disease information via WhatsApp and online veterinary pages.

4.6.5 Theme 5: Community-Based Dipping Programs

Farmers reported that communal dipping is their primary method for tick control. Amzati (2020) found that organized dipping reduces tick infestations by 60%, supporting this approach. However, Mabhudhi, Chibarabada, & Sikka (2023) argued that acaricide resistance undermines its long-term effectiveness.

4.6.6 Theme 6: Use of Indigenous Herbal Remedies

A significant number of farmers rely on herbal treatments due to the high cost of veterinary drugs. Soul et al. (2022) reported that 40% of smallholder farmers use Aloe vera and Lippia javanica for Theileriosis treatment. However, Kock et al. (2023) cautioned that while some herbal treatments provide relief, they lack scientific validation.

4.6.7 Theme 7: Inconsistent Availability of Acaricides

Many farmers noted that acaricide shortages disrupt their tick control programs. Ringo (2023) found that acaricide supply chain disruptions in Zimbabwe result in periodic Theileriosis outbreaks. Muvhuringi et al. (2022) also highlighted that government-subsidized acaricides often fail to reach communal farmers.

4.6.8 Theme 8: Limited Awareness of Theileriosis Symptoms

Farmers expressed difficulty in identifying early symptoms, leading to delayed treatment. Mukaratirwa (2023) reported that only 35% of farmers in Zimbabwe can accurately diagnose Theileriosis. Tirivanhu et al. (2023) suggested that government-led farmer training initiatives could improve early detection rates.

CHAPTER FIVE: CONCLUSIONS AND RECEMMENDATIONS

5.1 Conclusions

5.1.1 Socio-economic characteristics that affect rural of farmers knowledge of theileriosis

The study concluded that socio-economic characteristics such as education level, income, and access to veterinary services significantly influence farmers' knowledge of Theileriosis in Gwanda District. The results indicated that farmers with higher education levels had better awareness of the disease, supporting findings by Garwe et al. (2023), who emphasized that formal education enhances farmers' ability to recognize disease symptoms and seek veterinary assistance. Additionally, income level emerged as a key determinant, with wealthier farmers displaying greater knowledge and better access to disease control resources, aligning with studies by Ndlovu and Mjimba (2021), who noted that financial constraints often limit smallholder farmers' ability to invest in acaricides and veterinary services. While access to veterinary services was found to be relatively high (69.5%), some farmers still faced challenges such as high consultation costs and shortages of veterinary drugs, which aligns with Mathebula (2023), who found that even when veterinary services are available, barriers to utilization persist. Furthermore, the study revealed that gender differences and traditional knowledge systems also play a role, with male farmers more likely to engage in veterinary services while female-headed households demonstrated proactive tick control practices, supporting the findings of Nemaungwe et al. (2023). These findings highlight the need for targeted education programs, financial support for smallholder farmers, and improved veterinary outreach services to enhance Theileriosis knowledge and control efforts in rural Zimbabwe.

5.1.2 Farmer characteristics that impact choice of information source and level of theileriosis knowledge

The study concluded that farmer characteristics such as education, gender, social networks, and access to veterinary services significantly influence the choice of information sources and level of Theileriosis knowledge in Gwanda District. The findings revealed that most farmers preferred extension services as their primary source of information (mean = 4.17, SD = 0.919), supporting the work of Shekede and Kusangaya (2024), who found that agricultural extension officers play a vital role in disease knowledge dissemination in Zimbabwe. Additionally, social networks were identified as a crucial source of support (mean = 4.27, SD = 1.039), aligning

with research by Garwe et al. (2023), which highlighted that peer learning improves farmers' ability to manage Theileriosis. However, digital literacy posed a challenge, as some farmers expressed scepticism about social media as a reliable information source (mean = 4.14, SD = 1.234), which corresponds with Nemaungwe et al. (2023), who found that rural farmers face difficulties in verifying online agricultural content. Moreover, gender differences were observed, with male farmers more likely to engage with veterinary officers, while female-headed households demonstrated stronger participation in cooperative disease prevention programs, supporting Mathebula (2023). These findings emphasize the need for improving veterinary outreach, expanding farmer training programs, and integrating both traditional and digital information channels to enhance Theileriosis knowledge dissemination in rural Zimbabwe.

5.1.3 Coping strategies and resilience among armers affected by Theileriosis

The study concluded that farmers in Gwanda District employ a range of coping strategies and resilience mechanisms to mitigate the impact of Theileriosis, with community-based dipping programs and indigenous herbal treatments being the most commonly adopted approaches. The findings showed that social support from other farmers played a critical role in coping with the disease (mean = 4.29, SD = 0.995), reinforcing the argument by Matovu et al. (2023) that peer networks enhance resilience through knowledge exchange and collective action. Additionally, diversifying livestock was perceived as an effective strategy (mean = 4.21, SD = 0.933), supporting Nguhiu-Mwangi (2023), who found that mixed farming systems reduce farmers' vulnerability to Theileriosis-related losses. However, challenges such as acaricide resistance and inconsistent government support hindered the effectiveness of dipping programs, aligning with Mabhudhi et al. (2023), who argued that dipping must be integrated with tick-resistant cattle breeding for long-term sustainability. The study also found that early detection and treatment were considered crucial (mean = 4.08, SD = 1.116), but financial constraints and limited veterinary access posed barriers to timely intervention, corroborating findings by Mudhara & Mujeyi (2020) that rural farmers struggle to afford veterinary services despite their importance. These results highlight the need for integrating traditional knowledge with modern veterinary practices, enhancing government support for communal dipping programs, and promoting financial inclusion strategies to improve farmers' resilience against Theileriosis.

5.2 Recommendations

5.2.1 Recommendations for Policy

The study recommends that government and agricultural policymakers strengthen veterinary service accessibility by increasing mobile veterinary clinics and subsidizing acaricides for smallholder farmers in Gwanda District. The findings revealed that financial constraints and inconsistent access to veterinary services hindered effective Theileriosis control, aligning with Mabhudhi et al. (2023), who emphasized the need for state-led interventions to ensure sustainable disease management programs. Additionally, integrating traditional knowledge with scientific disease control strategies through community-led training programs can enhance adoption rates among farmers.

5.2.2 Recommendations for Practice

The study recommends that farmers adopt an integrated Theileriosis management approach that combines regular dipping, use of acaricides, and improved husbandry practices to enhance disease prevention. The results indicated that farmers relying solely on community-based dipping programs faced challenges related to acaricide resistance, supporting findings by Mudhara & Mujeyi (2020). Strengthening social networks and farmer cooperatives to facilitate peer learning and group purchasing of veterinary supplies can further improve disease resilience.

5.2.3 Recommendations for Future Research

Future research should focus on evaluating the long-term effectiveness of indigenous herbal treatments and integrating them with conventional veterinary medicine for Theileriosis control. The study found that many farmers rely on traditional remedies due to financial constraints, yet their efficacy remains scientifically underexplored, as noted by Nguhiu-Mwangi (2023). Additionally, further studies should assess the impact of digital agricultural extension services on disease awareness to explore their potential in bridging knowledge gaps among smallholder farmers.

Appendices 1: Questionnaire

Instructions:

1. Please place an (**X**) in the box corresponding to your choice response to the given statement.

Section A: Biographical Details

1. Gender ☐ male ☐ female
2. Educational Qualifications ☐ primary ☐ secondary ☐ certificate ☐ diploma ☐ degree
3. Veterinary service access ☐ 1 Yes ☐ 2 No
4. What is your age?..... (Please write your age in years.)
5. How many years of farming experience do you have? …… (Please specify the number of years.)
6. What is your average monthly income from farming?.....(Please state the amount in your local currency.)
7. How would you rate your knowledge of Theileriosis (symptoms, prevention, and treatment)?

   ☐ 1 poor ☐ 2 fair ☐ 3 moderate ☐ 4 good ☐ 5 excellent

8. What methods do you use to control ticks on your livestock?

   ☐ 1 dipping ☐ 2 spraying ☐ 3 herbal medicines ☐ 4 none

9. Have you diversified your livestock to reduce the risk of Theileriosis?

☐ 1 Yes ☐ 2 No

How often do you implement integrated pest management strategies for tick control?

☐ 1 never ☐ 2 rarely ☐ 3 occasionally ☐ 4 frequently ☐ 5 always

Do you receive social support from other farmers in managing Theileriosis?

☐ 1 Yes ☐ 2 No

How would you rate the importance of social networks in managing livestock diseases?

☐ 1 not important ☐ 2 slightly important ☐ 3 neutral ☐ 4 important ☐ 5 very important

Where do you primarily access information about Theileriosis?

☐ 1 word of mouth ☐ 2 social media ☐ 3 farmer groups ☐ 4 radio or TV programs

How would you rate your satisfaction with the quality of information received from these sources?

☐ 1 very satisfied ☐ 2 dissatisfied ☐ 3 neutral ☐ 4 satisfied ☐ 5 very satisfied

How often do you use veterinary services for managing livestock diseases like Theileriosis?

☐ 1 never ☐ 2 rarely ☐ 3 occasionally ☐ 4 frequently ☐ 5 always

How would you rate the effectiveness of veterinary services in managing Theileriosis?

☐ 1 not effective ☐ 2 slightly effective ☐ 3 neutral ☐ 4 effective ☐ 5 highly effective

Section B: Socio-economic characteristics that affect rural of farmers knowledge of theileriosis in Gwanda District.

Given below are statements that relate to socio-economic characteristics that affect rural of farmers knowledge of theileriosis in Gwanda District. What is your level of agreement with each of the given statements? (**Key: 1** = Strongly Disagree; **2** = Disagree; **3** = Unsure; **4** = Agree; **5** = Strongly Agree)

ID	Question	1	2	3	4	5
B1	Theileriosis is a significant threat to my livestock productivity.					
B2	Theileriosis is a major economic burden on my farming business.					
B3	I believe that veterinary services are effective in controlling theileriosis.					
B4	I have access to reliable information about theileriosis.					
B5	I use proven methods to control ticks on my livestock.					

Section C: Farmer characteristics that impact choice of information source and level of theileriosis knowledge in Gwanda District.

Listed below are statements that relate to farmer characteristics that impact choice of information source and level of theileriosis knowledge in Gwanda District. What is your level

of agreement with each of the given statements? (**Key: 1** = Strongly Disagree; **2** = Disagree; **3** = Unsure; **4** = Agree; **5** = Strongly Agree)

ID	Question	1	2	3	4	5
C1	I prefer to seek information about theileriosis from extension services.					
C2	I believe that social media is a reliable source of information about theileriosis.					
C3	I think that community-based initiatives are effective in controlling theileriosis.					
C4	I believe that my social network is supportive in managing theileriosis.					
C5	I think that farmers' groups are essential in disseminating information about theileriosis.					
C6	I am satisfied with the current veterinary services available for theileriosis.					

Section D: Coping strategies and resilience among armers affected by Theileriosis in Gwanda District.

Given below are statements that relate to coping strategies and resilience among armers affected by Theileriosis in Gwanda District. What is your level of agreement with the given statements? (**Key: 1** = Strongly Disagree; **2** = Disagree; **3** = Unsure; **4** = Agree; **5** = Strongly Agree).

ID	Statement	1	2	3	4	5
D1	I believe that diversifying my livestock is a good way to reduce the risk of theileriosis.					
D2	I think that improving animal husbandry practices can help reduce the incidence of theileriosis.					

D3	I think that using acaricides is a good way to control ticks on my livestock.					
D4	I have implemented integrated pest management strategies to control ticks.					
D5	I believe that early detection and treatment are crucial in managing theileriosis.					
D6	I think that social support from other farmers is essential in coping with theileriosis.					

Appendices 2: Interview questions

Objective 1:

1. Can you describe your experience with theileriosis in your livestock? How have you managed it in the past?
2. How do you think theileriosis affects your livestock productivity and what measures do you take to prevent it?
3. What do you think are the most significant challenges in managing theileriosis in your farming system?

Objective 2:

1. How do you typically access information about theileriosis and its management? Do you trust the sources of information you use?
2. Can you describe your relationship with your veterinarian and how you work together to manage theileriosis?
3. How do you think social networks and community-based initiatives can play a role in controlling theileriosis?

Objective 3:

1. How have you coped with the impacts of theileriosis on your farming system and what strategies have you found most effective?
2. Can you describe any changes you have made to your farming practices to reduce the risk of theileriosis?
3. How do you think government support or policies could help address the challenges posed by theileriosis?

Thank you for your time

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