BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF AGRICULTURE AND ENVIRONMENTAL SCIENCE

THE EFFECTS OF TICK-BORNE DISEASES ON SMALL SCALE CATTLE FARMING IN MUREHWA DISTRICT.

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A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF ANIMAL SCIENCE, BINDURA UNIVERSITY OF SCIENCE EDUCATION, IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF THE BACHELOR OF AGRICULTURAL SCIENCE HONOURS DEGREE IN ANIMAL SCIENCE AND TECHNOLOGY.

DECEMBER 2022

APPROVAL FORM

The undersigned confirm that, they have read and recommended this research project entitled**, The effects of tick-borne diseases on small scale cattle farming in Murehwa district**, submitted to Bindura University of Science Education by **RUMBIDZAI MUBAIWA (B190321A)** in partial fulfilment of the requirements of the Honours Degree in Animal Science and Technology.

Supervisor

I certify that I have supervised **Rumbidzai Mubaiwa** for this research titled, “to ascertain the effects of tick-borne diseases affecting small scale cattle farmers in Murehwa district” in partial fulfilment of the requirements for the Honours Degree in Animal Science and Technology and recommend that it proceeds for examination.

Mr TNC Mangwiro ……………………………

(Supervisor) Date

ABSTRACT

A significant biotic element affecting the production, handling, and management of livestock is cattle diseases; in particular vector borne diseases. In Murehwa district of Mashonaland East Province of Zimbabwe, a survey was undertaken to determine the effects of tick-borne diseases on small-scale farming. A questionnaire was utilized to gather data on the socio-demographics and general tick-related issues that cattle in the area were facing. Statistical analysis using descriptive analysis was carried out in SPSS version 20. The data was summarised in tables, graphs and charts. It was determined that diseases transmitted by ticks were the main cause of the deaths of cattle. The majority of farmers in Murehwa district (30.8%) own between 10 and 19 cattle, the largest herd size was above 60. 43.8% respondents encountered cattle deaths between the range of 1 and 5. Farmers (31.3%) lost between 6 and 10 cattle, and 20% of the farmers lost cattle above 10. Most farmers in the Murehwa district keep cattle for draught power and practice mixed farming. Knowledge on cattle dipping was 64.6%. The effectiveness of acaricides was hindered because not all ticks left their hosts after being dipped and few farmers followed dipping regimes. The researcher recommended for improved public awareness and the value of disease control especially to the community by using social media and radio.

Key words: Tick-borne disease, Murehwa district, Theileriosis, Veterinary services.

DEDICATION

This project is dedicated to my parents, Mr. P and Mrs. S Mubaiwa. This is to all small-scale cattle farmers of Murewha district who lost their cattle due to tick-borne diseases and are hoping for the provision of the best health care.

ACKNOWLEDGEMENTS

I want to thank my parents for all the financial assistance and all the encouragement that helped me to carry on with the project. I am very grateful for my supervisor, Mr. T.N.C Mangwiro for all the corrections and patience. My gratitude goes to Murewha Veterinary Services for all the assistance in data collection, in particular Mr. F Dzinotizei, the veterinary officer. My appreciation also goes to the Murewha district farmers for participating in answering the questionnaires. Above all I want to thank the almighty for making this project a success.

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List of abbreviations

TBD- Tick Borne Disease

TBI- Tick Borne Infection

TAD- Trans-boundary Animal Diseases

DVS-Department of Veterinary Services

OAG-Office of the Auditor General

PCV- Packed Cell Volume

AGRITEX- Department of Agricultural Technical and Extension Services

CHAPTER ONE

1 Introduction

Most of the rural population relies heavily on livestock for their livelihood. The majority of cattle owners in Africa are community farmers with few resources, and their herds are regularly afflicted by diseases spread by ticks. The most serious issues that limit livestock productivity and continue to impede the expansion of the livestock industry in Zimbabwe are parasites and illnesses (Lamy *et al*., 2012). According to Bennett *et al*. (2019), there are about 5.5 million beef cattle in Zimbabwe, the bulk of which (90%) are owned by smallholder farmers. The nation's national beef herd experienced a 9 percent mortality rate in 2019 (Ministry of Lands, Agriculture, Water, Fisheries & Rural Resettlement, 2020), and more than 50,000 cattle perished from diseases spread by ticks in the previous year (Global Press Journal, 2019). Zimbabwe's national herd continues to face a major threat from tick-borne diseases, which also poses a threat to household food and income security. (Eskezia and Desta, 2016)

Tick-borne diseases (mainly theileriosis) were a significant hazard to animal productivity as a result of the Department of Veterinary Services' inconsistent delivery of acaricides to community area dip tanks beginning in 2017 (Chidoori, 2022) and more than 50,000 cattle died of tick-borne diseases in the year 2018 (Global Press Journal, 2019). This was a result of deteriorating macroeconomic conditions. Cattle deaths have increased, notably as a result of tick-borne illnesses such Theileriosis (January disease), Red water, Heart water, and Gall sickness (Ministry of Lands, Agriculture, Water, Fisheries & Rural Resettlement, 2020). Babesiosis, theileriosis and Anaplasmosis are the main parasitic diseases transmitted by ticks and that generate important economic losses in cattle production around the world (Demessie and Derso, 2015)

One of the major veterinary and public health issues on the continent is the presence of ticks. Ticks are significant ectoparasites that harm productive animals such as cattle, small ruminants, swine, and poultry in significant numbers economically and health-wise. The direct losses are connected to the harm that ticks cause when they feed on their hosts' blood, while the indirect losses are connected to the infectious agents that ticks transmit and the costs of treatment and management.

Massive infestations of ticks can cause anemia, as a result of blood loss. Tick bite sites result in lesions that could put an animal at risk for localized dermatitis, subsequent bacterial infections, or flies (miasis), which are drawn to bloody areas. (Taylor, Coop, and Wall. 2016).

1:2 Problem Statement

High frequencies of cattle fatalities caused by tick-borne diseases are still on the rise, despite the department of Veterinary Services' intensified surveillance and disease management measures to stop the spread of tick-borne diseases. Small-scale farmers lose money because the diseased cattle inevitably die despite treatment, according to the Herald (6 Jan 2021). Farmers lost their supply of draught power, meat, and milk when their cattle died.

1:3 Justification

The study will look into the most likely causes of the spread of tick-borne illnesses in rural areas of the Murehwa district. The national cattle herd is at risk from tick-borne diseases, which will be significantly reduced by the research's findings. Selling their livestock or milk is how cattle ranchers make money. The majority of farmers engage in mixed farming, which includes using cattle for draught power and manure. Decreased tick-borne disease among small-scale farmers is therefore necessary.

1:4 Objectives

1. To evaluate the impact of tick-borne diseases affecting small scale farmers in Murehwa district.

2. To identify the most prevalent tick-borne disease affecting small scale farmers in Murehwa District.

3. To identify possible solutions to mitigate the spread of ticks and tick-borne disease.

1:5 Hypothesis

1. There is no significant relationship between the prevalence of tick-borne disease and the cattle fatalities in the area of Murehwa district.
2. There is no significant relationship between tick borne diseases occurrence and small-scale cattle farmers earnings in the district of Murehwa

CHAPTER TWO

LITERATURE REVIEW

2:1 Ticks as vectors of animal diseases

Ticks are obligate blood-feeders that live off the blood of mammals, birds, and even reptiles. By smelling animal breath and body scents, or by detecting body heat, wetness, and vibrations, ticks draw blood from their host (Hussain *et al*., 2021). Marufu defined ticks as obligate hematophagous ectoparasites of domestic and wild animals as well as human and they the vectors for a wide range of diseases including, theileriosis, anaplasmosis and heartwater. Worldwide, ticks have a significant influence on the output of cattle. The immediate impacts of a tick infestation, such as decreased milk production and body weight increase, as well as the expenditures of applying control methods, result in economic losses (Claire and Renate, 2018). Ticks like to feed on the udder, ear, groin, and tails of cattle, where they can irritate and cause an allergic reaction that directly affects the animals. A tick quickly boards when a host brushes the area where it is waiting (Rochelle, Walensky, 2022). Some ticks latch on fast, while others scurry around in search of regions with thinner skin, such as the ear. For several days, a tick will gently drain the blood. The tick will consume the pathogens with the blood if the host animal has a disease that is spread by blood.

During the feeding process, the tick's saliva may also make a little amount of contact with the host animal's skin. This process may be used to transfer a disease from the tick to the host animal. Most ticks will drop off and get ready for the next stage of their life cycle after eating. It can then pass on an acquired infection to the next host at its successive feeding (Rochelle, Walensky, 2022). Organophosphates, one of the acaricide families frequently used in the treatment of ticks, are resistant to some tick species, according to the Food & Agriculture Organization of the United Nations (2004). The phylum Arthropoda, class Arachnida, and order Acarina are where ticks belong (Nicholson *et al*., 2019).

The three economically significant families of Acarina are Argasidae (soft ticks), Ixodidae (hard ticks), and Nuttalliellidae, according to Oundo (2019). Groups of the Ixodidae genera Amblyomma, Hyalomma, Rhipicephalus, and Ixodes are important from a veterinary aspect. However according to Guglielmone *et al*., (2010) there are fourteen (14) genera of Ixodidae. There are eighty-two (82) species in the genus Rhipicephalus (Guglielmone *et al*., 2010). Since tick morphology varies, there are numerous tick families. The majority of ticks develop through four phases of development: egg, six-legged larva, eight-legged nymph, and adult. Ticks must consume blood to stay alive at every stage after emerging from the eggs. The life cycle of a tick that needs this many hosts can take up to three years, and the majority of them will die if they can't locate a host for their next meal.

Numerous illnesses transmitted by ticks cause substantial losses because of sickness and death, veterinarian and diagnostic expenses, vaccination prices, and trade restrictions (Jeremy and Willem 2018).

2:2 Tick-borne diseases

2.2.1 Introduction

The most tick-borne diseases which are of great importance worldwide are theileriosis (known as January disease in Zimbabwe), anaplasmosis (gall sickness), babesiosis (Redwater) and cowdriosis (heartwater) and have negatively affect livestock production particularly in Southern Africa. These are the four common tick-borne diseases are in Zimbabwe. These have caused a great impact in cattle deaths, accounting for 60% of cattle deaths during the 2020/ 2021 period. Zimbabwe has lost at least 3,430 cattle to tick-borne diseases between November 2017 and May 2018, with Mashonaland East recording the highest deaths. January disease is the major killer. Theileriosis has killed 1751 cattle, babesiosis 235, heartwater 816, anaplasmosis 596 and sweating sickness 32 countrywide. (The Herald 2018)

2.2.2 Theileriosis in Zimbabwe

The threat posed by theileriosis to Zimbabwe's expanding livestock industry has grown over the past five years. Theileria parva infection, which occurs in Zimbabwe, is the cause of this severe and frequently fatal disease of cattle. Theileriosis was first introduced in Zimbabwe at the turn of the 20th century; therefore, it has been present there for more than a century (Mwatwara, 2014). Despite eight decades of diligent tick treatment, the illness, also known locally as Zimbabwean theileriosis or January diseases, continue to pose a threat to the health of cattle. Theileriosis illnesses and the spread of Rhipicephalus appendiculatus ticks are typically associated with ineffective cattle dipping techniques or a lack of acaricides and treatments (DVS, 2021). Bovine theileriosis is thought to be the most severe tick-borne illness (TBI) and transboundary animal disease (TAD) threatening cattle in sub-Saharan Africa (Minjauw and McLeod, 2003).

Theileriosis is mostly spread by the brown ear tick, which belongs to the R. appendiculatus genus. Brown ear ticks have a life cycle that lasts around 2-3 years, but it can last up to 6 years depending on environmental factors including temperature, relative humidity, and sunlight (Parola and Raoult, 2001). Without food, nymphs may last up to 6.5 months, adults up to 2 years, and larvae up to 7 months (Parola and Raoult, 2001). As a result, it is more challenging to control the tick using management techniques like rotational grazing, which are meant to starve the ticks. The only method for effectively lowering brown ear tick numbers is to continue routine dipping. Animals will visit the grazing area and bring ticks at the dip-tank for culling.

In Zimbabwe, theileriosis results in a significant loss of cattle each year, necessitating the establishment of intensive dipping laws to control its vector, (Lawrence and Perry 2005). Theileriosis in Zimbabwe is a common occurrence in the highveld, typically from December to May. However, the disease has been spreading across the country as a result of climate change and unrestricted movement of cattle. After they recover from theileriosis, cattle continue to spread the disease for at least 18 months (Latif *et al*, 2001). Theileriosis clinical signs resemble those of East Coast Fever (Lawrence and Perry, 2005). These include extreme inappetence, sadness, excessive salivation, rapid heartbeat, and incoordination. Subcutaneous oedema, diarrhea, lacrimation, and death are potentially significant symptoms. Petechiation on mucous membranes, inappetance, stopping of ruminating, salivation, serous and nasal discharge, quick and weak heartbeat, and intestinal ulcers may be seen as symptoms (Mtambo *et al*., 2008; Siegel *et al*., 2006).

Parvaquone and its derivative buparvaquone are used to treat theileriosis. 20 mg/kg b.w. parvaquone "Bimeda" i.m. Buparvaquone "Butalex" 5 mg/kg b.w. i.m. The medication is most successful when given in the early stages of clinical disease and less effective when given in the latter stages (Gharbi and Dargouth, 2015). It is possible to immunize cattle against T. parva using a single dose of long-acting oxytetracycline given simultaneously in the case of significant destruction of lymphoid and hematopoietic tissues. When administered at the beginning of infection, oxytetracycline prevents the development of the parasite. It is advised to immunize cattle three to four weeks prior to allowing them access to infected pasture. Additionally, live vaccinations are used to improve cattle's resistance to theileriosis (Kanhai et al., 2009).

2.2.3 Anaplamosis in cattle production

Anaplasmosis is a tick-borne disease formerly known as gall sickness. Ruminant disease brought on by obligatory intraerythrocytic (Abdisa, 2019). The obligate intercellular bacteria Anaplasma marginale, which is a member of the order Rickettsiales, is the cause of the infectious disease known as bovine anaplasmosis, which affects cattle (Hanzlicek, *et al* 2016) A. ovis can infect sheep, deer, and goats, and A. central can cause mild illness in cattle. Cattle infection by a phagocytophilum has just been reported. The major cause in Zimbabwe is Anaplasma marginale. The infected tick can support the replication of A. marginale. The tick is thought to be the main vector of this illness, and it collects A. marginale through feeding on contaminated erythrocytes from cattle. After then, it replicates in a variety of tissues, particularly the mid-gut and salivary glands, with the latter being more crucial for the spread of the infection back to cattle (Rodrguez *et al*. 2009).

Additionally, the disease may be spread via dehorning, the use of contaminated needles or surgical tools, or other means. Anaplasmosis infection reveals a favorable association between the age of cattle and illness severity. Compared to older cattle, calves are more resistant to disease (but not infection). This is because anaplasmosis-related losses in cattle are low when A. marginale infection occurs early in life. After the acute phase of infection has passed, cattle continue to carry the virus chronically, but they are typically immune to subsequent clinical illness (Budke *et al*, 2015). Cattle carcasses that succumb to anaplasmosis typically exhibit severe anemia and jaundice. They will have thin, watery blood, a soft, enlarged spleen with conspicuous follicles, a mottled, yellow-orange liver, and a gallbladder that is frequently swollen and filled with thick, brown or green bile. Anaplasmosis is subclinical in animals younger than one year old, moderately severe in yearlings and 2-year-olds, and severe and frequently deadly in older animals. These symptoms are seen in anaplasmosis (Abdisa, 2019).

Imidocarb and tetracycline antibiotics are used to treat anaplasmosis. In the early stages of an acute illness, prompt administration of tetracycline medications—including tetracycline, oxytetracycline, chlortetracycline, doxycycline, rolitetracycline, and minocycline is effective. For carrier animals, at least two intramuscular injections of long-acting oxytetracycline at a dosage of 20 mg/kg are often used. These medications sterilized animals and ensured that cattle receiving treatment were immune to severe anaplasmosis for at least eight months afterward.

Since blood transfusions can partially restore PCV, they increase the survival rate of more severely injured cattle.

2.2.4 Babesiosis in cattle production

Red water or babesiosis is a potentially fatal febrile condition that affects both domestic and wild animals. It is characterized by severe erythrocytic lysis, which causes anemia, icterus, and hemoglobinuria. Babesiosis is a disease that affects a wide range of vertebrate hosts, including cattle, horses, small ruminants, and humans and bats (Schnittger *et al*, 2012). Rhipicephalus Boophilus spp. (Blue ticks) is the cause. Babesiosis poses a serious hazard to both human and animal health in locations where babesia parasites and competent tick-vectors are widespread, with estimates of more than 500 million cattle at risk worldwide (Suarez and Noh, 2011). High temperature, loss of appetite, weakness, anemia, and the cow lagging behind the herd are common signs. Babesia is prevalent in regions with its arthropod vectors, particularly those with tropical and subtropical climates.

More commonly found and significant in Africa, Asia, Australia, and Central and South America are Babesia bovis and B. bigemina. In certain regions of Europe and possibly northern Africa, Babesia divergens has significant economic importance (Bock, Jackson and De Vos, 2004). Ticks are controlled by repellents and acaricides in locations where tick eradication is not practical or desirable, which has resulted in the eradication of Babesia by the elimination of the tick vector and/or intense chemotherapy regimens. Reducing cattle exposure to ticks by the use of acaricides, regular inspection, and insect repellents; controlling animals and property; and eliminating the tick vector. After just one infection with B. bovis, B. divergens, or B. bigemina, cattle develop a strong, long-lasting immunity. Some nations have taken use of this trait to immunize cattle against babesiosis.

The introduction of animals lacking in immunity should be monitored closely in endemic areas. Disruptions in tick exposure and disease transmission caused by variations in the climate, host variables, and management Cattle with polluted blood may need special precautions to prevent mechanical infection. It is possible to worry about the emergence of acaricide resistance. Tick habitats can also be destroyed through environmental change, however in certain situations this may be challenging or ecologically undesirable. Natural endemic stability is unreliable as a solo method of prevention since it is susceptible to changes in the environment and host factors and management.

Live vaccine: As a service to the livestock industries, the majority live vaccines are manufactured in calves or in vitro in government-supported production facilities using specifically chosen Babesia strains mostly B. bovis and B. bigemina (Florin-Christensen *et al*, 2014). Although they are typically used on younger animals, an experimental B. divergens vaccine made from the blood of infected Meriones has also been successfully used, so caution should be used when using them on adult animals as they may be virulent, may be contaminated with other disease agents, and could cause hypersensitivity reactions. Killed vaccine: made from the blood of B. divergens-infected calves; little is known about the extent and persistence of immunity given. Other vaccines: Despite global initiatives, there is still hope for recombinant vaccines against Babesia species and to date no such vaccine is available commercially.

2.2.5 Cowdriosis in cattle production

It is one of the TBDs that affects ruminant animals but is not communicable to them. It is frequently referred to as heart water. These tick species were prevalent in Zimbabwe's dry southern low-veld during the late 1800s, but they were rare in the country's higher-rainfall high-veld (Peter *et al*., 1998). Cowdria ruminantium, which is now known as Ehrlichia ruminantium and is a member of the family Anaplasmataceae and the order Rickettsiales, is the causal agent. E. The virulence of ruminantium is diverse, with certain species being more virulent than others (Kelly *et al*., 2011). Heartwater (Amblyomma tick) vectors prefer a warm, moderately humid environment as well as bushy grassy places for their development. As a result, the sickness is more common during the rainy season.

General signs are seen by collapse, high stepping gait rapidly progressing to nervous signs, paddle with the legs and rapid death. Ticks are a reliable source of E. For animals traveling to heartwater-free areas, cautious dipping and hand-dressing followed by examination to ensure there are no ticks is advised because infection can last in them for at least 15 months. Uilenberg (2007) Oxytetracycline doses of 10 mg/kg and doxycycline doses of 2 mg/kg are typically effective. The initial dose should be administered intravenously if it is delayed until other clinical signs have appeared or during the feverish reaction. A second and third treatment may be necessary before the fever subsides. Sheep, goats, and vulnerable cattle may need higher doses of oxytetracycline between 10 and 20 mg/kg. If the condition worsens, it may also be necessary to administer a second intramuscular injection of a long-acting oxytetracycline formulation. Immunization of calves is also done.

2:3 Management and control of ticks and tick-borne diseases

Chemical, biological, and cultural approaches are now used to manage ticks (Nicholson *et al*., 2019). In some areas of Zimbabwe, the usage of herbal plants has been performed in addition to physical approaches (Nath *et al*., 2018; Nyahangare et al., 2019). Acaricides such as organophosphates, amidines, synthetic pyrethroids, mixes, or macrocyclic lactones are used in the chemical technique (Rodriguez-Vivas *et al*., 2017). Cattle dipping are thought to be the most efficient way to reduce the risk of tick-borne infections and the resulting losses (Shahardar *et al*., 2019). Due to a lack of acaricides, inadequate dipping cycles have made the issue worse (Shekede *et al*., 2021). Cultural techniques include rotational grazing and controlled paddock burning However, because communities share grazing lands, it can be difficult to apply them in communal settings (Levin, 2020).

Thus, to diminish selection pressure in favor of acaricide-resistant individuals, holistic integrated ecto-parasite management is used to manage ticks both on and off hosts (Nath *et al*., 2018). (Rodriguez-Vivas *et al*., 2017). The most often used kind of control is the use of chemicals while dipping. Zimbabwe's Animal Health (Cattle-Cleansing) Regulations of 1993, which date back to 1914 when intense dipping of cattle became necessary for the prevention of East Coast Fever, a severe type of Theileria parva infection, made it essential for cattle to dip (Makuvadze *et al*., 2020). (Norval and Deem, 1994). Improved global management of tick-borne illnesses of cattle and associated vectors would significantly increase the output of meat and milk (Barnett, 1974a and 1974b).

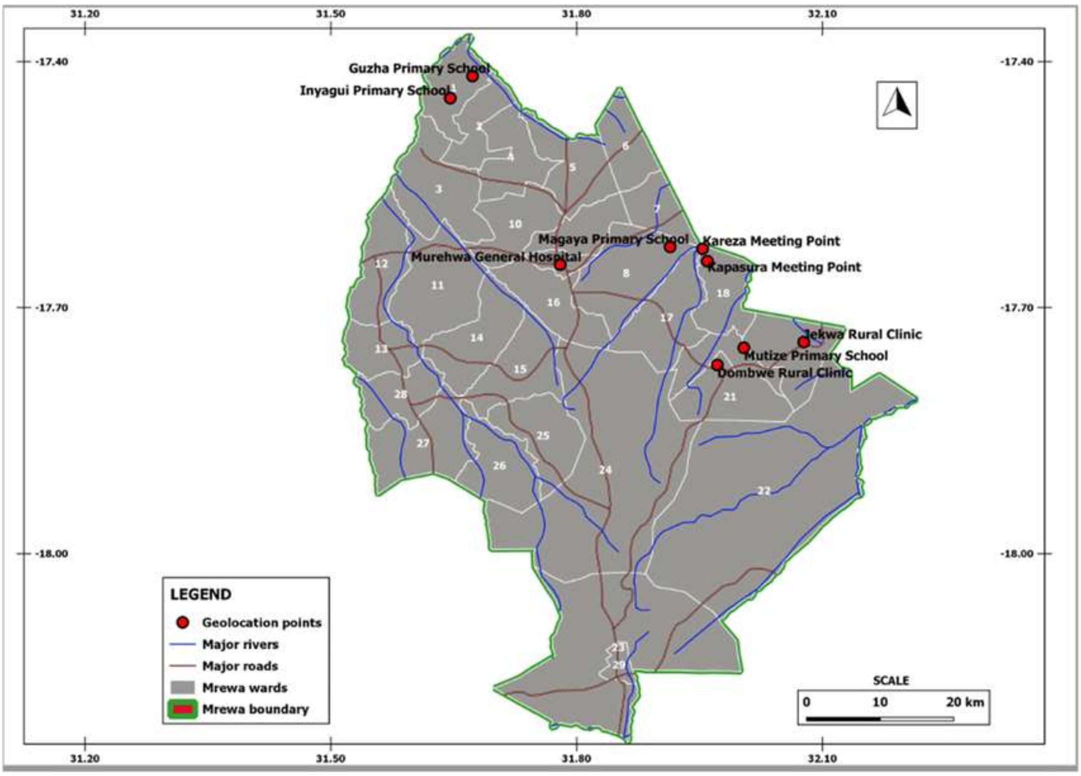
The combination of several measures, which must be specific to the particular circumstance and take into account all options, including chemical tick control, grazing management, and breeding for host resistance to ticks, provides the cattle industry with the best defense against diseases spread by ticks (Claire and Renate, 2018). Babesiosis treatment effectiveness is reliant on early detection and quick delivery of many medications. Particularly when range cattle are involved, this is hard. Anaplasmosis treatment, like babesiosis treatment, depends on early diagnosis and quick delivery of a suitable medicine. In various regions of the world, anaplasmosis vaccination has been used with varied degrees of success using either dead vaccine, attenuated live vaccine, or live Anaplasma centrale vaccine.

In accordance with tick populations, the recommended dipping schedule for cattle is weekly in the summer and biweekly in the winter (Sungirai *et al*., 2018). In the majority of urgent situations, a 5-5-4 dipping regimen is advised in tick-infested locations. A 5-5-4 dipping program is a planned dipping procedure in which animals are dipped once every 5 days for the first 4 days to guarantee tick control. The goal of the 5-5-4 dipping regimen is to stop the ticks' life cycle before they gorge themselves

(Walker, 2011). The brief time that the ticks engorge makes this method the most appropriate (Sekkin, 2017).

CHAPTER THREE

3.1 Study site



(Source: Murehwa Rural district web page)

Figure 3.1: showing Murehwa district map. The study was carried out in ward 6, 7, 9, 10, 12 and 16.

The study was carried out in Murehwa district in six rural communities' wards, which lies 80 kilometers to the northeast of Zimbabwe's main city of Harare (-17.6499974 31.7833302). The Murehwa district is located in Natural Region 2, which has an average annual rainfall of approximately 750mm and average winter temperatures of roughly 18°C. Murehwa is a part of the Highveld, where intensive agricultural and animal productions are the main farming endeavors. Maize and wheat are a few of the crops that are raised. Pig, poultry, beef, and dairy production are the main animal operations. Farm ownership patterns in the Murehwa district have changed from a few large farms to numerous smaller plots that benefit more farmers. The new farmers originated from different regions of the nation, and because animal movement controls were difficult to monitor at the time, there was a chance for disease and parasite transmission between normally protected areas. Murehwa district has 205 442 total population and 54 248 households. Both indigenous and exotic cattle are prevalent in Murehwa and the current animals are random crosses of the different kinds that are found in the area, including the indigenous Mashona breed, the exotic Brahman, Angus, and many others.

3.2 Data collection tools

Cattle farmers were the study population; no live animals were used in this study. A pretested questionnaire was used to interview the farmer. Random sampling was used to select 6 wards in Murehwa district. The dip tanks namely Kambarami (ward 9), Ngwerume (ward 10), Cross Musami (ward 12), Dombwe (ward 6), Chitowa (ward 7) and Rhodes (ward 16) were visited. The information was collected in the morning on the day of dipping. Farmers that attended dipping session that particular day where asked. This was done for easy accessibility. The questionnaire was effective in this research since information required was collected from farmers. The questionnaire had all relevant questions that answered the objectives. Secondary data was used to gather the quantitative responses on the tick-borne diseases that occur in rural community of Murehwa. Sample of the questionnaire in attached in appendix one.

3.3 Data analysis procedures

The data from the interviews was categorized and organized into themes. Excel was used to organize data. Rankings were used to display the information acquired through interviews. SPSS version 20 application was used to organize and analyse the data. Statistical analysis using descriptive frequency was used to analyse data. The results were presented using tables and figures.

CHAPTER FOUR

4.1 RESULTS

In total, 60 questionnaires were prepared, and farmers who came for dipping sessions completed the questionnaires. There was only one visit at each dip-tank. Out of 60 questionnaires, 48 were answered. 12 of the questionnaires were not completed because of shortage of farmers at the dip-tanks. Out of the total 48 respondents, 16 were female and 32 were male giving a percentage of 33.3 for females and 66.7 for males. Many of the cattle farmers in the rural wards of Murewha district are males.

Table 4:1 showing distribution of respondents by level of education.

Level of education	Frequency	Percent
None	7	14.6
Primary	6	12.5
Secondary	26	54.2
Tertiary	9	18.8
Total	48	100

Majority of farmers in rural wards of Murehwa district have attained secondary education level. Some few of the farmers attained the tertiary education and primary. 14.6 % of the farmers did not go to school.

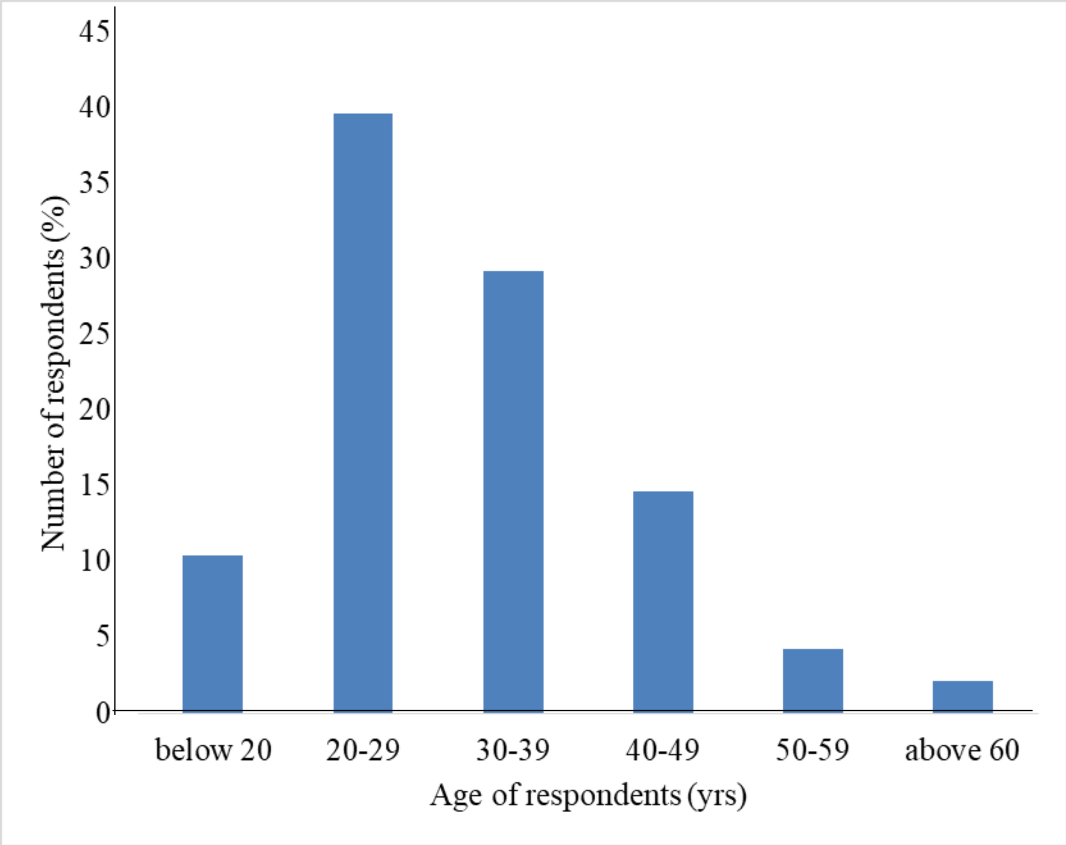


Figure 4.1 showing distribution of respondents by age.

Most of the farmers were between the ages of 20-29years (39.6%). This is followed by respondents ageing between 30 and 39years (29.2%). Respondents aged between 40 and 49 (14.6%), below the age of 20 (10.4 %), between 50 and 59 (4.2%) and above 60 years (2.1%).

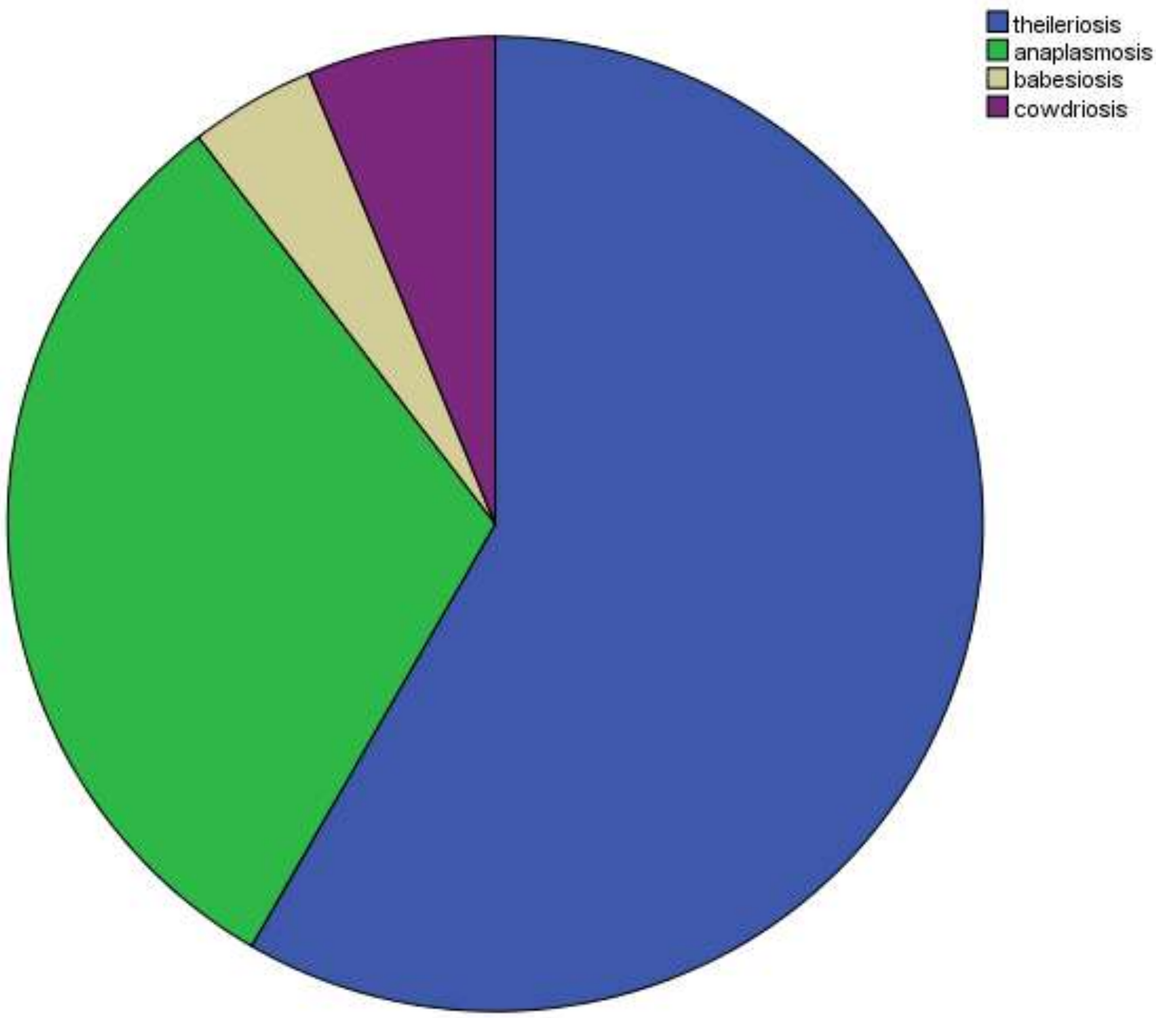


Figure 4.2 showing the perceived incidence of tick-borne diseases based on the respondents.

According to the farmers, Theileriosis is the most prevalent disease in Murewha district, having a frequency of 28 respondents (58.3%). Anaplasmosis is the second prevalent disease having a frequency of 15 respondents (31.3%). Babesiosis being the least tick-borne disease affecting cattle in Murewha district having a frequency of 2 (4.2%). Cowdriosis has a frequency of 3 (6.3%). Most of the farmers recognized these diseases by the type of ticks affecting their cattle. Tiny brown ticks found in the ears were recognized as the brown ear ticks. Bont ticks were recognized to be brown and black having striations, others have bont legs. Blue ticks were recognized to be dark blue and spotted black on their backs. Others have been informed by the Department of Veterinary Services about the diseases affecting their cattle.

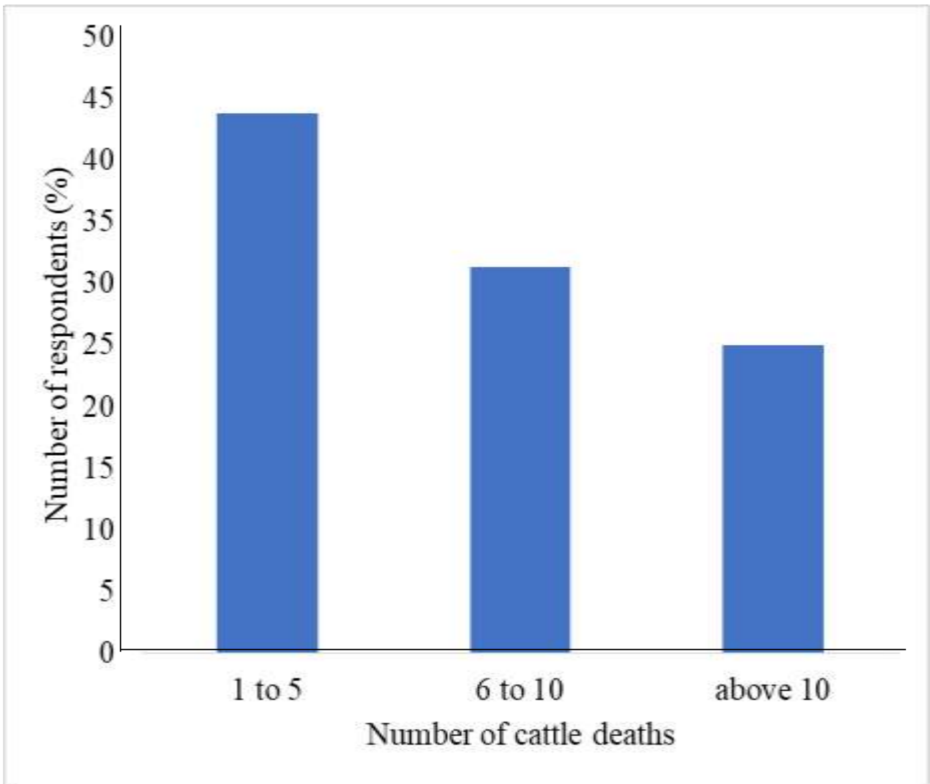


Figure 4.3 showing the distribution of respondents by number of cattle deaths encountered.

The graph shows number of cattle deaths encountered by livestock farmers in Murehwa district. 21 (43.8%) respondents encountered cattle deaths between the range of 1 and 5. Some of the farmers (31.3%) lost between 6 and 10 cattle. 12 of the farmers (25%) lost cattle above 10.

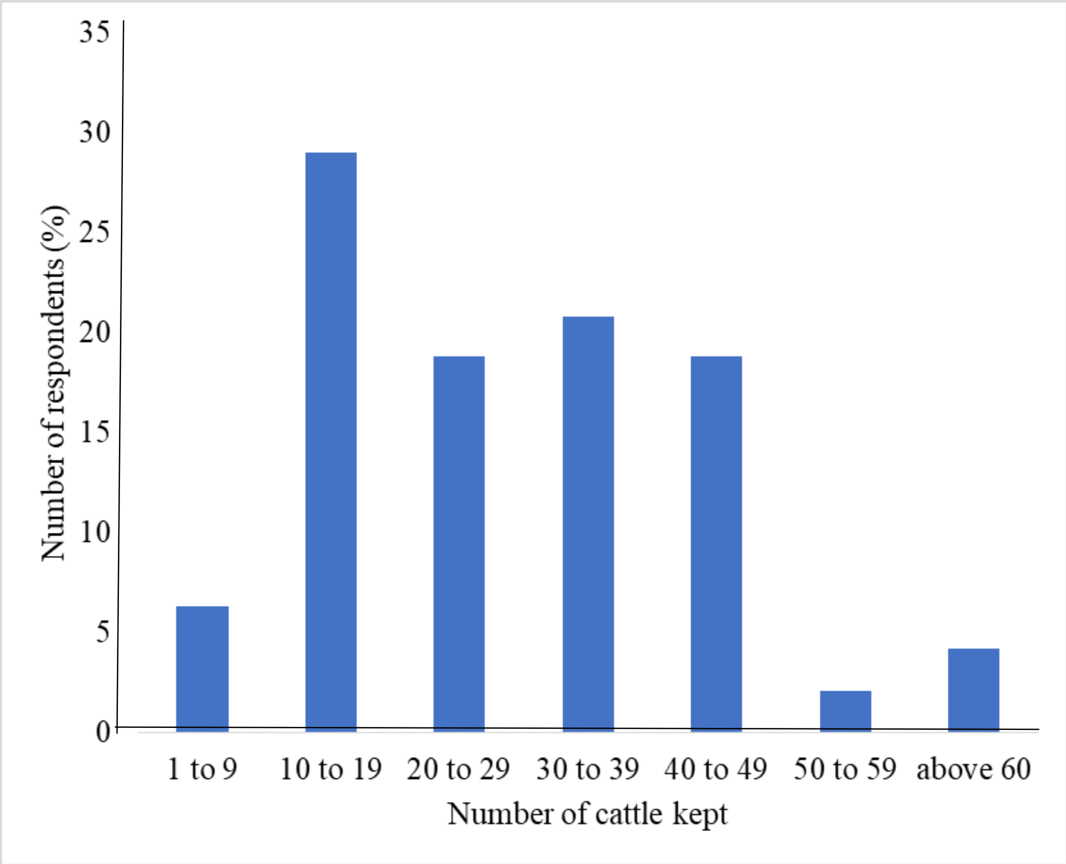


Figure 4.4 showing the distribution of respondents by number of cattle kept.

Median of cattle kept is between 20 and 29. The mode is between 10 and 19.

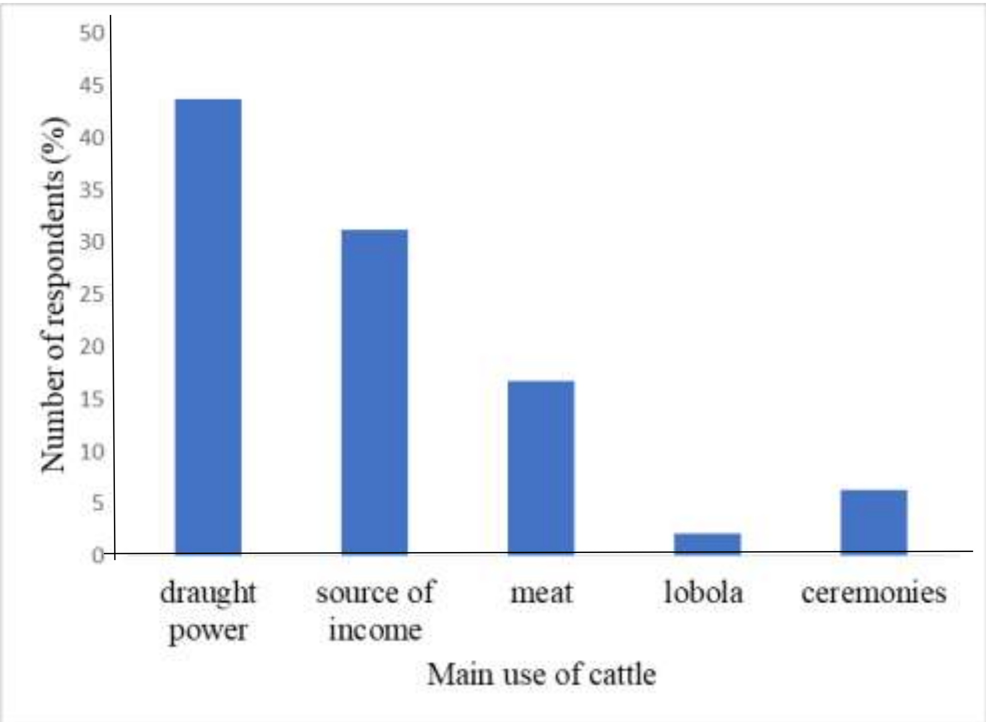


Figure 4.5 showing different uses of cattle by farmers.

Most farmers (43.7%) in Murehwa district keep cattle for draught power, and some farmers (31.2%) keep cattle as a source of income. Cattle is also mainly used for meat by 8 (16.7%) of the respondents. A few of the farmers (6.3%) use cattle mainly for social ceremonies and also others (2.1%) for lobola.

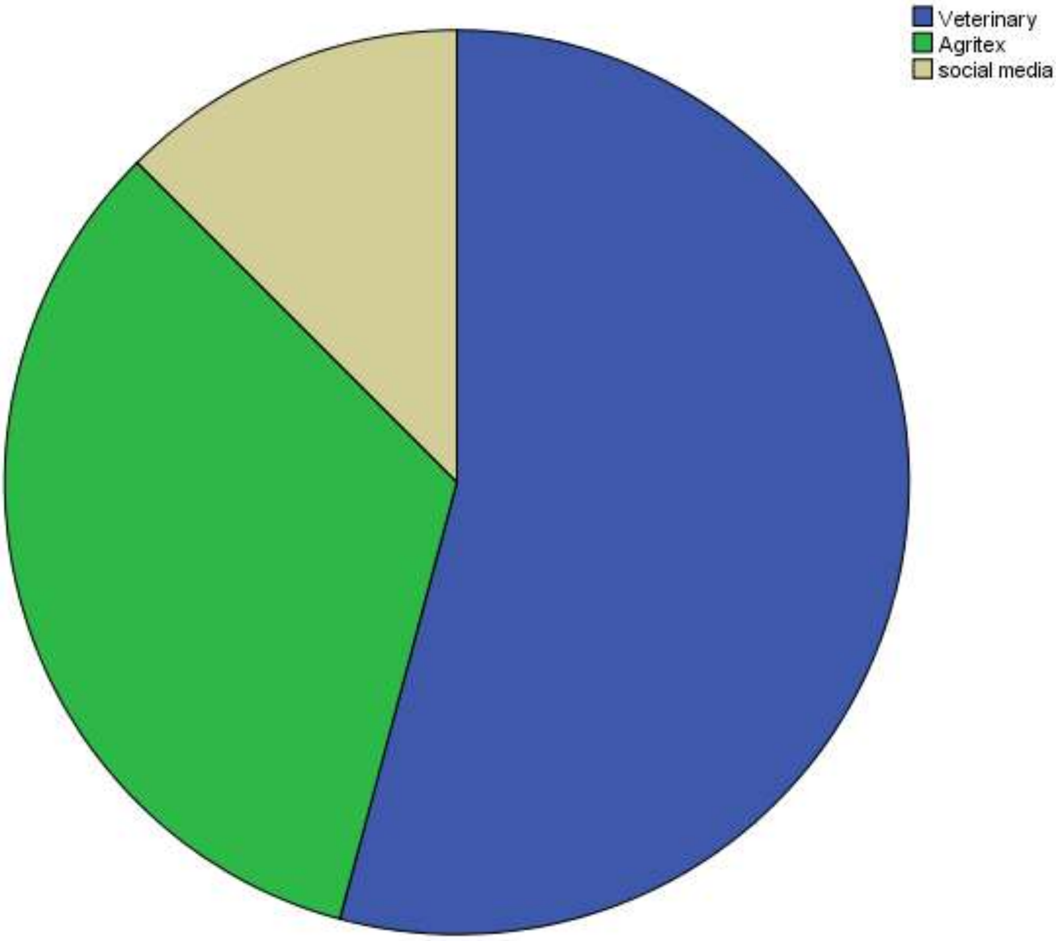


Figure 4.6 showing different sources of advice given to farmers.

54.2% of the total respondents get most their advice from veterinary services and 33.3% get their advice from Agritex. Only 12.5% get their advice from social media.

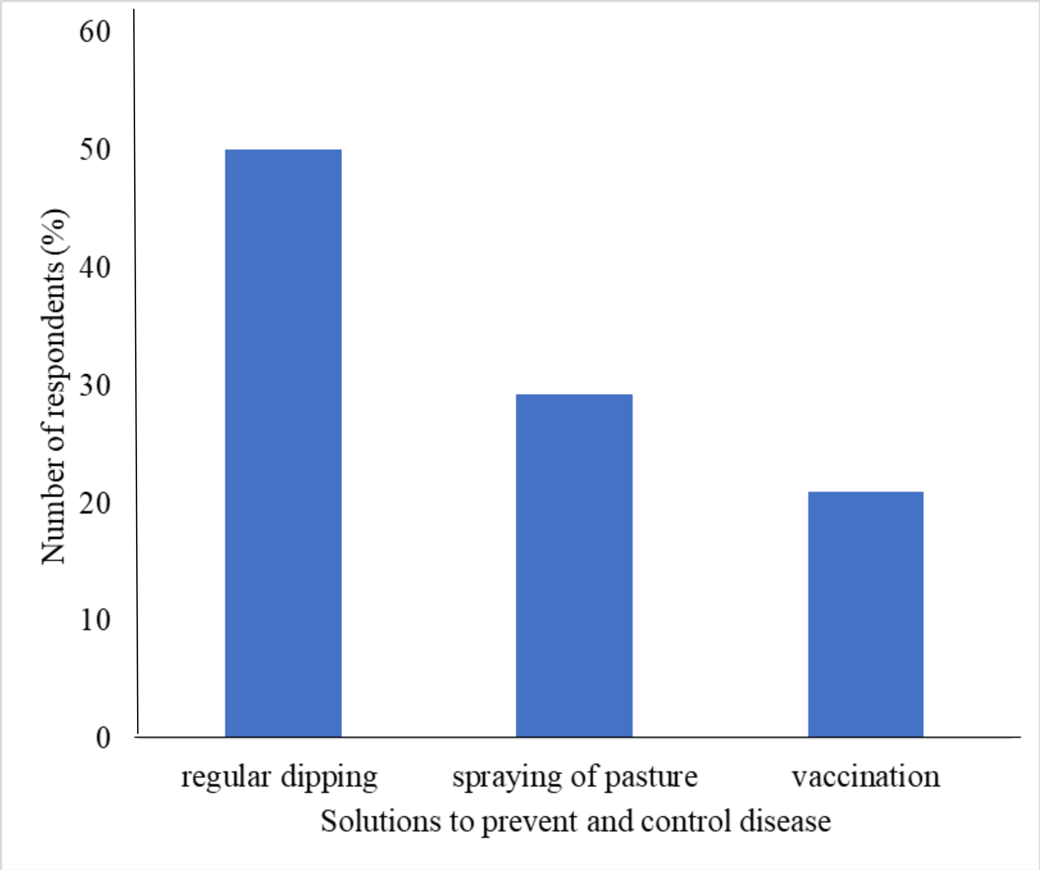
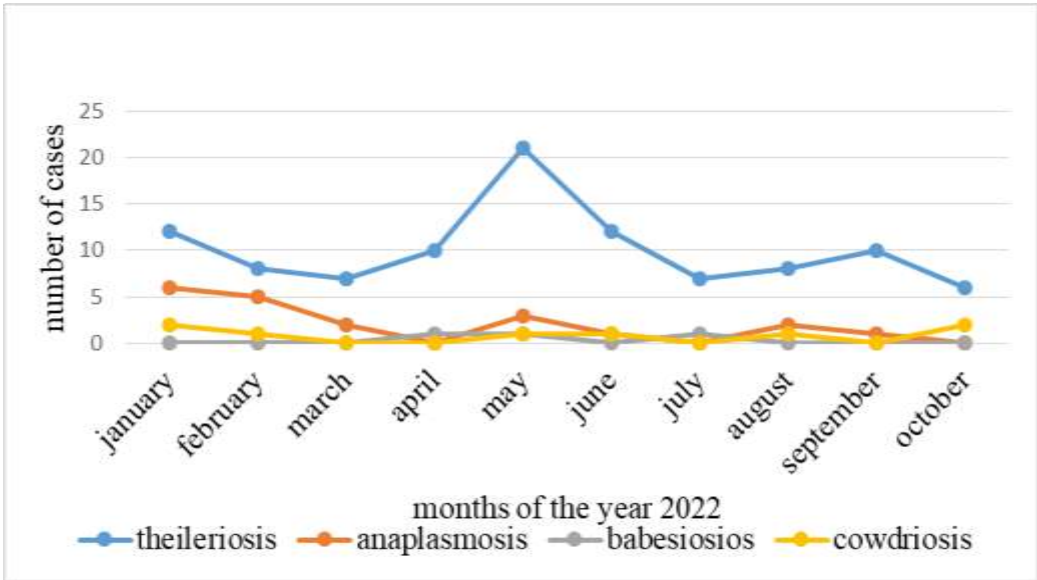


Figure 4.7 showing proposed solutions by respondents to prevent and control ticks and TBD.

Farmers (50%) suggested that regular dipping must be practised; spraying of pasture was also suggested by 29.2% of the total respondents. A few numbers of respondents (21%) suggested vaccination as a solution to prevent and control ticks and tick-borne disease.



(Source- DVS monthly reports 2022)

Figure 4.8 showing cases of tick-borne disease in Murehwa district.

The chart shows the number of cases of tick-borne disease encountered by small-scale farmers of Murehwa district in the year 2022. Many cases were from tick-borne diseases and were high in May. Cases from anaplasmosis were secondly encountered by famers and were higher in January and February. Babesiosis and anaplasmosis were the least diseases affecting cattle. Cases became more prevalent in May other than in January because of inconsistent supply of acaricides resulting in erratic dipping regimes. This was beyond individual's control as acaricides are supplied at district from the national stores. Hence there was high morbidity and high mortality rates. The predilection site of brown ear ticks that cause theileriosis are inside ears. They are very small and stay in the hairs; hence acaricides may fail to reach them. When the beast is in the pool, its head will be raised and not submerged in water. Theileria parva spreads fast hence a notifiable disease.

CHAPTER FIVE

5.1 Discussion

Males make up a large portion of the Murewha district's small-scale cattle farmers. This was explained by the fact that men look after larger stock like cattle at the household level, whereas women look after smaller stock, like poultry, as head of households. This is in agreement with Galiè *et al.* (2015), who claim that men are more likely than women to possess larger animal species like cattle. More cattle attendants had a particular degree of education, with 54.2% having a secondary education or higher. The current study's findings are analogous to those of Muvhuringi *et al.* (2021), who likewise noted that the majority of farmers in the Mazowe district had completed secondary education. Education is fundamental since it improves knowledge of the principles of cattle management practices like dipping regimes and general disease control.

Cattle are affected by the tick-borne diseases Theileriosis, Babesiosis, Anaplasmosis and Cowdriosis. Theileriosis is the most prevalent disease affecting cattle in the Murehwa district. For the past five years, theileriosis has become a threat to the growing livestock industry and it is due to the tick resistance to acaricides, climatic changes which favor the survival and breeding of ticks, lack of knowledge regarding to ticks and tick-borne diseases and unavailability of funds by some farmers to purchase acaricides. Similar findings were made by Muvhiringi *et al* in 2021, who reported that theileriosis was the main illness (affecting 47.2% of cattle) in the Bindura district. The 2015–2016 DVS report, which stated that tick-borne fatalities accounted for 65% of the recorded cases, is consistent with the findings that tick-borne diseases are a major cause of cattle deaths in the Murewha district (OAG, 2018). In the Murewha district, Anaplasmosis is the second most common disease affecting farmers. Farmers also said that brown ear ticks are mostly seen, bont ticks, and blue ticks are as well a problem. Farmers have also claimed that they are dealing with other diseases like dermatophytosis, mastitis, and coccidiosis. According to a

2015–2016 study by the Department of Veterinary Services in the Matabeleland North province's Nkayi and Lupane districts, diseases spread by ticks are mainly responsible for significant livestock losses (OAG, 2018). This study backs up Nyangiwe *et al* (2018)'s claim that ticks have the most negative influence on livestock loss in Africa due to morbidity and death. Farmers assumed that the majority of the diseases were caused by tick-borne diseases even though they were unsure of the exact causes of the illnesses and deaths in their animals.

Only 37.5% of the general population uses traditional methods for controlling ticks, compared to all farmers who employ conventional methods because farmers take their animals for dipping sessions by the veterinary. Farmers also added that they make use of tick grease and they also practice hand spraying on cattle. Few farmers use traditional methods, and others are unaware of these effective means of tick management. Farmers concurred that the cost of acaricides was beyond of their pricing range. This is in line with Irvin et al. (1996), who highlight that despite acaricides' increased complexity, many smallholder farmers and governments in developing countries still cannot afford them. Most people (64.6% of the population) are knowledgeable of ticks. Having knowledge about ticks means that the farmer may also have knowledge on how to control them. Most of the farmers get their advice from veterinary services, followed by Agritex. Some even get it from social media (12.5%). It was noted that few farmers are familiar with social media because of poor network supply in their areas. Some farmers do not own smart phones in-order to access social media platforms. Social media can be very useful to farmers for example WhatsApp farmer's groups where different problems being faced by farmers are discussed. There is also the use of tik-Tok videos and Facebook videos where a farmer can post about the disease affecting cattle and quick response is given. Social media may also help educate farmers on methods of tick control and treatment of affected cattle. Maiyaki (2010) extension services and farmer training are essential for successful agricultural productivity Farmers listen to agriculture programs on the radio and they watch Talking Farming and Murimi Wanhasi shows on ZBC TV.

A number of farmers keep cattle between 10 and 19 and a number of farmers lost their cattle between 1 and 5. This suggests that some farmers lost close to 50% of their whole herd. Both the nation and individual households suffer financial losses as a result. According to Mkuhlani *et al* (2018).'s research, cattle are mostly used for draught power and savings in the rural communities of Goromonzi and Murewha. This is based on their observations of these locations. Farmers engage in mixed farming, and when cattle die, the lack of draught power prevents farmers from cultivating crops, which leads to poverty. For ploughing purposes, a span of cattle (pairs) is required, therefore when one animal from a span is lost the remaining one cannot be used alone. 31% of the total respondents use cattle as a source of income. Loss of income due to cattle deaths prevents the majority of farmers from paying their children's tuition. It was also noted that the use of animal may influence the investment in the animal for example those that uses animals for draught have their main focus on oxen. Farmers that use cattle for meat mainly focuses on cattle fattening. Use of cattle as a source of income makes the farmer to focus on high feeding of cattle in-order to sell off the best beast or for higher milk production.

Since tick-borne diseases are responsible for 75% of cattle losses in Zimbabwe according to DVS, most farmers proposed regular dipping of cattle as a way to manage ticks and tick-borne diseases. This is related to the fact that thorough dipping must be done to effectively control ticks (2020). The farmers recommended spraying the pasture with the help of the Department of Veterinary Services. They also suggested that cattle share grazing lands. Tick-infested grazing lands will continue to infect the livestock that graze there. To prevent livestock that are not being dipped from affecting others, agreed-upon dipping days must be observed. Biological control of ticks in fields has been achieved by free ranging chickens but the method is no longer used because of theft. Chickens are now kept in fenced houses. Treatment of affected animals is a way of controlling ticks and tick-borne diseases. If cattle are treated earlier after being affected, it prevents the spread of the ticks.

Secondary data obtained from the veterinary services shows that a number of cases were from theileriosis. Theileriosis is the most prevalent diseases. Anaplasmosis is the second prevalent disease. Other tick-borne disease like babesiosis and cowdriosis mostly have a few cases and the number of cases recorded where treated. The district report is comparable at ward level as theileriosis is the most prevalent followed by anaplasmosis. The veterinary service concluded that farmers are failing to control the type of diseases because there will be in search of cheaper products. Farmers end up purchasing fake products from unknown stores. Farmers are failing to consult formal services for advice instead then become their own doctors. Ticks also develop a resistant to acaricides when kept exposed to a single type of acaricide such as amitraz or different acaricides but with same mechanism of action (cross-resistance). For example, ticks which are resistant to DDT may also be resistant to the pyrethrins and the synthetic pyrethroids because mechanism actions of these acaricides are same.

CHAPTER SIX

Conclusion and recommendations

6.0 Conclusion

The study found that the farmers are encountering losses of cattle due to tick-borne diseases and this is mainly caused of lack of knowledge by the farmers. Theileriosis is the most prevalent disease affecting cattle in Murewha district. For the livestock industry to grow well in Zimbabwe, ticks and tick-borne diseases has to be put into consideration as with notifiable diseases in Zimbabwe which include: anthrax, foot and mouth diseases and rabies. Tick controlling methods such as biological control methods, grazing management, genetic manipulation and vaccination could be well employed to manage tick borne diseases properly. Further researches on how ticks build resistant to acaricides and on development of tick- and tick-borne disease vaccines have to be done. Educate and encourage livestock producers on the use of indigenous plants or herbs with acaricidal effects.

6.1 Recommendations

Reintroduction of mass intensive dipping programs. Factors such as the resettlement program, ignorance, failure by cattle owners to pay dipping fees, shortage of acaricides and higher prices for acaricides hand contributed much on the collapse of intensive dipping in Zimbabwe. Tick and tick-borne diseases vaccines, when used together with acaricides, tick burden on animals is greatly reduced. Good management practices such as pasture spelling and habitat modification should be adopted by livestock owners in managing and controlling of ticks. Promote the use of ethnoveterinary plants with acaricidal effects.

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APPENDIX 1

RESEARCH QUESTIONNAIRE. NO:

My name is **Rumbidzai Mubaiwa**, a final year student at Bindura University of Science Education studying Bsc in Animal Science and Technology (Hons). As part of my studies, I am carrying out a research project with the title, **the effects of tick-borne diseases on small scale cattle farming in Murehwa district.** The questions on the questionnaire will be used in this study only and all the responses remain confidential. I Rumbidzai Mubaiwa will be held accountable for any information that will be leaked. The aim of the study is to find possible solutions to prevent and control ticks and tick-borne diseases.

Demographic Information.

Date of interview: __/__/__/

Dip tank name…………………………

Gender: male ☐ female ☐

Age: below 20 ☐ 20-29 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ 60+ ☐

Educational level: Did not go to school ☐ Primary ☐ Secondary ☐ Tertiary ☐

Livestock information.

1. Which animals do you keep?
   a. Cattle ☐ b. goats ☐ c. rabbits ☐ d. chickens ☐ e. any other (please specify) ☐
2. How many cattle do you have?
   a. 1-9 ☐ 10-19 ☐ 20-29 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ 60+ ☐
3. What is the main use of your cattle?
   a. Draught power ☐ b. source of income ☐ c. meat ☐ d. lobola ☐ e. ceremonies ☐
4. What diseases are affecting your cattle?

a. Theileriosis ☐ b. Anaplasmosis ☐ c.Babesiosis ☐ d. cowdriosis ☐

e. any other (please specify) ☐

5. Which of the above diseases is the most prevalent? …………………………

6. What types of ticks affect your cattle?

a. Brown ear tick ☐ b. Bont ticks ☐ c. Blue ticks ☐ d. any other (please ☐ specify)

7. Do you have any knowledge about the ticks that affect your cattle?

Yes ☐ No ☐

8. How have the tick-borne diseases affected your standard of living?

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9. What methods do you use to control ticks and tick-borne diseases?

Conventional methods of control	Traditional methods of control

10. Which of the above methods is mostly used?

……………………………………

11. Do you get advice from professionals?

Yes ☐ No ☐

11b. If yes, where do you get it from?

a. Vert extension officers ☐ b. Agritex ☐ social media ☐ ny other (please specify) ☐

12. What assistance is being provided to control tick-borne diseases?

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13. What suggestions do you have in order to control tick-borne diseases?

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Other comments:

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