BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF AGRICULTURE AND ENVIRONMENTAL SCIENCE

DEPARTMENT OF ANIMAL SCIENCE

PREVALENCE OF BOVINE BRUCELLOSIS IN MWENEZI DISTRICT

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RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS OF THE BACHELOR OF SCIENCE HONOURS DEGREE IN ANIMAL HEALTH, PRODUCTION AND EXTENSION

JUNE 2025

DECLARATION

PREVALENCE OF BOVINE BRUCELLOSIS IN MWENEZI DISTRICT

By

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"A thesis submitted to the Department of Animal Science, Faculty of Agriculture and Environmental Science, Bindura University of Science Education in partial fulfilment of requirements for the degree Bachelor of Science Honors in Animal Health and Production Extension".

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Chairperson: Mr. Pagute A. Date 06/10/25

Signatures

I declare that the above research is my work and that all the sources that I have refereed to and quoted have been acknowledge through complete academic referencing.

I also declare that I have not previously submitted this same work, or part of it for acquiring academic qualification at BUSE or any other institution of higher education.

Signed: ……………………… Date: 01/06/2025

ABSTRACT

This study investigated the prevalence of Bovine Brucellosis in Mwenezi District, with the broad objective to find the distribution of Bovine Brucellosis in the district by establishing the seroprevalence of the disease and establish the distribution of the disease across farming systems. Random sampling of 11 dip tanks and subsequently farmers was done using R Studio. A questionnaire was administered on the selected farmers. Blood samples were taken from the cows provided by the selected farmers for laboratory analysis in Masvingo Provincial Veterinary Laboratory. The outcome from the questionnaire administered to the selected farmers indicated that there was limited knowledge of Brucellosis disease, where the response to knowledge of Brucellosis was 98.78%. The high abortion rate of 60.25% indicates a significant reproductive issue and the third trimester of 61.38% showed that there is high possibility of Brucellosis. From the blood samples tested for brucellosis, 5.6% of processed samples tested positive and this made the researcher to reject the null hypothesis (Ho) which stated that the seroprevalence of Brucellosis has no bearing on the low production and reproduction of cattle in Mwenezi and there is insignificant difference in distribution of Brucellosis across farming systems. The researcher also accepted the alternative hypothesis which stated that the seroprevalence of Brucellosis has a bearing on the low production and reproduction of cattle in Mwenezi and there is insignificant difference in distribution of Brucellosis across farming systems. The positive laboratory results of Brucellosis cases in Mwenezi District indicated a significant possibility of losses through abortions contributing to low cattle production. Also, it is of public health concern since the disease can be transmitted to humans through contact with infected animals and consumption of contaminated cattle products, taking note of the limited knowledge on disease transmission, prevention, and control as guided by the survey. It was recommended that as Government of Zimbabwe through the DVS, private sector and cattle farmers should collaboratively take action in implementing campaigns and programs to provide farmers with knowledge in the transmission and control of Bovine Brucellosis, establishment of a regulatory framework and enforcement with regards to the management of Bovine Brucellosis in communal areas.

DEDICATION

I dedicate this research project to my wife (Silvia Kwangwari) and children (Anthony, Rachel, Abel and Rebecca) for their awesome support. Thank you, family, for the encouragement and support throughout the time of my study.

ACKNOWLEDGEMENTS
I would like to thank God for the gift of life through the past years since I joined Bindura University of Science Education for my study in Animal Health and Production Extension. The project is entirely based on finding the prevalence of bovine brucellosis in Mwenezi District. I therefore thank my lecturers for their effort towards imparting knowledge with regards to Animal Health and Production Extension. I would also like to thank my supervisor Doctor Paul Chatikobo (now no longer with Bindura University of Science Education), who has laid and guided the foundation of this research work as my supervisor. I well appreciate my co-supervisor Mr. Mangwiro Tawona for academic guidance and wisdom ensuring the success of this project.

Great appreciation goes to Doctor Grace Tsungirirai Magwayana (Masvingo Provincial Veterinary Laboratory Officer) for adopting my research work as part of the Department of Veterinary Service's disease surveillance program; and the laboratory technicians for processing blood samples for Brucella abortus examinations. The department is also conducting further tests on the samples that have tested positive to Rose Bengal Test. Special acknowledgement for Doctor Irvine Mlambo (Mwenezi DVO) for guidance during blood samples collection and my work supervisor Mr. Zishiri Manuel in giving directions where necessary.

I would like also to acknowledge my wife Silvia Kwangwari for assistance in data analysis through the use of SPSS, my brothers and sisters who have continually prayed with me and who made available all the resources needed for the project.

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ABBREVIATIONS

DVFS	Division of Veterinary Field Services
SOP	Standard Operating Procedure
DVFS	Division of Veterinary Field Services
DVS	Department of Veterinary Services
CVL	Central Veterinary Laboratory
MasPVL	Masvingo Provincial Veterinary Laboratory
NAPF	National Agriculture Policy Framework
RBT	Rose Bengal Test
CFT	Complement Fixation Test
MRT	Milk Ring Test
ELISA	Enzyme-Linked Immunosorbent Assay
PCR	Polymerase Chain Reaction
FPA	Fluorescence Polarisation Assay
CDC	Center for Disease Control
SPSS	Statistical package for social scientists

CHAPTER 1

1.0 INTRODUCTION

Abortion reports, particularly in the late pregnancy period, that is the third trimester in cows, with some cases indicating three consecutive abortions is quite interesting, considering that a cow bears a calf once per year(Tzelos et al., 2020) , and it takes about $2^{1/}{}_{2}$ to 3 years for a calf to grow enough for sale or reproduction. That indicates that someone is losing on production time and in particular production and reproduction. This created interest in the researcher to settle on the proposed research topic to identify the major problem and to what extend the problem has reached production wise and economically.

The Division of Veterinary Field Services (DVFS) standard operating procedure (SOP) manual, currently the second edition of July 2021, provides a guide on how to handle notifiable and zoonotic diseases, however the SOP manual is silent about brucellosis although it is also zoonotic. Absence of brucellosis in the DVFS SOP has illuminated the absence of Brucellosis control in the communal and small holder farming areas. As such this study is an attempt to pave way for service provision regarding Brucellosis control in communal Zimbabwe.

The most recent attempt to estimate the prevalence of Brucellosis in Zimbabwe was done using samples submitted to the Central Veterinary Laboratory (CVL) between 2010 and 2014 and was published in March 2018(Vhoko, 2018). The study was carried out on 156 farms and it is paramount to note that there is better Brucellosis management in commercial farms than communal areas, and as such the 2010 to 2014 study cannot be a true representation of Brucellosis prevalence in Zimbabwe. Envisaged by very few studies and publications on prevalence of brucellosis in the communal and smallholder farming areas in Zimbabwe, this research project seeks to obtain a bird's view on the prevalence of Brucellosis in part of the communal Zimbabwe setup.

The current agricultural trend following fast track land reform program of Zimbabwe officially announced in July 2000 (*FAST TRACK LAND REFORM IN ZIMBABWE*, n.d.), shaped most commercial farms into communal farming areas, where Brucellosis control is voluntary. The need to achieve National Agriculture Policy Framework (NAPF)'s vision 2030, bordered mainly on achieving food and nutrition security. In this context all possible parameters that contributes to the achievement of vision 2030 of being an upper middle-income economy have to be explored.

1.1 Problem statement

Deficit in knowledge of prevalence of Brucellosis in communal and small holder farming areas of Zimbabwe is the first problem to be addressed. Results from this research project will quantify the amount of Brucellosis in terms of percentage in the area of study and will use that percentage for inference on the approximate quantity of the disease in the district. The knowledge thereof will guide on the control and prevention measures to be taken against Bovine Brucellosis.

The economic and social losses generated by the presence of Brucellosis can only be appreciated through conducting this research project. The results from this proposed research will project the amount of loss farmers are incurring due to abortions, weak calves and infertility. The Socio-economic implications of the disease will be assessed through questionnaire interviews.

The current management system and Brucellosis awareness level needs to be known. The research will assess the cattle management and level of knowledge of brucellosis that farmers have, assessed through questionnaire interviews. This will guide extension services on where and how to initiate control and prevention measures. Knowledge of Brucellosis awareness level is particularly important as the disease is zoonotic considering that consumption of livestock products such as milk and meat; and livestock handling is rife in communal areas.

1.2 Objectives

1.21 Broad objective

To find the distribution of Bovine Brucellosis in communal areas of Mwenezi.

1.22 Specific objectives

a) To establish the seroprevalence of brucellosis in Mwenezi district.

b) To establish the distribution of brucellosis across farming systems.

1.3 Hypothesis

$H_{o\,=}$ the seroprevalence of Brucellosis has no bearing on the low production and reproduction of cattle in communal Mwenezi.

H_1 = the seroprevalence of Brucellosis has a bearing on the low production and reproduction of cattle in communal Mwenezi.

H_0 = There is insignificant difference in distribution of Brucellosis across farming systems.

H_1 = There is significant difference in distribution of Brucellosis across farming systems.

1.4 Justification

The research project will provide data on Brucellosis prevalence in the communal areas under study that will reflect on the district Brucellosis prevalence, and as such provide the basis for initiating husbandry practices that controls and prevent the occurrence of the disease. The results will show the need to carry out surveillance of brucellosis in cattle in Zimbabwe to understand the spatial distribution of the disease in the country. This is particularly relevant given the zoonotic and economic implications of this disease. Assessment of the socio-economics of the disease will provide data on how much farmers are losing per year through Brucellosis, and that will conscientize farmers on the need to start livestock production as a business.

The need to attain vision 2030, which seeks to fundamentally transform Zimbabwe to an upper middle-income economy by 2030, with a per capita Gross National Product of over US$5000 in real terms, from the current of US$1440 (The Herald, March 07, 2024). Now this national vision is supported by ministerial visions, and the Ministry of Agriculture rides on the National Agriculture Policy Framework (NAPF)'s vision 2030, of a prosperous, sustainable, resilient, diverse and competitive agriculture sector, ensuring food and nutrition security and significantly contributing to national development in the context of sustainable structural transformation. This will eventually make communal farmers realize profits from cattle sales and in turn raise the gross domestic product of the nation.

The research will also reflect on the zoonosis effects of Brucellosis, and provide advice on handling cases and potential cases.

CHAPTER 2

2.0 LITERATURE REVIEW

2.1 History of Brucellosis

Brucellosis is believed to have originate in the Mediterranean region in the late Roman era. The disease was associated with military campaigns in the region, and it gained its name from its resemblance to the organism *Brucellae* (later called *Brucella*) from carbonized cheese. Sir David Bruce, Hughes, and Zammit explored the disease while working in Malta; hence the name 'Malta fever' is occasionally used for typical fever conditions caused by *Brucella.* Brucellosis, Undulant fever, Contagious Abortion and Malta Fever are all interchangeable names that represent clinical conditions caused by Brucella abortus].(*TropicalMed | Free Full-Text | An Overview of Brucellosis in Cattle and Humans, and Its Serological and Molecular Diagnosis in Control Strategies*, n.d.)

2.11 Brucellosis researches done in Zimbabwe

Estimating the prevalence of Brucellosis in cattle in Zimbabwe from samples submitted to the Central Veterinary Laboratory between 2010 and 2014(Vhoko, 2018). This was the first attempt to estimate the prevalence of brucellosis in Zimbabwe as a whole. Samples were analysed at the Central Veterinary Laboratory (CVL) between 2010 and 2014. The samples from a total 156 farms were tested using the Rose Bengal Test (RBT), Complement Fixation Test (CFT) and Milk Ring Test (MRT)(Vhoko, 2018). These are serological assays that can be used in the examination of Brucella in serum. Serology is a medical science that studies the blood serum immunological reactions and properties to detect the presence of antibodies against a specific antigen(*Definition of SEROLOGY*, 2024).

Thus, regarding the current proposal, the researcher will still use the same tests for samples that will be submitted to the CVL to determine Brucellosis prevalence in the area proposed. 30.1% (47/156) of the farms that were studied between 2010 and 2014 were found to be positive to brucellosis. Harare district had the highest number of sample submissions with 6 out of 17 farms testing positive. It is important for the proposed research, to note that the research of 2010 to 2014 clearly indicated sampling on 156 farms throughout the country, leaving out the communal areas were in the researcher's opinion is a potential hub of brucellosis due to lack of significant Brucellosis management practices. Awareness of milk-borne zoonosis was assessed to be as low as 41.5% in farmers. The researcher admitted that the awareness percentage can be even lower in small-holder farms and communal areas where the likelihoods of selling or ingesting raw milk compared with dairy farmers is higher (Vhoko, 2018).

Molecular characterization of Brucella species from Zimbabwe (Ledwaba et al., 2019), is an article that describes the use of various assays such as Automated Molecular Typing System (AMOS), Bruce-ladder, Multiple Locus Variable Number Tandem Repeats Analysis (MLVA), and whole genome sequencing to characterize Brucella species isolated from different animals in Zimbabwe. The study was carried out on samples submitted to the CVL to assess the practical possibility of genotyping Brucella using Polymerase Chain Reaction (PCR) assays (MLVA, AMOS-PCR and Bruce-ladder) for laboratories that do not have bio typing capabilities as was the case with CVL, Zimbabwe at the time of the study (Ledwaba et al., 2019). In most countries Brucellosis is controlled based on serological tests which includes RBT, MRT, CFT, enzyme-linked immunosorbent assay (ELISA) and the fluorescence polarisation assay (FPA) (Ledwaba et al., 2019). Most laboratories in Africa lack resources especially finances, equipment and expertise to perform necessary tests for diagnosis and identification of specific pathogens as such these limiting factors are determinants of the choice of assays to be employed. The study of Molecular characterization of Brucella species from Zimbabwe shows that the differentiation of species can be correctly concluded from the analysis with AMOS, Bruce-ladder and MLVA16 assays (Ledwaba et al., 2019).

2.2 Aetiology

Brucellosis is caused by facultative intracellular, Gram negative coccobacilli bacteria of the family a2-Proteobacteriacea, genus Brucella (Tulu, 2022), with six major species: Brucella abortus, Brucella melitensis, Brucella ovis, Brucella suis, Brucella canis and Brucella neotomae (Khan & Zahoor, 2018). Two other species were later discovered, which are Brucella pinnipedialis (in seals) and Brucella ceti (in whales and dolphins). Brucellosis is among the most common contagious and communicable zoonosis worldwide, with high rates of morbidity and lifetime sterility, posing serious economic concerns(Zakaria et al., 2019).

After ingestion of contaminated feed or pasture, the bacteria infect an animal through the gastrointestinal tract then spreads to local lymph nodes where it replicates intracellularly in phagocytes (*Anderson et al., 1986a*). Lymphatic infection leads to bacteremia resulting in systemic infection, with an affinity to the pregnant uterus (a strong tropism to the uterus in the last trimester of pregnancy), male genital organs, and mammary gland (*Ko and Splitter, 2003*).

2.2 Epidemiology

2.21 Distribution

In Zimbabwe, Bovine brucellosis is said to be endemic, that is the disease is always present and sero-prevalence as high as 53% were reported in commercial herds in comparison to 16% from small-scale farmers(Ledwaba et al., 2019).

2.22 Species

Brucellosis affects a vast range of animals both wild and livestock; and in particular humans. Six species of Brucella are *Brucella abortus* in cattle, *Brucella melitensis* in goats, *Brucella ovis* in sheep, *Brucella suis* in pigs, *Brucella canis* in dogs and Brucella neotomae in dessert wood rats(Qureshi et al., 2023). Brucellosis becomes of public health importance when the bacteria are transmitted to human via unpasteurized milk, meat, and animal byproducts, from infected animals(Qureshi et al., 2023). Brucellosis is harbored in wild animals such as buffaloes and antelopes making it difficult to control and prevent the disease, particularly in areas close to game parks(Ledwaba et al., 2019). All breeds of species affected are equally susceptible irrespective of gender, with some cases of intrauterine transmission, where calves are born infected.

2.23 Transmission of Brucellosis

The most important source of infection is contaminated pasture, where the aborted fetuses, fetal membranes and uterine secretions are deposited after abortion or parturition(Samartino & Enright, 1993). Ingestion of contaminated pasture causes infection through the gastrointestinal tract(Neta et al., 2010). Brucellosis can also be transmitted vertically, that is from dam to offspring. Contaminated milk is another source of infection to both calves and humans. Thus, brucellosis transmission is either direct by contact with fetus, fetal fluids, placenta, vaginal discharges and indirectly by byproducts such as milk, meat and cheese (Khan & Zahoor, 2018). Farmers, abattoir workers, laboratory and professional health workers are all predisposed to Brucellosis through their work environment

2.24 Clinical signs

Abortion in the third trimester of gestation is the pathognomonic sign of Bovine Brucellosis (Samartino & Enright, 1993); birth of stillborn or weak calves, retained placenta, and reduced milk production(*Brucellosis in Cattle - Reproductive System - MSD Veterinary Manual*, n.d.). Abortions usually occur once in infected animals, however they can still shed *Brucella abortus* in amniotic fluid and milk at preceding calvings(*Brucellosis in Cattle - Reproductive System - MSD Veterinary Manual*, n.d.). Fever, vesiculitis, orchitis, and epididymitis are the main characteristics of Brucellosis in bulls, with some cases of testicular abscesses and the condition terminates into a lifetime infertility (Tulu, 2022).In humans it is characterized by undulant fever, general malaise, and arthritis (Khan & Zahoor, 2018).

2.25 Diagnoses

Direct diagnosis of Brucellosis can be confirmed by demonstration of the bacteria in smears with modified Ziehl-Neelsen (MZN) stain. Smears are collected from the vagina, placenta, colostrum, fetal stomach fluid, the aborting cattle lochia, or the abomasum of the aborted fetus. Indirect diagnosis is done based on serological tests such as the Rose Bengal Test (RBT) and indirect and competitive enzyme-linked immunosorbent assays (i-ELISA and c-ELISA) (*Https*, n.d.).

2.26 Treatment in Bovine Brucellosis

To treat Bovine Brucellosis, Streptomycin, Tetracycline and Ox tetracycline can be administered intramuscularly at a dose of 20-30mg per kilogram body mass. Treatment of Brucellosis is not the ultimate solution, as such antibiotics should be used in combination with other control measures, such as test and cull, vaccination, and hygiene practices. Brucellosis treatment in cattle is challenging, and antibiotic treatment may not always be effective due to relapses. The most suitable technique in the management of Brucella infection is the vaccination of young female cattle. Brucella abortus can also be eradicated by the isolation of diseased cattle, administration of immunizing agents, and test-and-slaughter methods. Therefore, it is important to implement applicable management techniques and to increase public awareness about the transmission of brucellosis, and further research should be conducted on brucellosis in high-risk groups.(Tulu, 2022).

2.27 Treatment in humans

Treatment options include doxycycline 100 mg twice a day for 45 days, plus streptomycin 1 g daily for 15 days. The main alternative therapy is doxycycline at 100 mg, twice a day for 45 days, plus rifampicin at 15mg/kg/day (600-900mg) for 45 days. Experience suggests that streptomycin may be substituted with gentamicin 5mg/kg/daily for 7–10 days, but no study directly comparing the two regimes is currently available. The optimal treatment for pregnant women, neonates and children under 8 is not yet determined; for children, options include trimethoprim/sulfamethoxazole(co-trimoxazole) combined with an aminoglycoside (streptomycin, gentamycin) or rifampicin2025/10/10.

2.28 Control

Eradication and control program based on compulsory calf vaccination with B. abortus strain S19 was introduced in Zimbabwe in the early 1980s, but only to commercial farms and was voluntary to communal ones (Ledwaba et al., 2019). Dairy farms are required by legislation to vaccinate calves between 3 and 9 months of age using the B. abortus Strain 19 vaccine, (Matope et al. 2011). Both S19 and RB51 vaccines are available. A Brucellosis Accreditation Scheme (BAS) for the control of brucellosis in Zimbabwe started in 1982 on a voluntary basis with the aim of controlling and, eventually, eradicating the disease from dairy herds around the country (Borland and Moyo 1995). It became compulsory for all commercial producers and remained voluntary to communal farmers since 1991. Under this scheme all female dairy cattle at least 18-month-old were bled and tested for Brucellosis 3 times a year. If all 3 bleedings were negative, upon the fourth negative result, the farmer would receive an accreditation certificate. The veterinary service department was and is still responsible for undertaking this scheme. Accreditation certificates were renewed annually under the condition that bulk milk samples submitted to the laboratory for the Milk Ring test (MRT) every 3 months were negative over 1 year (Reg. 1995). Farmers with accreditation certificates were offered higher premiums for their milk by the industry (Reg. 2004). Brucella abortus can also be eradicated by the isolation of diseased cattle, administration of immunizing agents, and test-and-slaughter methods. These brucellosis control procedures can be applied to the communal sector if Brucellosis eradication is sincerely to be achieved.

2.29 Public health advice

Eating undercooked meat of game or domesticated animals, consuming unpasteurized (raw) milk or other dairy products made from contaminated milk, breathing in the bacteria that cause brucellosis and getting in contact with body fluids from infected animals predisposes to Brucellosis. People with certain jobs or hobbies may face increased exposure to the bacteria that cause brucellosis, including: Slaughterhouse workers, Hunters, Veterinarians and veterinary staff, Animal breeders or animal shelter staff and Laboratory workers (CDC, 2024). If you work with animal tissues, protect yourself by wearing: Rubber gloves. Goggles Gowns or aprons Masks or respirators(CDC, 2024).

CHAPTER 3

3.0 MATERIALS AND METHODS

3.1 Study area

The research was conducted in Mwenezi district, Masvingo province, lying in the southern part of Zimbabwe and is part of the South-Eastern Lowveld. It shares borders with Chiredzi, Beitbrigde, Mberengwa and Chivi districts, to the east and northeast, south and west, northwest and north, respectively. The district is in natural region V, characterized by erratic rainfall and vegetation species such as mopane trees, acacia species and panicum grasses. The region receives an average annual rainfall of 400 – 500mm. The study has covered the communal and resettled A1 areas of Mwenezi District. It is made up of Maranda and Matibi communal areas. Matibi is further divided into Matibi 1 and Matibi 2. Matibi 1 and lies to the north of Maranda and encompasses the Neshuro growth point area. The study has covered 11 dip tanks under the Department of Veterinary Services (DVS) in Mwenezi District as shown in figure 3.1 below.

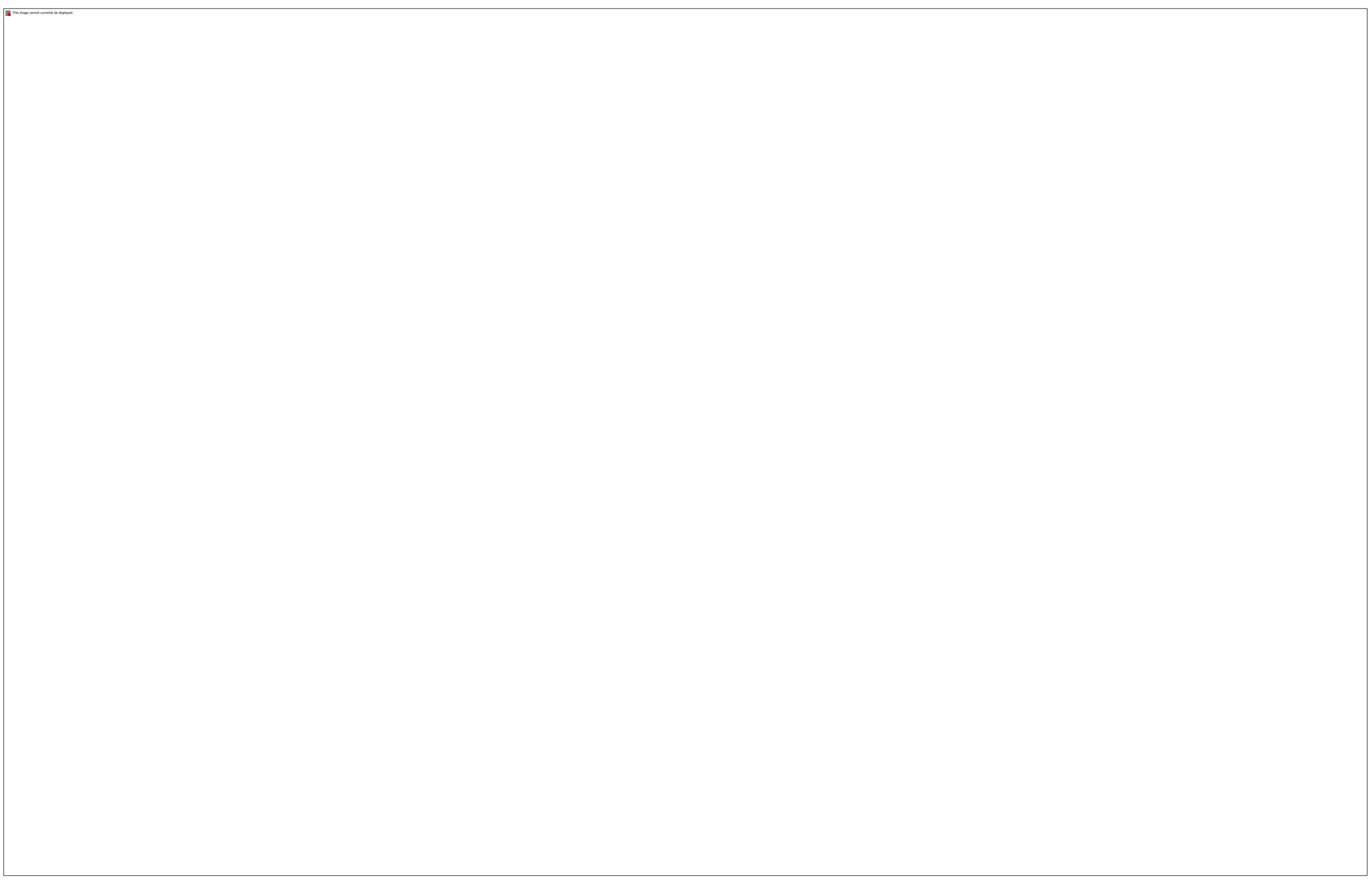

Figure 3.2: Map showing sampled dip tanks in Mwenezi

3.2 Study design

The sampling frame comprised of all cows in the randomly selected dip tanks. The dip tanks were randomly selected from a pool of 110 dip tanks in Mwenezi. 10% of the total dip tanks have been sampled (n=11). The 11 randomly selected dip tanks provided a cow sampling frame of 5189 cows. A total of 246 farmers were randomly selected from the 11 dip tanks, each provided a cow for blood sampling and also answering questionnaire. Out of the 11 dip tanks 4 provided 23 farmers each subsequently providing 23 cows per dip tank. The other 7 dip tanks provided 22 farmers each and subsequently providing 22 cows per dip tank. Appendix A, figure 2 shows randomly selected dip tanks and Figure 3.3 up to 3.13 shows random selection of farmers on each of the 11 randomly selected dip tanks.

3.3 Sample size

For more appropriate sample size to be reached an approximate prevalence is to be given based on prior evidence of prevalence if available. However if prior evidence is not available a suitable procedure would be to use a 50% prevalence for maximum number of samples, or to use 20% prevalence to achieve more sample unit(Thrusfield, 2008).

In this case due to the deficit in approximate prevalence knowledge, the researcher used an approximate prevalence of 20% to achieve more sample units by using the following formula:

$n=1.96^2\, P_{exp}\, (1-P_{exp})/d^2$ (Thrusfield, 2008), to get 246 samples. Calculations are shown in appendix III.

3.4 Data collection

3.4.1 Questionnaire

Data was collected through a questionnaire run on the 246 randomly selected farmers who also provided cows for blood samples. As such a total of 246 questionnaires were completed. The questionnaire provides data with respect to demography, encountered C.A. cases, C.A. knowledge, case management and human risk assessment. SPSS data collection questionnaire is provided on Appendix C.

3.4.2 Blood samples

Approximately 7ml of blood was collected in red top vacutainer tubes from each sample cow by jugular vein puncture. See Appendix B, Plate 1 on blood sample collection. A total of blood samples (n = 246) were collected. Materials for the exercise included 15-gauge needles used once on each cow then disposed, vacutainers for blood collection, cooler boxes for handling blood samples, ropes to assist in handling cows and gloves for protective handling of blood samples. After blood collection vacutainers were transported in cooler boxes in standing position to allow blood clotting in transit to Masvingo Provincial Veterinary Laboratory (MasPVL) for serological tests. See Appendix B, Plate 2 below, for blood sample packaging.

3.4.3 Milk samples

Milk samples could also have been collected from sampled cows and send to the CVL for Brucella abortus tests using the Milk Ring Test (MRT. However, this research could not cover milk sample testing as the local Veterinary Laboratory in Masvingo does only provide testing for Rose Bengal Testing.

3.5 Data analysis

- 'R' Studio was used in randomizing sampling of dip tanks and farmers to provide for questionnaire data collection and cows for blood sampling.
- Statistical package for social scientists (SPSS) was used to analyze data collected through the questionnaire survey.
- Blood samples were analyzed according to serological tests and results were given to quantify the existence of disease through prevalence percentage.

CHAPTER 4

4.0 RESULTS

4.1.0 Demography Data

Of the total sampled population of 246 farmers 84.96% were males and 15.04% were females. On level of education primary level 33.33%, secondary level 58.94%, tertiary level 3.66% and those with no marked level 4.07%.

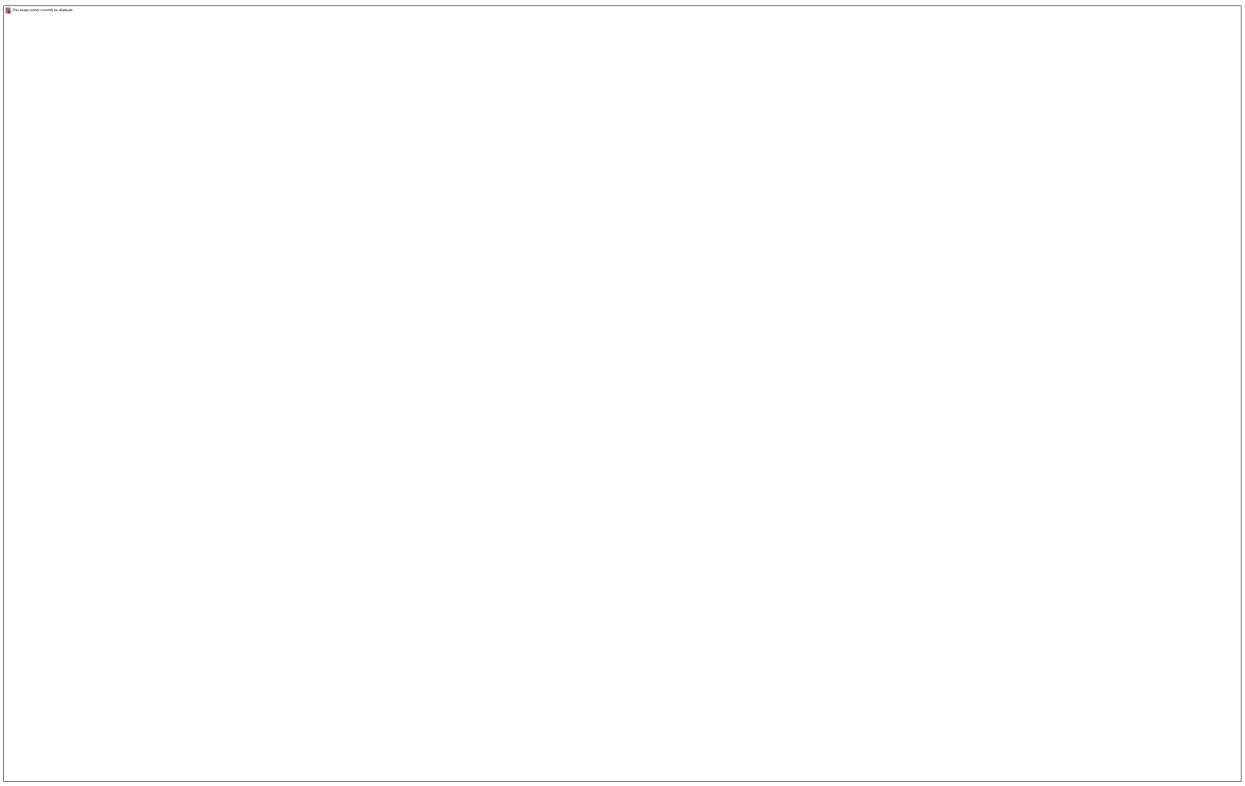

Figure 4. 1: Level of education

The source of household income was mainly through informal ways indicated by 95.93% against the formal sector of 4.07%.

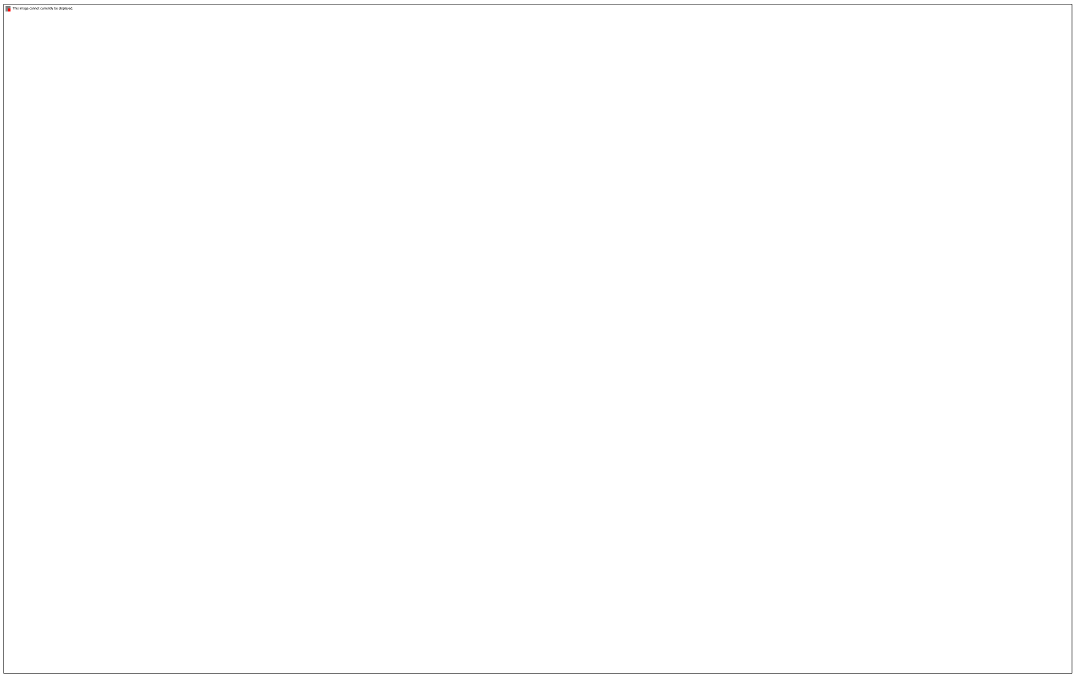

Figure 4. 2 Source of household income

4.2.0 Knowledge of Brucellosis

The response to knowledge of Brucellosis was 98.78% negative (people without knowledge) and 1.22% positive (people with some knowledge).

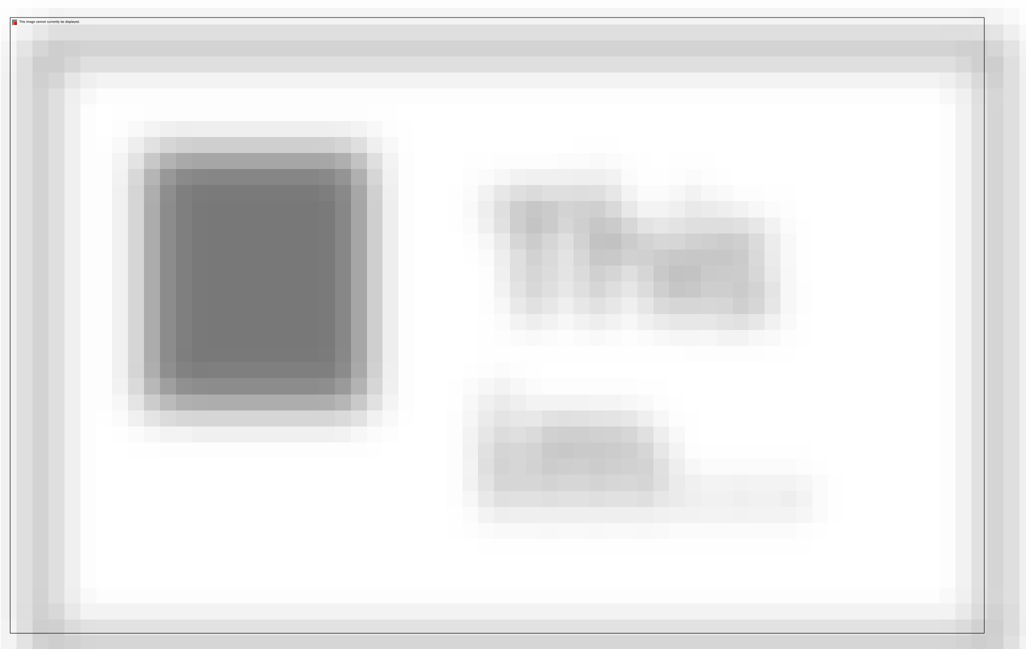

Figure 4. 3 Knowledge about Brucellosis

4.3.0 Abortion Cases

Abortion cases were 60.20%, while none abortion cases were 37.80%. The third trimester had 61.38% cases, second trimester 1.22% and none abortive cases 37.40%. See figure 17 and figure 18 respectively.

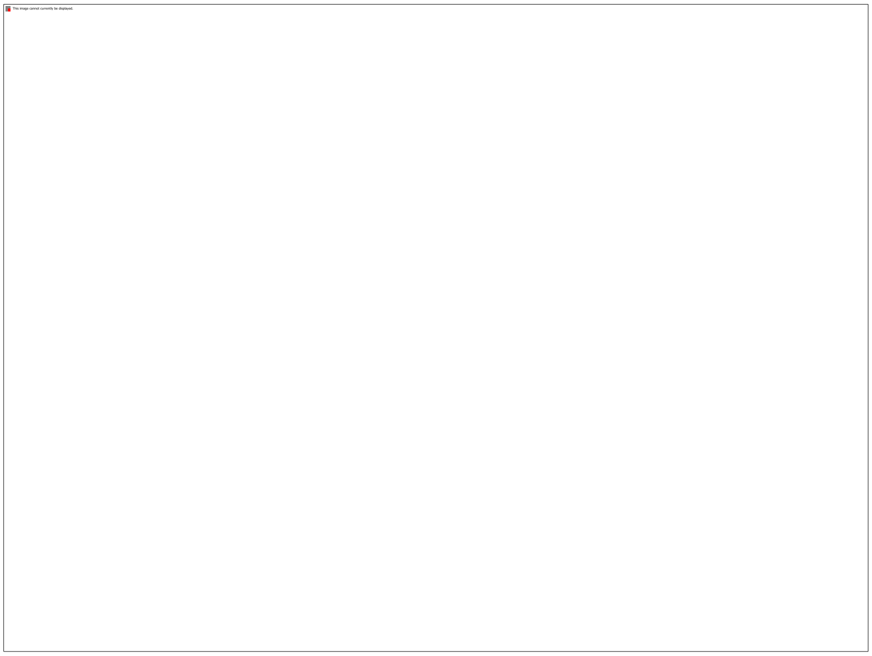

Figure 4.4 Abortion cases

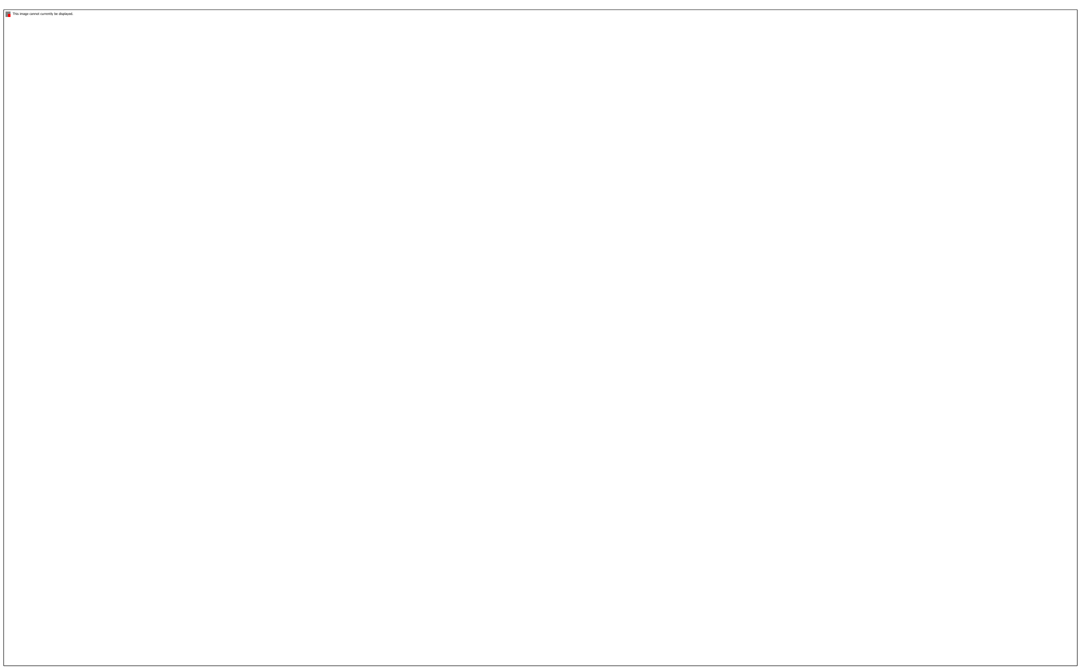

Figure 4.5 Trimester of Abortion

4.4.0 Brucellosis Management

With regards to brucellosis management 97.56% of farmers retained their aborting cows for breeding, whilst 2.44% sell the aborting cows to abattoirs. Fetus handling without any form of protection was recorded at 95.12% against protective handling of 4.88%.

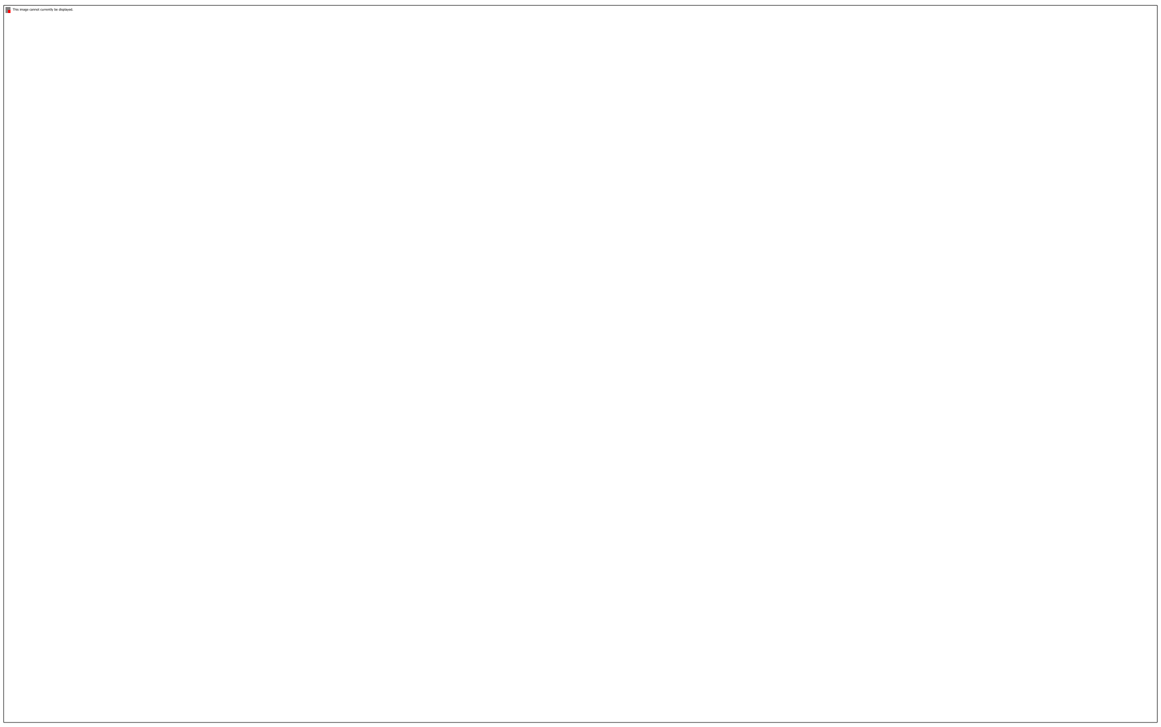

Figure 4.6 Disposal of aborting cows.

4.5.0 Human Risk of Exposure

Assessment of human risk exposure done through questionnaire revealed a 100% risk exposure as no one of the 246 interviewees exhibited knowledge on self-protection during case handling, cattle handling and raw milk consumption.

4.6.0 Blood Samples Laboratory Results

Four dip tanks (Quagga pan, Musaverima, Gandama and Maranda) provided 23 blood samples each. Seven dip tanks (Guruguru, Chengwe, Mfula lundi, Lower, Mjingwe, Chomumvuri and Masangula) provided 22 blood samples each. Approximately 7ml of blood was collected from each cow and analyzed at the local Veterinary Laboratory in Masvingo using Rose Bengal Test. A total number of blood samples successfully processed for brucellosis using Rose Bengal Test were

192 out of 246 tested. A positive result is indicated by agglutination (visible clumping) in a blood serum inoculated with Rose Bengal reagent. Non agglutination indicates the absence of brucella arbutus antibodies implying that the animal is free from brucella abortus. The average positive results for Brucellosis were 5.6% calculated out of the processed 192 blood samples and results are shown in Table 4.1 Rose Bengal plate agglutination test for Brucellosis below.

Table 4.1: Rose Bengal plate agglutination test for Brucellosis results

Diptank	Agglutination (%)	Non agglutination (%)
Chengwe	0%	100%
Maranda	4.3%	95.7%
Guruguru	0%	100%
Chomumvuri	20%	80%
Lower	4.5%	95.5%
Quagga pan	9%	91%
Mjingwe	8.3%	91.75
Musaverima	not processed	not processed
Masangula	not processed	not processed
Mfula Lundi	0%	100%
Gandama	4.3%	95.7%

CHAPTER 5

5.0 DISCUSSION OF RESULTS

5.1.0 Demographic Data

5.1.1 Respondents gender

The data presented male respondents at 84.96% and female respondents at 15.04%. This reflects the social monopoly on livestock ownership regarding major livestock such as cattle as the simple of wealth for most African man. The imbalance can also be attributed to the maniac handling of cattle that is required in their management. Socially women become owners of such livestock through inheritance after spouses have passed on. Given the knowledge with regards to brucellosis management, the demography shows high potential of success through a higher percentage of male respondents who would provide the labor required.

5.1.2 Level of education

On level of education with primary level at 33.33%, secondary level 58.94%, tertiary level 3.66% and those with no marked level 4.07%, this implies that the total level of literacy is above 50% is a good starting point on provision of literature and farmer trainings on the management of bovine brucellosis.

5.1.3 Sources of household income

The source of household income was mainly through informal ways indicated by 95.93% against the formal sector of 4.07%. This is typical of most communal areas where livelihood sustenance is mainly through subsistence farming. Hence the need to have a more radical approach in the farming system being undertaken, with the main objective of boosting production through precision farming and climate smart agriculture. Regarding bovine Brucellosis management, there is dire need to curb losses through abortions, particularly third trimester abortions associated with bovine Brucellosis, which not only reduces production but causes financial losses through loss of production time. If this goes unchecked communal farmers will remain at subsistence level of cattle production, and in that respect derail the vision 2030 of being an upper middle-class economy.

5.2.0 Knowledge of Brucellosis

The response to knowledge of Brucellosis was 98.78% negative (people without knowledge) and 1.22% positive (people with some knowledge). This is quite significant lack of knowledge on a disease that cuts on the total annual calf crop and more so on a disease that is zoonotic. Apparently, the Veterinary Department Standards Operations Procedure (SOP) manual is silent about Bovine Brucellosis management. Probably this is due to the use of an old legislature that focuses mainly on the management of Bovine Brucellosis in commercial farms, particularly dairy farms due to their nature of production. However, it still does not suffice to totally ignore any form of bovine brucellosis management in the communal areas where farmers handle and consume cattle products almost daily, taking into account that no disease knows boundaries, more so where management is slack. Management of the diseases can be one dimension that is a challenge considering the communal farming set up. However, provision of knowledge regarding the zoonotic nature of the disease cannot be over emphasized, for public health safety concerns.

5.2.1 Abortion cases

High abortion rate of 60.25% indicates a significant reproductive issue and the third trimester of 61.38% showed that there is high possibility of Brucellosis according to Samartino & Enright, 1993. However, not all the 61.38% abortions cases can be attributed to Brucella abortus as there are some factors such as nutrition, physiological and environment factors. This is clearly expressed by the low prevalence of 5.6% bovine brucellosis serological tests against 60.25% abortion cases. Thus, some abortions can be related to nutrition challenges as the time of this research was towards the end of the 2024 – 2025 drought period. Physiological and labor (draught power) during ploughing could all have contributed to the high abortion cases.

5.2.2 Brucellosis management

Retaining infected cows and poor handling practices can lead to widespread disease transmission within herds and to humans, since Brucellosis diseases is zoonotic, poor management practices put farmers, veterinarians and others at risk. The results from the interviewed farmers shows that 97.56% of farmers retained aborting cows for breeding which is quite alarming as it perpetuates the disease and risks infecting other animals. Inadequate fetus handling of 95.12% by farmers poses a significant health risk to themselves

5.3.0 Human risk exposure

The 100% risk of exposure of farmers in Mwenezi District, coupled with a lack of knowledge on self-protection during abortion cases handling and raw milk consumption highlighted a critical public health concern

5.4.0 Blood samples laboratory results

Rose Bengal plate agglutination test for Brucellosis done showed that 5.6% of the blood samples were positive of brucellosis with 94.4% negative. However, there is need to consider the incidence off false positives, possibly due to cross-reaction with other bacteria. False negatives may also occur in early or chronic stages of infection. Thus, further tests with other techniques such as CFT, ELISA and PCR particularly on the RBT positive cases will give a conclusive guide to the prevalence rate. A prevalence rate of 5.6% indicates that brucellosis is present in the district, posing a risk to animal health, contributing to reproductive issues, abortions, and economic losses. Public health is also at risk due to zoonotic transmission potential through handling and consumption of infected cattle and cattle products respectively. The 5.6% prevalence rate highlights the need for proactive measures to control and prevent bovine brucellosis in Mwenezi District.

5.5.0 Limitations of the research

The local veterinary laboratory in Masvingo was only capable of performing Rose Bengal test. Sensitivity and specificity of the diagnosis methods of brucellosis examinations is important for accurate inference and initiation of control programs. The choice of the assay to use depends on the affordability and availability of expertise in a given country, the quality of the results is thus dependent. In Zimbabwe, RBT, CFT and MRT assays can be done for brucellosis testing at the Central Veterinary Laboratory in Harare, each sample costing US5.00. Thus, financially the researcher opted for RBT at the local veterinary laboratory in Masvingo.

Reagents for the Rose Bengal Test were also limiting resulting in some samples still to be examined resulting in the research analysis to be based on the processed 192 samples.

As the disease is zoonotic, the research could have potentially extended to investigate prevalence in humans, however due to social, ethical and financial limitations the research has been limited to finding prevalence in cattle.

Infrastructure at some dip tanks and stakeholder- farmer cooperation was limiting, resulting in two dip tanks being pulled out of the sample and replaced despite having been initially selected through R – Studio.

CHAPTER 6

6.0 CONCLUSION AND RECOMMENDATIONS

6.1.0CONCLUSION

In conclusion, we reject the null hypothesis (Ho) that says the seroprevalence of Brucellosis has no bearing on the low production and reproduction of cattle in communal Zimbabwe and that there is Insignificant difference in distribution of Brucellosis across farming systems and accept the alternative hypothesis (H1) that says the seroprevalence of Brucellosis has a bearing on the low production and reproduction of cattle in communal Zimbabwe and there is significant difference in distribution of Brucellosis across farming systems. The presence of Brucellosis cases in Mwenezi District indicates a significant possibility of losses through abortions contributing to low cattle production. Moreover, the presence of Brucellosis cases poses a public health concern, likely linked to animal-human transmission through contact with infected animals and consumption of contaminated cattle products, limited knowledge on disease transmission, prevention, and control.

6.2.0 RECOMMENDATIONS

As recommendations, the Government of Zimbabwe through the Department of Veterinary services, private sector in collaboration with cattle farmers should implement and exercise the following recommendations:

1. Implement campaigns and education programs that provide farmers with education on Brucellosis risks, transmission and control measures to improve management
2. Stakeholders to implement animal health measures by enhancing disease surveillance, vaccination, and control programs.
3. Farmers to consider testing and culling of aborted cows to control further spread of the disease
4. Farmers to implement proper protective measures for handling aborted fetuses and infected materials such as handling with gloves, disinfecting infested ground with veterinary soda and burying or burning the aborted fetuses then the farmer should disinfect his or her clothes by washing with strong detergents
5. The extension services should promote safe-milk consumption services such as pasteurization.

6. Establishment and enforcement of regulatory frame work in the communal farming sector with regards to the management of Bovine Brucellosis.
7. Further research to investigate factors contributing to the prevalence and establishment of tailor- made prevention and control measures

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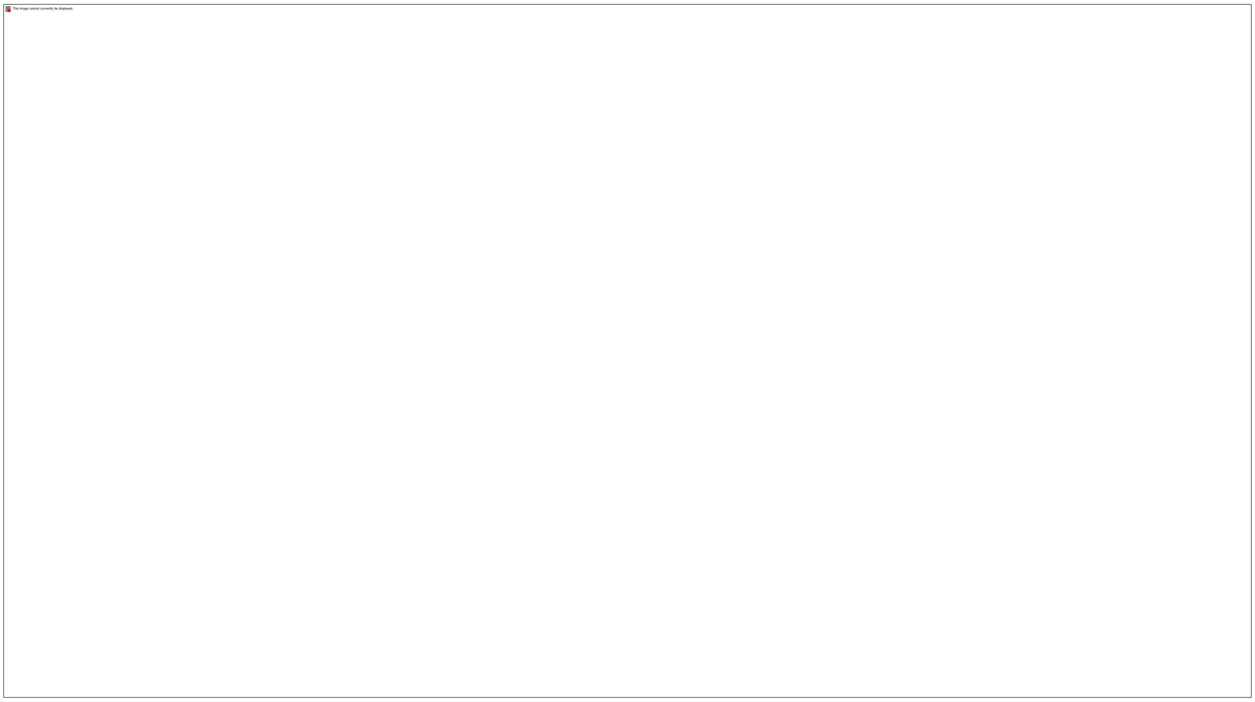
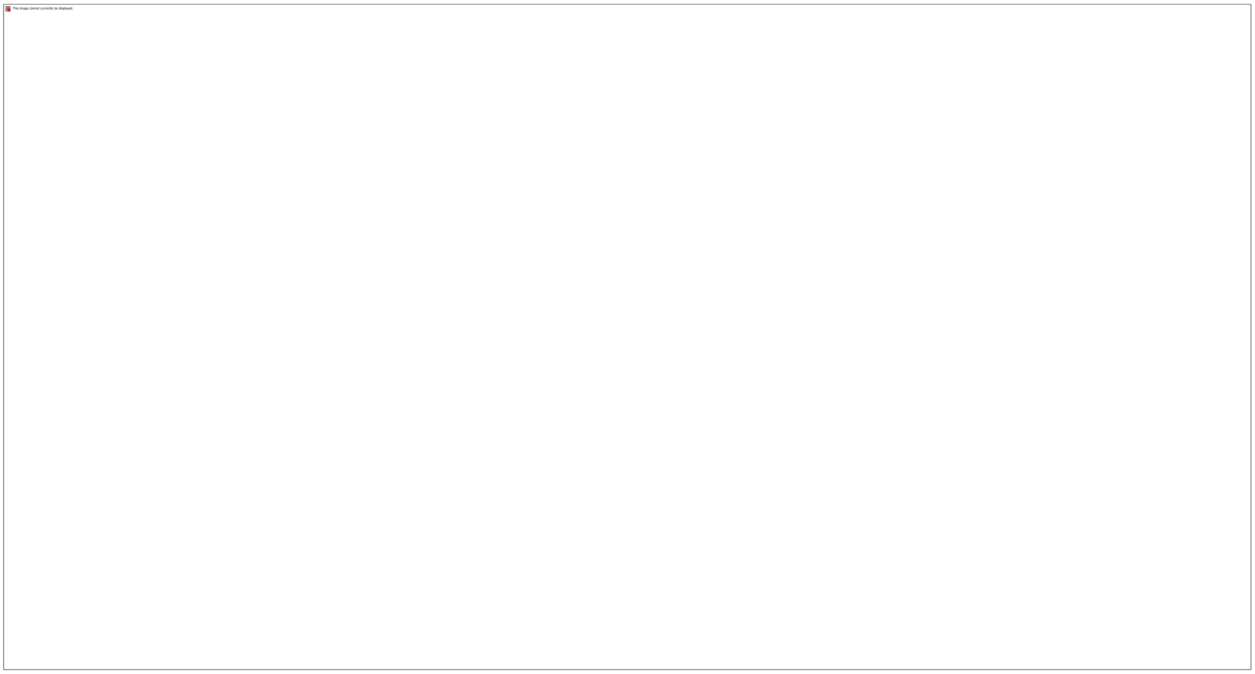
8.0 APPENDICES

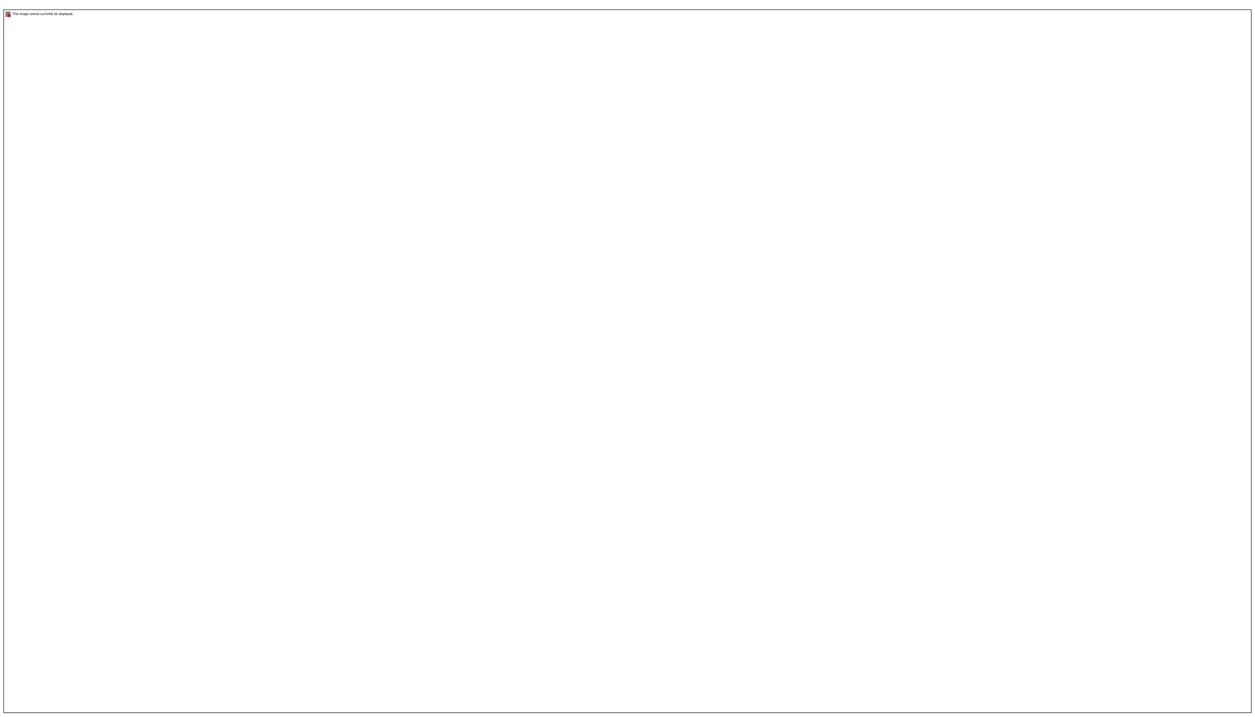
Appendix i: Farmer and dip tanks selection data



Random selection of dip tanks through R Studio



Musaverema farmer selection



Mujingwe Farmer selection

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Mavambo Farmer selection

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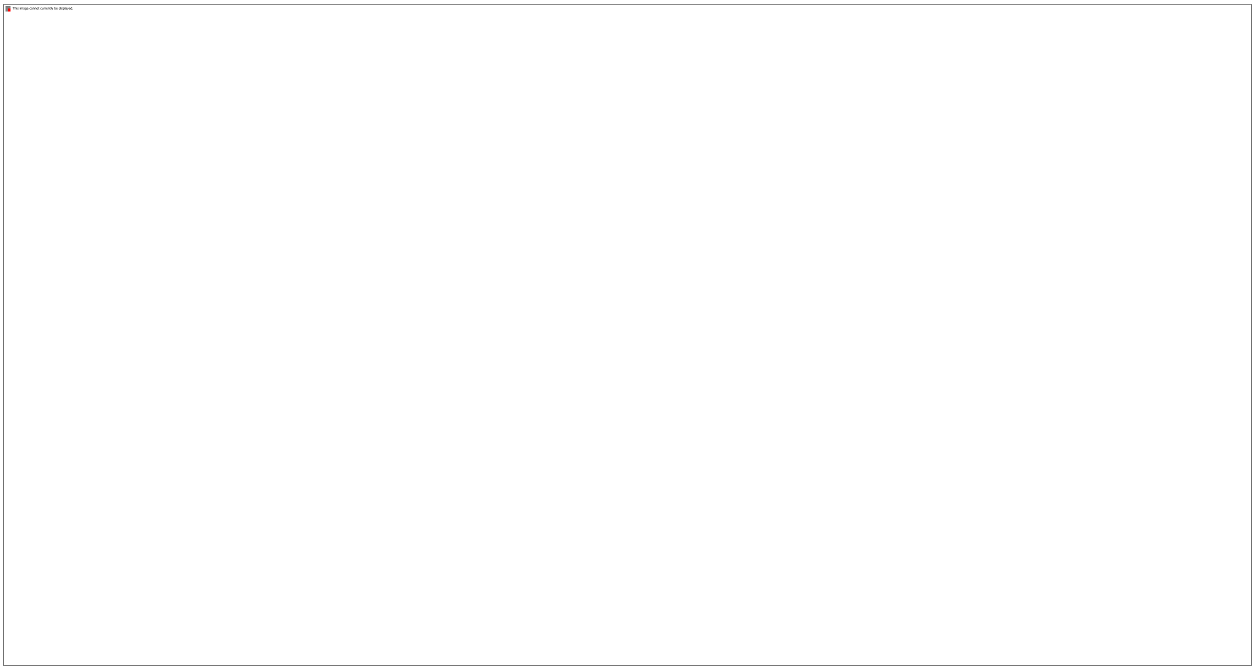
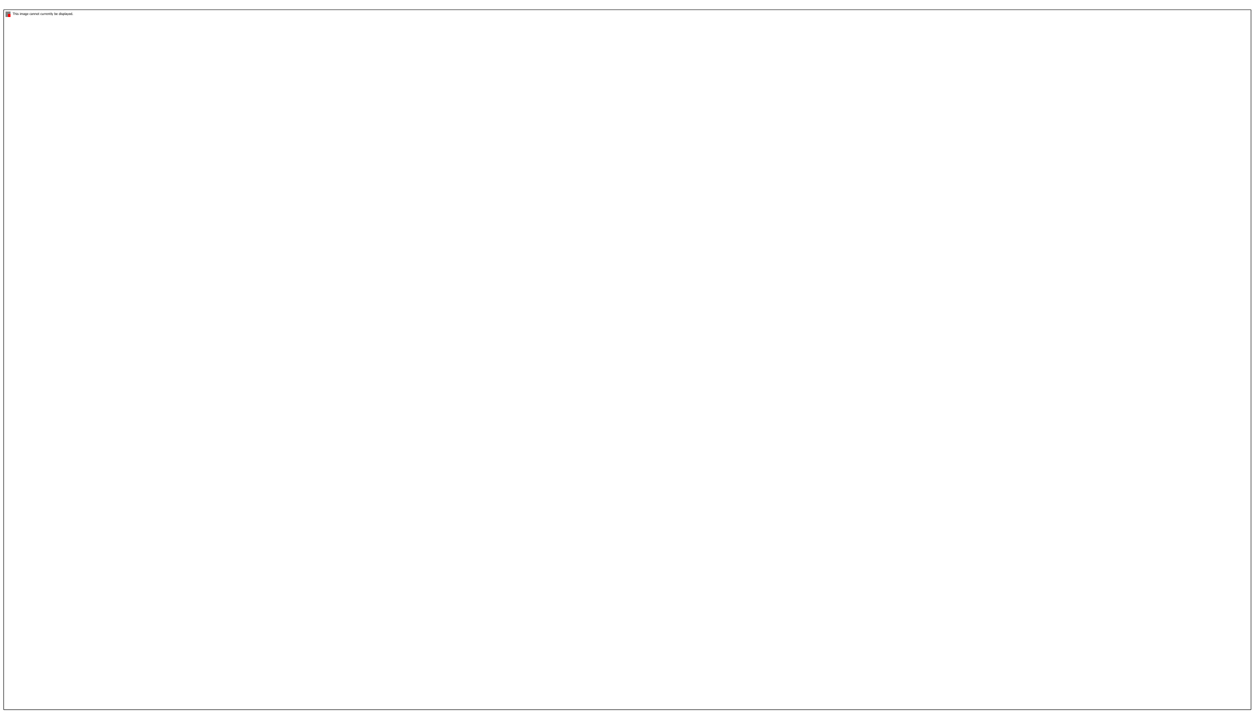
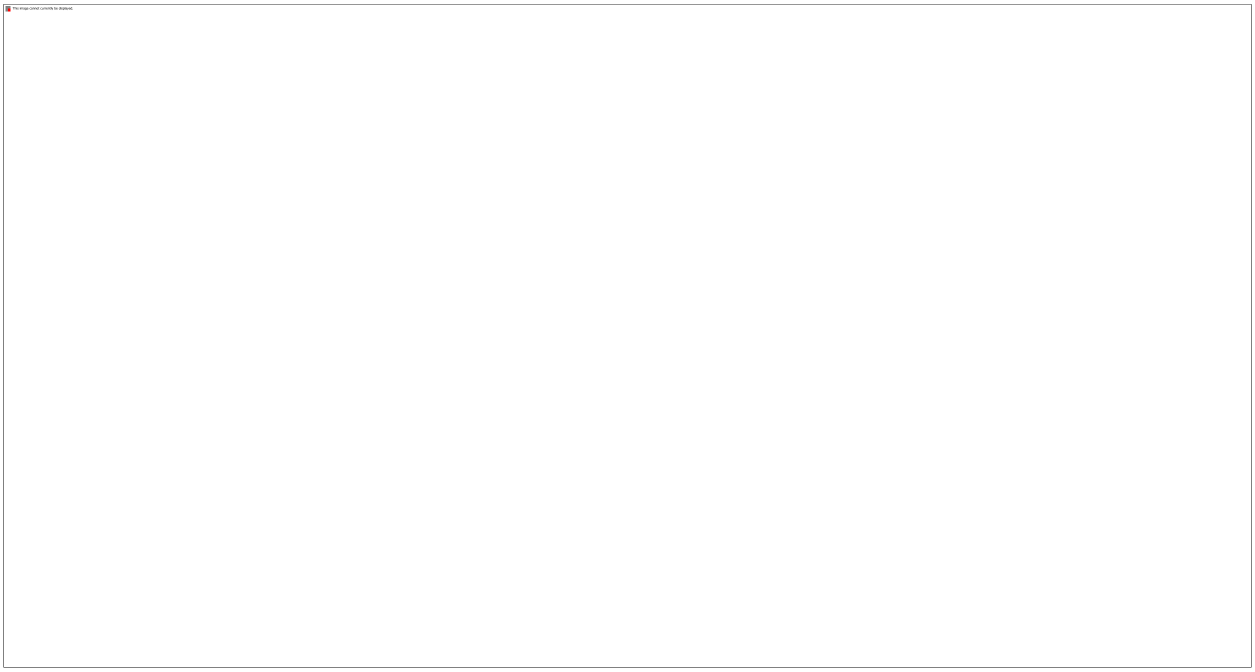
Maranda farmer selection



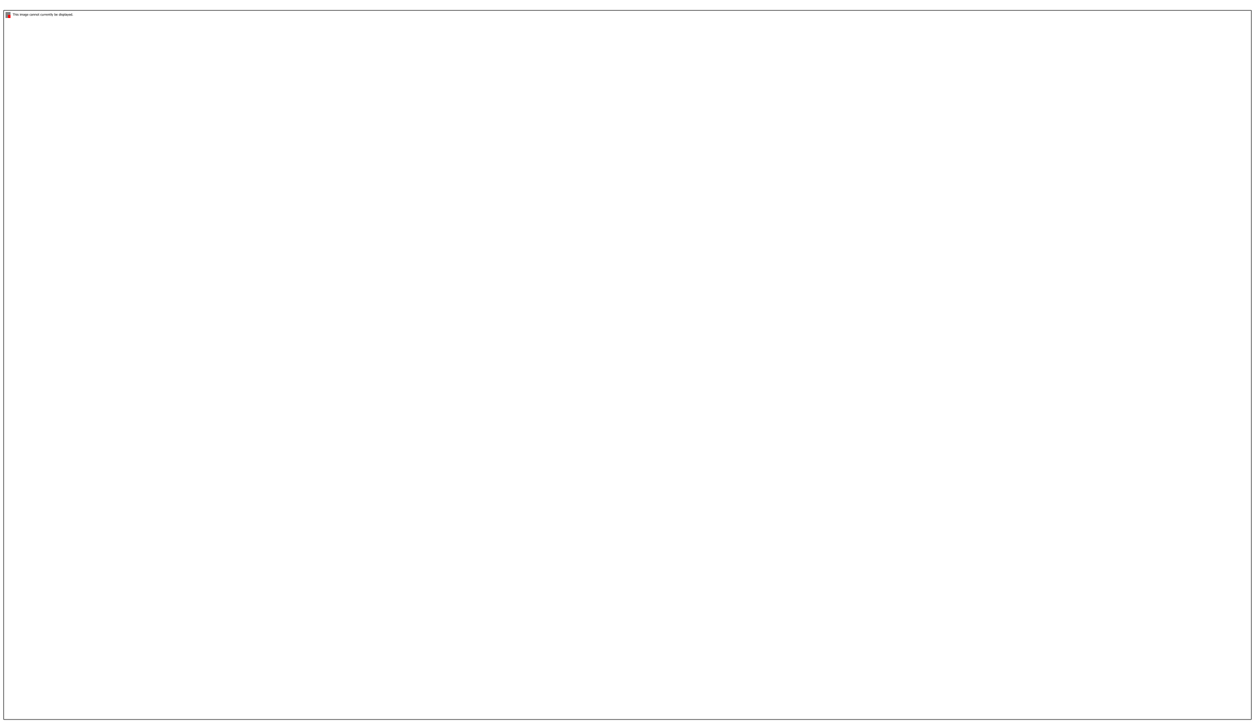
Lower farmer selection



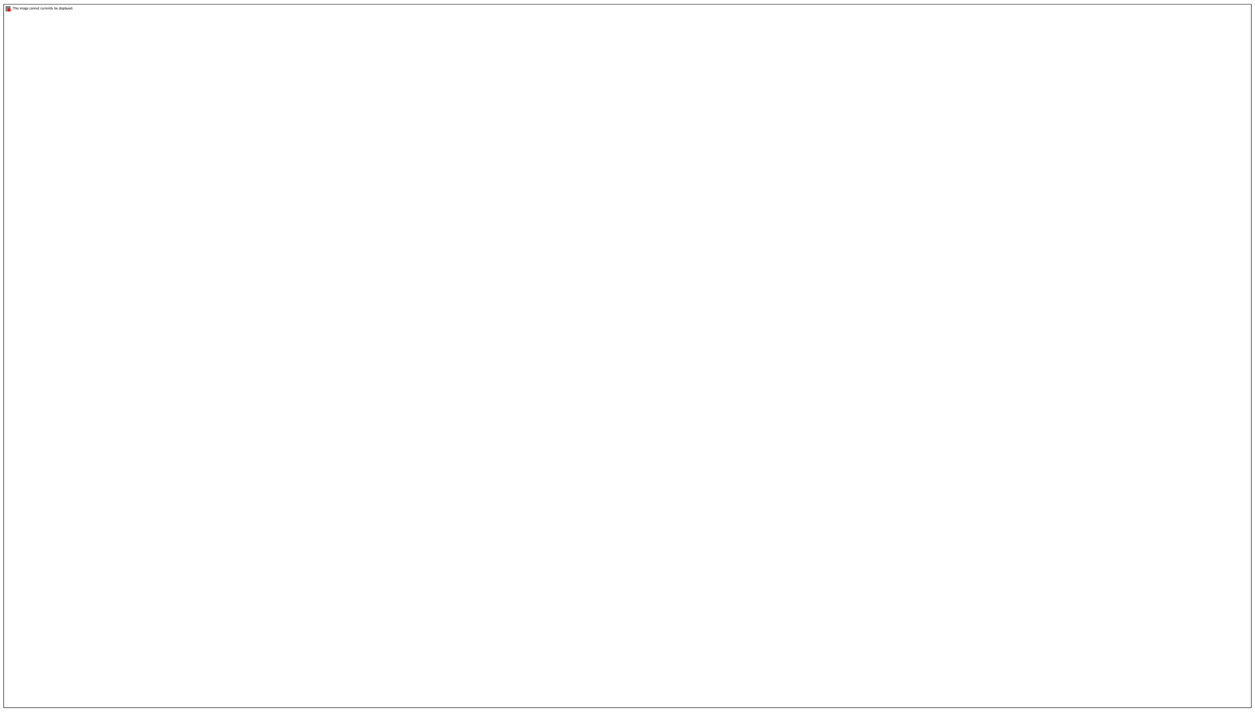
Guruguru farmer selection



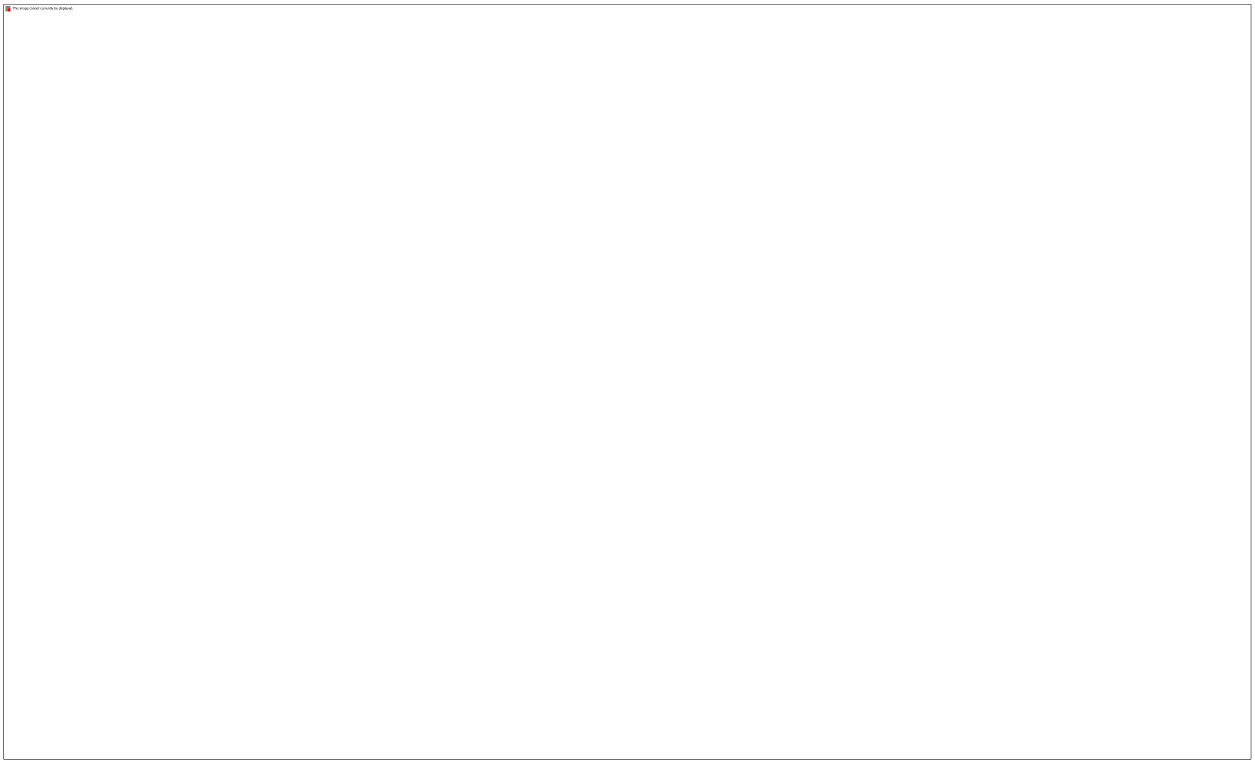
Gandama farmer selection



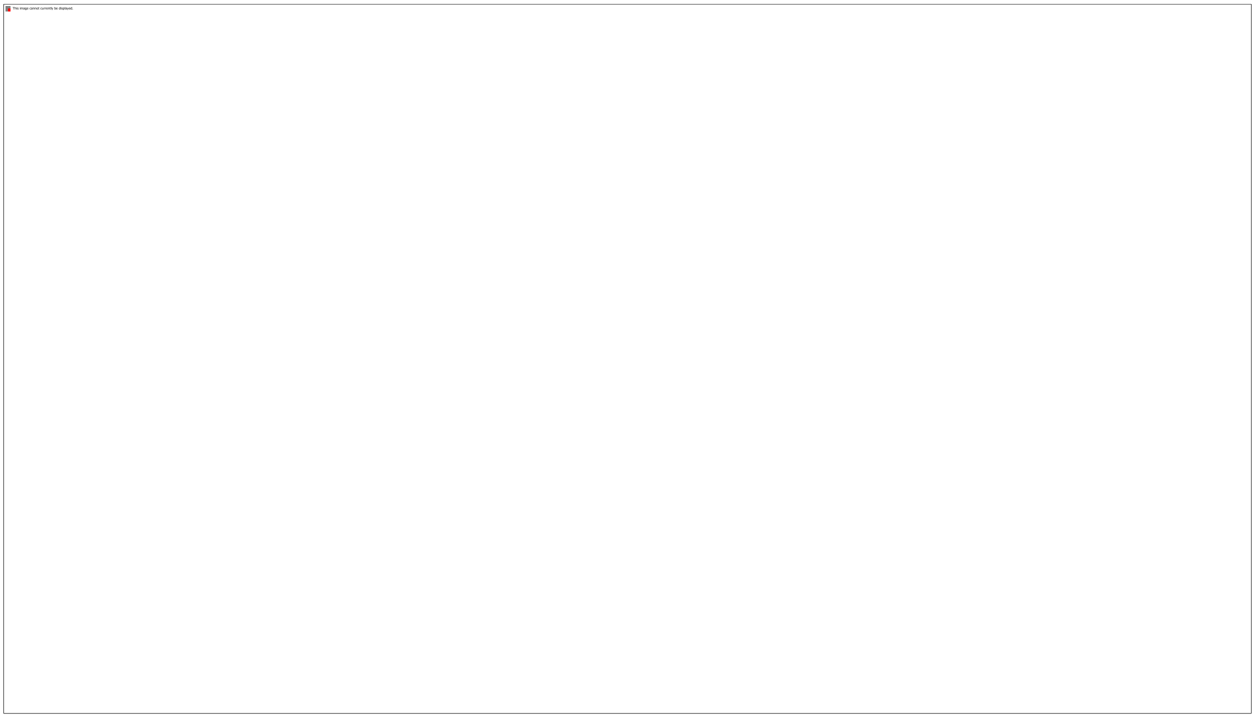
Chengwe farmer selection



Quagga Pan farmer selection



Chomumvuri farmer selection



Mfula Lundi farmer selection

Appendix ii: blood collection and packaging

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Plate 1: Blood Sample Collection at Lower Dip Tank

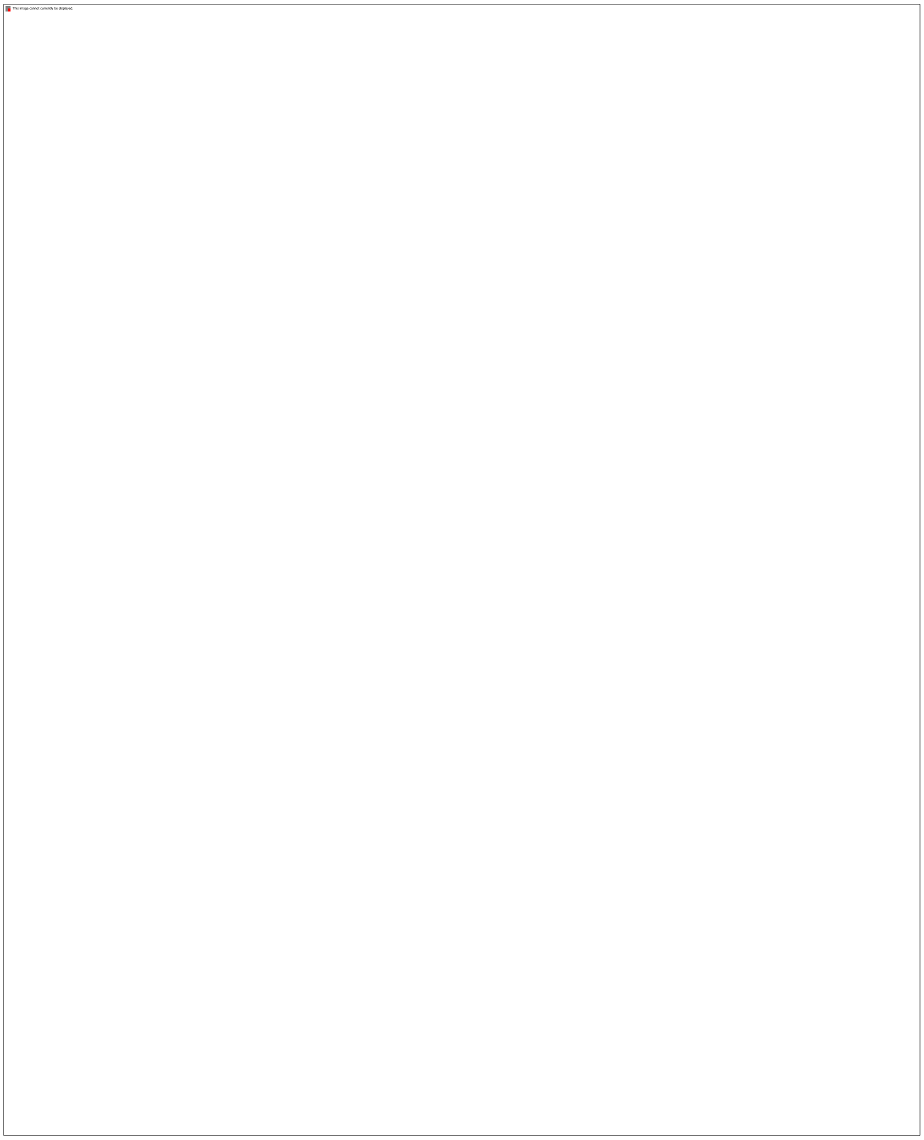

Plate 2: Blood Samples Packaging

Appendix iii: Sample size calculations

$n=1.96^2\ P_{exp}\ (1-P_{exp})/d^2$ (Thrusfield, 2008)

Where n = required sample size

P_{exp} = expected prevalence

d = desired absolute precision

A desired absolute precision of 5% at 95% level of confidence has been used. Thus, sample units:

$n = 1.96^2\ 0.20(1- 0.20)/0.05^2 =246$

Appendix iv: Laboratory results

KWANGW~2.PDF

Kwangwari Lab report 2.pdf

Kwangwari Lab report 1 .pdf

Appendix v: Questionnaire

BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES

DEPARTMENT OF ANIMAL SOIL SCIENCES

PREVALENCE OF BOVINE BRUCELLOSIS IN MWENEZI DISTRICT

SURVEY QUESTIONAIRE

My name is Kwangwari Elias Student Number B223252B and Identification Number 04-085358F-04, studying towards attaining a Bachelor of Science Honors Degree in Animal Health and Production Extension with Bindura University of Science Education, I am conducting a Brucellosis prevalence and its socio-economic survey in Mwenezi District. You have been selected to be part of the survey. This information will be used solely for academic purposes. Your answers will not be released to anyone and they will remain anonymous. May you please assist by sparing your time to take part in the survey.

Identification details

Name of interviewer: ……………… Date of survey: ……………… Village…………

A: Demographic Data

1: Sex: 1: Male 2: Female

2: Marital status: 1: Married 2: Single 3: Widowed 4: Divorced 5: Separated.

3: Age of registered household head: ………………………………………………………...

4: Relationship of respondent to household head: …………………………………...

5: Level of education of household head

1: Primary 2: Secondary 3: Tertiary

6: Household category: 1: Male-headed 2: Female headed 3: Child headed

B: Household Composition

7: Number of people in respondent's household: …………………………………………

8: Household members' breakdown by age

Age group	**Number of females**	**Number of males**
0 – 5 years		
6 – 17 years		
18 – 40 years		
41 – 64 years		
Above 65 years		

9: What is the main source of income for the household?

1: Informal 2: Formal 3: Remittances 4: Others: specify…………………………

C: Livestock Ownership

10: State the number of livestock

11. Cattle: ……………………... 12. Goats: …………13. Turkeys……………

14. Sheep: ……………………...15. Pigs: …………16. Chicken…………

17. Donkeys: ……………………18. Others: specify……………

D: Knowledge about Brucellosis/ Contagious Abortion

19: Have you ever heard of Brucellosis? 1. Yes 2: No

20: If yes, in Question 19, state source of information 1 Radio 2. Television 3. Extension officer

21: Have you ever had any cows aborting? 1. Yes 2: No

22: If yes, in Question 21, State number of cows aborted: ………………...

23: Sate trimester of abortion: 1. First trimester… 2.Second trimester… 3. Third trimester …

24: Are there any repeats of abortion? 1. Yes 2: No

25. If yes to Question 24, state number of abortions per cow: cow 1……………, cow 2 ……………, cow 3 ……………, cow 4 ……………

26: Is any of the aborted cows still available? 1. Yes 2: No

27: If yes to Question 26, identify the animal/s by:

a). Tag no. ………………… , …………………, …………………

b). Tag name …………………, …………………, …………………

c). Name …………………, …………………, …………………

28. Have you ever had any of your cows having stillbirth? 1. Yes 2: No

29. If yes to Question 28, state number of cows affected: ....

30. Is any of the affected cows still available? 1. Yes 2: No

31. If yes to Question 30, identify the animal/s by:

a). Tag no. ………………… , …………………, …………………

b). Tag name …………………, …………………, …………………

c). Name …………………, …………………, …………………

32. Have you noticed any cattle with swollen joints? 1. Yes 2: No

33. If yes to Question 32, state number of cattle affected: ....

34. Is any of the affected cattle still available? 1. Yes 2: No

35. If yes to Question 34, identify the animal/s by:

a). Tag no. ………………… , …………………, …………………

b). Tag name …………………, …………………, …………………

c). Name …………………, …………………, …………………

E: Management of Brucellosis

36. How do you dispose aborted fetus? 1. Burning … 2. Burring … 3. open disposal …

37. How do you handle the aborted fetus? 1. Bare hands … 2. Protective clothing …:

38. How do you dispose aborting cows? 1. Local slaughter … 2. Sell to abattoirs … 3. Keep them for breeding …

39. Have you ever vaccinated heifers against Brucellosis? 1: Yes 2: No

40. If yes to Question 39, state type of vaccine used: ....

41. State number of heifers vaccinated: ....

42. If yes to Question 39, state the regime 1. Once per year 2. Twice a year 3. Thrice a year

43. Do you test bulls for Brucellosis? 1: Yes 2: No

44. Have ever been offered a Brucellosis Free Accreditation Certificate? 1: Yes 2: No

45. How is your grazing? 1. Paddocking… 2. Open grazing…

F: Annual Sales of cattle products

46. Where do you sell your cattle? 1. Private abattoirs 2. Local butcheries 3. Individuals

47. How many cattle do you sell per year? ....

48. What is the current value of average livestock unit (500kg) ....

49. Do you sell beef locally? Yes 2: No

50. If yes to Question 49, state number of slaughters per year: ....

51. What is the local price per kilogram of beef? ....

52. Do you sell milk locally? 1: Yes 2: No

53. If yes to question 52, state quantity per year: ....

54. Do you buy milk locally? 1: Yes 2: No

54. What is the price per liter of milk?...

G. Human Exposure

55. Have you or any family member, or hired laborer diagnosed of Brucellosis? 1: Yes 2: No

56. Do you wear protective clothing when handling animals and animal products? 1: Yes 2: No

57. Do you consume raw milk or dairy products from your on farm? 1: Yes 2: No

58. Do you have a veterinary care plan against Brucellosis? 1: Yes 2: No

H. Knowledge and Attitude

59. How would you rate your knowledge of Brucellosis? 1. Poor 2. Fair 3. Well informed

60. Do you believe Brucellosis is a significant problem in your area? Yes 2: No

61. Would you be willing to participate in a Brucellosis control program?

THANK YOU

END OF QUESTIONAIRE

Appendix vi: Approval letter to conduct research

This image cannot currently be displayed.