BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF AGRICULTURE AND ENVIRONMENTAL SCIENCE

DEPARTMENT OF ANIMAL SCIENCE

EFFECTS OF CATTLE DIPPING PRACTICES ON TICK BORNE DISEASE OCCURANCE, A CASE STUDY OF SHURUGWI DISTRICT, MIDLANDS PROVINCE.

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A DISSERTATION PROPOSAL SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS OF THE BACHELOR OF SCIENCE HONOURS DEGREE IN ANIMAL HEALTH AND PRODUCTION EXTENSION

DECLARATION

I hereby declare that this thesis has been the result of my own original efforts and investigations. The project has not been submitted and presented anywhere for any degree program.

DEDICATION

I dedicate my dissertation work to my wife Loice Furusa and siblings.

ACKNOWLEDGEMENT

I would like to express my heartfelt gratitude to all those who have contributed to the completion of this project. Firstly , I extent my deepest appreciation to my project Supervisor Mr T N C Mangwiro ,Midlands Veterinary Provincial Director Dr M Sibanda ,our Department Secretary Mrs C Kanyongani ,our programme lecturer Dr P Chatikobo and several University lecturers to mention but just a few, for all their invaluable guidance, support, and encouragement throughout the entire duration of this project. Their expertise and constructive feedback have been instrumental in shaping the direction and quality of this work.

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In addition, I would like to give great thanks and appreciation to my fellow class mates and friends whose dedication, teamwork and collaborative spirit have been essential in accomplishing my project goals.

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ABSTRACT

Zimbabwe's economy is agro based with more than 65% of the population deriving their livelihoods from agriculture and 40% of these doing so from livestock production. Livestock rearing is an integral part of most of the farming systems practiced in Zimbabwe, particularly in the smallholder communal sector where livestock provides more than 80% of tillage in addition to being cheap source of natural enrichment of the soil through manure for crop production. Currently, livestock farming in the smallholder farming sector is hampered by a lot of challenges because of tick-borne infestations. Improved livestock disease management is key in addressing these drawbacks. Consistent livestock dipping, being one of the major disease management strategies should be prioritised to control ticks which are the vectors of tick-borne diseases. The current study investigated on the causes and effects of inconsistent dipping in the communal farming sector. The causes include unavailability of funds to pay dipping levies, distance to dip tanks among other factors. The researcher also highlighted on how these causes can be addressed for example by adopting the 2020 dipping model which was spearheaded by the Government and responsible Government Departments and other implementing partners. Adoption of this model will ease on farmers paying dipping levies and make accaricide availability, controlled by the DVs (District Vet Services) and Dip tank Livestock Development Committees (LDCs)

Key word: Smallholder, tick-borne, livestock, inconsistent

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LIST OF ACRONYMS AND ABBREVIATIONS

DVS- Department of Veterinary Services

FAO- Food and Agricultural Organisation

ZIMVAC-Zimbabwe Vulnerability Assessment Committee

FAO STAT- Food and Agricultural Organisation Statistics

FGD- Focus Group Discussion

ANOVA- Analysis of Variance

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Agriculture is the mainstay of Zimbabwe's economy contributing between 15 and 20 per cent of GDP, which rose from US$ 6.7 billion to US$ 8.2 billion between 1987 and 1997, (Wolf et al., 2023). Agriculture also provides the bulk of the nation's food requirements in a normal rainfall year, 60 per cent of the raw materials for industry and 45 per cent of foreign exchange earnings. As at March 2001, agriculture provided 26 per cent of the formal employment in the country and 70 per cent of the population with employment or livelihood (Williams, 2005). Livestock and livestock products play an important role in the socio-economic development of Zimbabwe. It contributes about 25 per cent of value of agricultural output in all farming sectors. Hides from cattle are also an important component of the agricultural sector in generating foreign export earnings in Zimbabwe (FAO, 2023)

Beef cattle production is the management and rearing of cattle for household meat consumption or for commercial sale of meat (Marai, *et al*., 2007). Many farmers in Zimbabwe keep animals for numerous purposes including for meat production, draft power in the absence of mechanization, manure for organic material, breeding, exhibition purposes, milk and cheese production or for immediate social capital such as dowry payments. In traditional systems, cattle are culled or sold when infirm or too old to be productive (Jewel, 2001). The country is endowed with diverse breeds comprising both indigenous and exotic types. The exotic breeds are dominant in the commercial sector, which is the main source of marketed livestock products. Indigenous breeds are numerically predominant in the country, and these are reared mainly in the smallholder sector where they perform multiple functions (Chiromo, 2004)**.**

More than 80% of the 15 000 rural households in Shurugwi district of Midlands province own cattle from which they derive meat, milk, hides, manure, draught power, transport, income, and socio - cultural aspects (Marai *et al*., 2007). Mashona crosses is the major cattle breed kept by most communal farmers in the district.

However, the major challenges these farmers face on beef cattle production, management and marketing are poor animal health, high livestock mortality rate (20% per year), poor animal husbandry skills, weak support from public and private institutions, poor access to markets, uneconomic livestock prices (ZIMVAC, 2023. Poor cattle health and high mortality are

attributed to prevalence of diseases and most of these diseases are tick-borne. Tick infestations are very rampant in Zimbabwe and Shurugwi in particular due to inconsistent dipping programmes by most communal farmers (Modell, 2021). Tick borne diseases, pose a major challenge to beef production and management to smallholder farmers, particularly those in the communal areas through lack of adequate tick control. Ticks species such as *Haemaphysalis spp*, *Hyalomma spp* and *Rhipicephalus spp* are very rampant in Shurugwi district.

1.2 Problem statement

Although the Government of Zimbabwe through the Department of Veterinary Field Services have put in place several measures in improving National Herd, it has remained with great challenges in meeting our National Development Strategy one (NDS1) – food and nutrition security , due to increase in tick borne diseases across the Country , with high morbidity and mortalities.

Efforts by DVS, through tick control, with the use of accaricide in an attempt to reduce impact of tick borne diseases yet cases are still increasing. Failure to investigate, address and control inconsistence dipping may affect cattle production. The issue of inconsistence dipping, if not properly addressed this may also lead to a drastic reduction to our National Herd, which is a threat to our Food and Nutrition security as a Country. This study attempts to fill in that gap.

1.3 Justification

Zimbabwe's response to the outbreak of tick-borne diseases has been hampered by inconsistent dipping programmes. An assessment on the effective and consistent dipping programmes for tick control will assist in farmer capacitation in terms of knowledge and adoption of dipping models. Therefore, there is need to analyse and quantify the effectiveness of consistent dipping programmes so that communal farmers will be in a good position to effectively control tick infestations as these are the vectors of tick-borne diseases.

1.4 Main Objectives

To determine the effective cattle dipping programme which is helpful in the control of tick-borne diseases in communal farmers.

1.4.1 Specific Objectives

-To compare tick infestation levels at different cattle dipping regimes in the communal sector.

- To determine the number of cattle deaths recorded in different areas because of the different dipping programmes using secondary data.

1.5 Hypothesis

Ho: There is no significant difference in tick infestation levels at different dipping regimes.

Ho: There is no significant difference in cattle deaths due to different dipping programmes.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 General beef cattle management

Proper management of beef cattle improves beef cattle production and productivity; herd sizes increase through reduced calving intervals, higher conception rates, higher births weights, improved growth rates, improved weaning weights, reduced calf mortalities, and eventually cattle reach the breeding weights and marketable weights earlier (Modell, 2007). Tick infestations and tick-borne diseases are a major problem for farmers in the tropical and subtropical regions of the world and are widespread in Africa (Yam et al., 2018). These diseases cause considerable economic losses to owners in those areas in which cattle are communally grazed. The occurrence of tick worry, abscesses and even mortality is often high due to the ticks and diseases. Livestock production in Zimbabwe is heavily dependent on improved animal health and this entails good tick- and tick-borne disease control (Brown and Torres, 2008). Many commercial and some rural subsistence farmers use regular short interval dipping to keep their cattle virtually tick-free. Where vector density is high, infection with tick borne diseases is common and usually occurs early in the host's life, accompanied by reduced morbidity and mortality (Yam et al., 2018).

The Zimbabwean national beef cattle herd was estimated at around 5.5 million heads (Bennet et al., 2019), with the majority (90%) of them in the hands of smallholder farmers. Improved livestock disease management is key in addressing these drawbacks as the country drives towards transformation of this important economic sector (Coetzer and Tustin, 2019). Tick-borne diseases rank highest on the list of diseases of concern to livestock in both the small holder communal sector and large-scale commercial sector in Zimbabwe (Abbas et al., 2014). Theileriosis is one of the major concerns to the ruminant livestock farmers as it can cause high morbidity and mortality and consequently result in high production loses (Kahn, 2005). It is therefore imperative that farmers enhance capabilities to fight this disease as part of the effort to develop a lasting solution to challenges preventing the livestock sector from realizing its full potential. Majority of cattle owners in Africa are resource-constrained communal farmers (Sungirai et al., 2016) and their herds are frequently attacked by tick-borne diseases. Parasites and diseases are among the most severe factors that affect livestock productivity (Larry et al., 2012) and continue to impede growth of the livestock sector in Zimbabwe. The control of tick-borne diseases in Zimbabwe is based primarily on the control

of their vectors through dipping using various methods and accaricide on the market. According to Food and Agriculture Organization of the United Nations (2004), there is a wide spread of tick species that are resistant to organophosphates, one of the accaricide groups commonly used in the control of ticks. The spread and increase in the number of tick-borne diseases are generally attributed to lack of adherence to cattle dipping routines or shortage of accaricide and drugs (DSV, 2021).

Good animal health management is important to improve beef production. As a result, there is need to control and prevent the spread of diseases. Tick-borne diseases, for example, pose a major challenge to beef production and management to smallholder farmers, particularly those in the communal areas through lack of adequate tick control (Marai, et al., 2007). Ticks are transmitters of tick-borne diseases, loss of blood, irritation and animals become prone to other bacterial, fungal, and other parasite infections. Hence, the need to control them (Modell, 2007). There are four main methods of tick control, which are plunge dipping, use of spray race, hand spraying and the pour on method. Plunge dipping is the most used dipping method whereby an animal leaps into a dip tank resulting in total immersion of the said animal. It then swims through to exit ensuring thorough soaking of the body. Spray race animals are forced to walk through a passage in which jets of spray wash are sprayed over the entire body of the animal resulting in wetting of the body. It can be as effective as plunge dipping (Singh, et al., 2013). Hand spraying is used in small herds where there are no other alternative dipping facilities. A knap sack is used. For this method to be effective, the animal must be thoroughly wetted. In pour-on, the dip chemical is applied from the poll of the head along the top line of the animal and up to the base of the tail. The chemical then spreads to cover the entire body. Pour-on accaricide are expensive and are mainly used in areas where water is scarce (Khan, 2005).

2.2 Ticks and tick-borne diseases

Ticks are classified under phylum *Arthropoda*, class *Arachnida* and Order *Acarina* (Nicholson et al., 21019). According to Oundo (2019), *Acarina* has three key economically important families namely *Argasidae* (soft ticks), *Ixodidae* (hard ticks) and *Nuttalliellidae*. Ticks suck blood from the host, which they locate by responding to cues associated with host odours, breath, body heat and vibration from victim (Hussain et al., 2021). Ticks have their predilection sites on the udder, ear, groin region and tails of cattle, where they can affect livestock directly by causing irritation and allergic reaction. Ticks and tick-borne diseases are

one of the constraints to livestock production in the sub-tropical areas of the world. Global economic losses due to ticks and tick-borne diseases have been conservatively put at US18.7 billion annually (Makuvadze et al., 2020). The losses are incurred through the direct effects of ticks as blood sucking parasites and indirectly as disease vectors which will lead to reduced growth rate, fertility problems, decline in milk production, livestock mortalities and notwithstanding the costs associated with treatment and control (Walker, 2011). The best way to control tick-borne diseases is through the control of the vector ticks (Sungirirai et al., 2018).

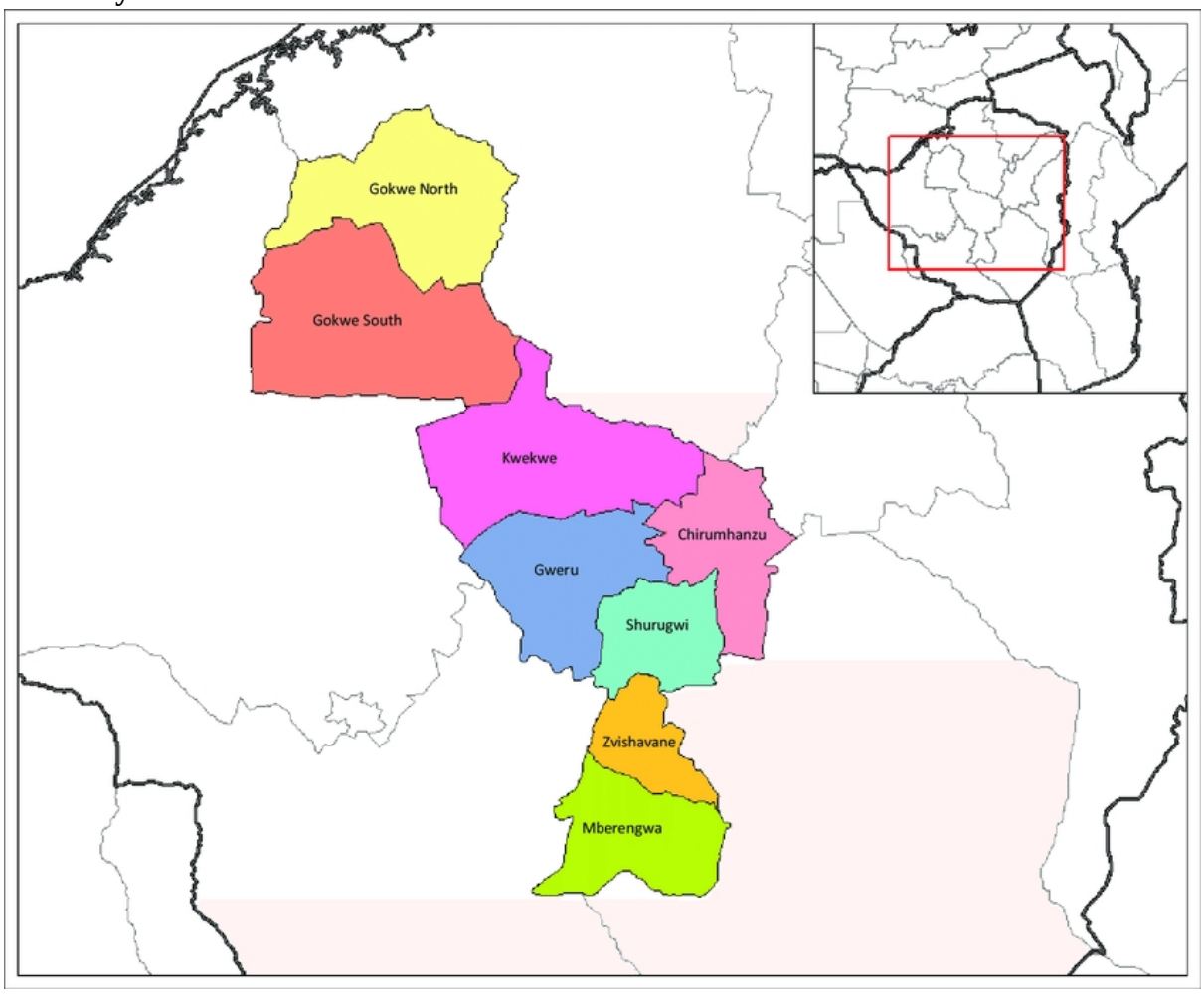
2.3 Prevention and Control

Method of tick control in use currently are chemical, biological, and cultural control methods (Nicholson et al., 2019). Physical methods are also carried out (Nath et al., 2018) and use of herbal plants has been practiced in some parts of Zimbabwe (Nyahangare et al., 2019). Chemical method involves the use of accaricide available such as organophosphates, amidines, synthetic pyrethroids, mixtures or macrocyclic lactones (Rodriguez-Vivas et al., 2017). Dipping cattle is regarded as the most effective method for preventing high incidences of tick-borne diseases and associated losses (Shahardar et al., 2019). Inadequate dipping cycles due to shortage of accaricide has exacerbated the situation (Shekede et al., 2021). Controlled burning of paddocks and rotational grazing are examples of cultural methods. However, their applicability in communal set-up is a challenge as communities share grazing lands (Levin, 2020). Tick control thus can either be on host or off host with holistic integrated ecto-parasite management being practiced (Nath et al., 2018) to reduce selection pressure in favour of Accaricide-resistant individuals (Rodriguez-Vivas et al., 2017). Use of dipping chemicals is the most practiced control method. Animal Health (Cattle-Cleansing) Regulations of 1993 in Zimbabwe have made it compulsory that cattle should dip (Makuvadze et al., 2020), and this regulation dates to 1914 when intensive dipping cattle became mandatory for the control of East Coast Fever (Narval and Deem, 1994). The dipping guideline is that in summer cattle dip weekly and in winter fortnightly (Sungirai et al., 2018) as informed by tick populations. In most critical cases, a 5-5-4 dipping regime is recommended in tick infested areas. A 5-5-4 dipping regime is strategic dipping practice where animals are dipped every five days and then at 4-day intervals to ensure that there is effective tick control. The basis of the 5-5-4 dipping regime is to cut the life cycle of the ticks before they are engorged (Walker, 2011).

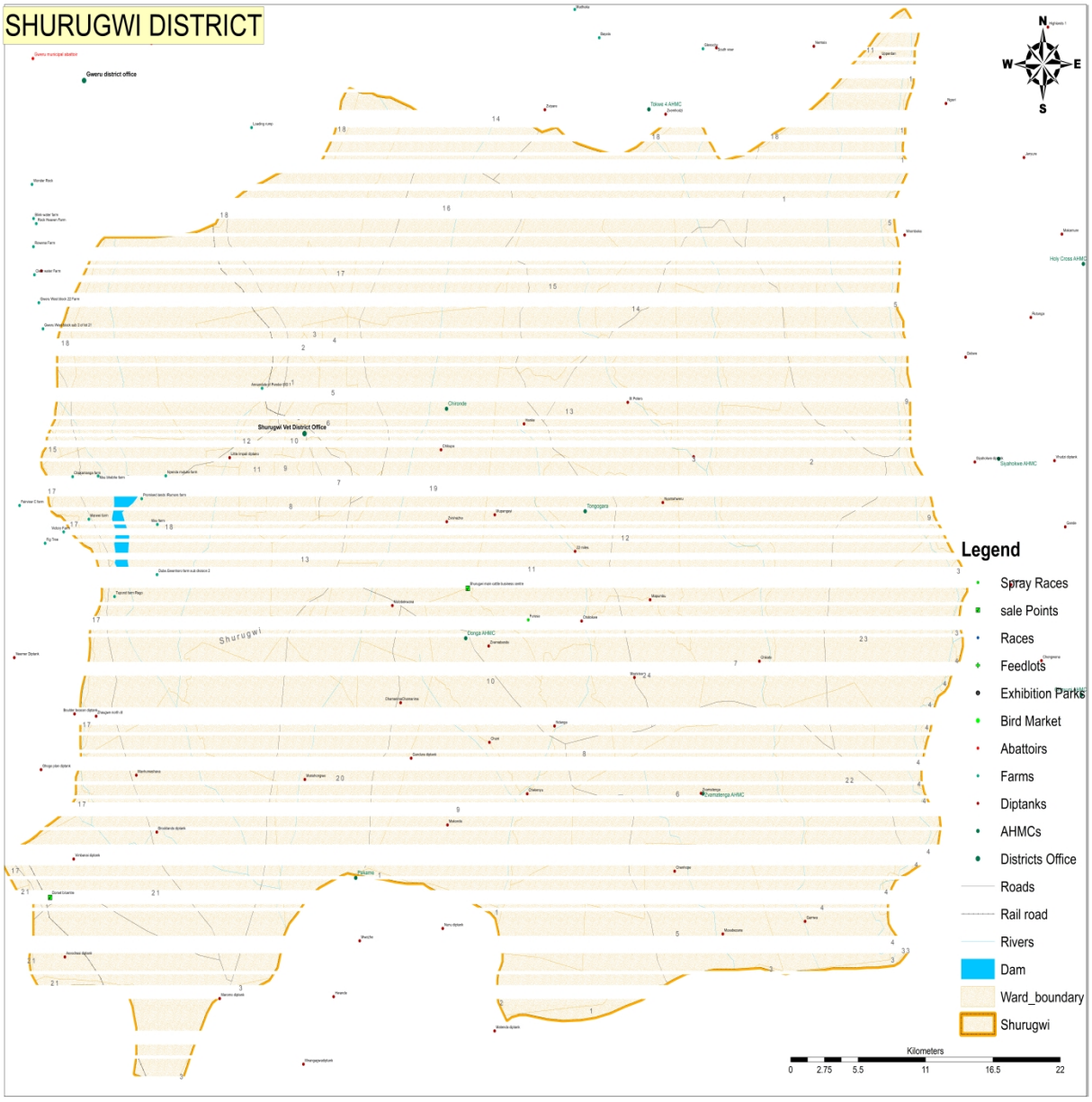
CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Study site



Map of Shurugwi District in the Midlands Province of Zimbabwe.



Map of Shurugwi District in the Midlands Province.

The experiment was carried out in Shurugwi District, Midlands Province. The District falls under agro-ecological region III which receives rainfall ranging from 600-800mm per annum (Mugandani et al., 2012). Livestock production, especially beef cattle mainly the Mashona Cross breed, is a major source of income for most households in the District. Temperature ranges of between 15-30 Degrees Celsius are experienced in this area. The semi-arid environment in this area supports extensive woodlands of *Colophospermum mopane* whose leaves have high protein content and high nutritive value for cattle (Marai, *et al*., 2007).

3.1 Study Design

This research was grounded in quantitative methodology in which a structured questionnaire and secondary data was used to gather quantitative responses on the factors exacerbating tick-borne disease occurrences in rural communities. Respondents provide their own explanations in a participatory exchange with interviewers.

3.2 Targeted Population

The study was targeting livestock farmers in ten rural wards of Shurugwi district.

3.3 Sampling procedure and sample size

Systematic random sampling technique was used to select five communal wards from a total of ten wards. A list of livestock farmers was obtained from both the Department of Veterinary Services (DVS) and AGRITEX. Random selection of 30 livestock farmers who own cattle from each ward was done to come up with a total of 150 livestock farmers.

On sample size for livestock farmers owning cattle, researcher will use the formula (ref) $n=z^2pq/e^2$

Where:

n= Sample size

z= Standard normal deviate which is set at 1.96 corresponding to 95% confidence interval

p= Proportion of cattle farmers in the district

q= 1-p

e= Maximum allowable error set at 0.05

3.4 Research Techniques

The researcher used household interviews, focus group discussions, questionnaires, interviewing key informants such as Chiefs and Headman and personal observations. The survey also provided detailed demographic profiles to shed further light on some grey areas. The researcher was an instrument for data collection, via methods such as household interviews.

3.4.1 Interviews

Primary data was obtained from household interviews. The researcher used interviews because they paved a way for accessing respondents' perceptions, meanings, and definitions of situations and constructions of reality (Birkelo et al., 1991). Each cattle farmer from a selected household was asked the same series of questions and responses were organized so that conclusions can be drawn from them. Key informants were interviewed such as chiefs and headman who have, for years, observed climatic transformation over the years they lived in the district and ward to generate information on the practice.

3.4.2 Focus group discussions

One Focus Group Discussion was be conducted in each ward. In the FGD, the researcher facilitates, moderates, monitors, and records the responses and less act as an interviewer.

3.4.3 Questionnaires

A questionnaire survey was used in the study to solicit information related to cattle production and farmer perceptions on dipping. Targeted farmers were those who own livestock irrespective of the class. A structured questionnaire consisting of both closed and open-ended questions was administered to the selected farmers. The researcher ensured that each respondent to the questionnaire represented one household.

3.4.4 Secondary sources

The researcher collected data which includes disease incidences, cattle mortalities, and dipping frequencies from the Midlands Central Veterinary Department.

3.4.5 Data analysis

Data was analysed using SPSS version 21. The statistical package generated frequency distribution for disease occurrence, cattle deaths and dipping intervals and challenges. Association between gender of household head and cattle ownership was carried out using the x^2 test. Microsoft excel was used to produce graphical presentations while tables and graphs were used to present the research findings.

3.5.5 Ethical considerations

The researcher upheld confidentiality of participants through promoting anonymity like not writing their names on the questionnaire. There was no sharing of any participant information to a third person (Creswell, 2003). All information was collected in confidence and was reported in anonymity, with no direct reference to respondents' identities. The researcher also respects the privacy of respondents by upholding their autonomy. This is because the invasion of privacy can lead to the infringement of individual's autonomous right to protect what is personal to them, (Hammersley et al., 2012). Permission to carry out the study was soughted verbally from the Councillors, Headman, and District Administrator.

CHAPTER FOUR

4.0 DESCRIPTIVE STATISTICS ON EFFECTS OF INCONSISTANT DIPPING ON PREVALENCE OF TICK-BORNE DISEASES

Demographic data obtained from cattle farmers was interpreted and presented using tables.

4.1 Age of participants

Table 4.1 below shows that among the 150 interviewed farmers, 42% were above the age of 50 while those between 40 and 49 contributed 18% of the total farmers interviewed. Farmers between 30 and 39 years contributed 22% of the total and those between 19 and 29 contributed 15.3%. However, participants below the age of 19 years had a lower percentage contribution to the total.

Table 4.1: distribution of participants by age group

Table 4.1: Age of participants

Age	Frequency	Percent	Cumulative %
< 18	4	2.7	2.7
19-29	23	15.3	18
30-39	33	22	40
40-49	27	18	58
>50	63	42	100.0
Total	150	100.0	

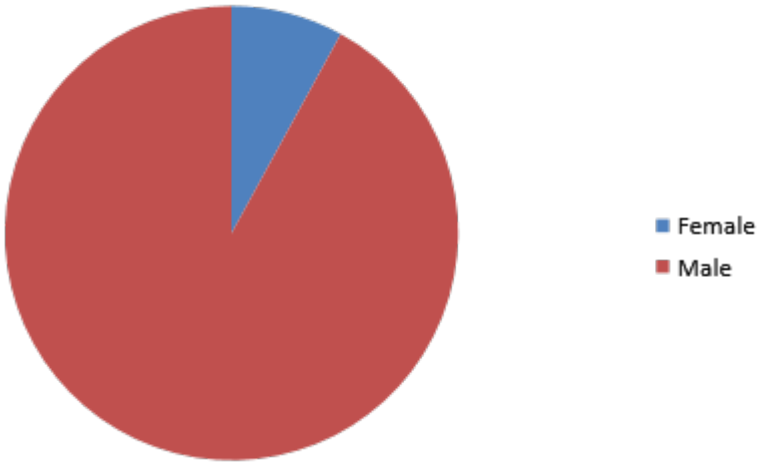
4.2 Gender of participants

Results from the study showed that of the 150 respondents who participated in the survey, 92% were males and only 8% were females. This indicates that most cattle owners in the ward are males. Table 4.2 below shows the frequency and valid percentages obtained from the survey.

Table 4.2: Gender of participants

Gender	Frequency	Percent	Cumulative %
Female	12	8	8
Male	138	92	100.0
Total	150	100.0	

Pie chart: Gender of participants



4.3 Level of education of participants

Results from the study showed that 53.3% of the participants attained secondary education, 24% attained tertiary education, and 16% had primary education while those with no level of education had 6.7%. This showed that most farmers who own cattle in the ward attended at least secondary education. Table 4.3 below shows the different levels of education and the percentages for farmers in the ward.

Table 4.3: Participants' level of education

Table 4.3: Participants' level of education

Education level	Frequency	Percentage	Cumulative %
No education	10	6.7	6.7
Primary	24	16	22.7
Secondary	80	53.3	76
Tertiary	36	24	100.0
Total	150	100.0	

4.4 Total number of cattle owned by participants.

Results from the survey indicated that 58.7% of the participants owned cattle less than 10 while 42% owned cattle more than 10 in the district. Results are summarized in table 4.4.

Table 4.4: Total number of cattle

Table 4.4: Total number of cattle owned.

Number of cattle	Frequency	Percentage	Cumulative %
0-5	48	32	
5-10	40	26.7	58.7
10-20	62	41.3	100
Total	150	100.0	

4.5 Source of income

Results from the study showed that 62% of the participants relied on farming as a major source of income, 6% relied on formal employment while 32% relied on remittances from relatives.

Table 4.5: Source of income

Table 4.5 Source of income

Source of income	Frequency	Percentage	Cumulative%
Farming	93	62	62
Formal Employment	9	6	68
Remittances	48	32	100
Total	150	100.0	

4.6 Average monthly income

Results from the study showed that 10.7% of the cattle farmers were getting between $10 and $20, 33.3% of the farmers had between $21 and $30, 21.3% were getting $31and $40, followed by 20.7% who were getting between $41 and $50 while 13.9% were getting above $50 per month. Table 4.5 below shows the average income for cattle producers in the ward.

Table 4.6: Average income

Average income ($)	**Frequency**	**Percentage**	**Cumulative %**
10-20	16	10.7	10.5
21-30	50	33.3	39.4
31-40	32	21.3	65.7
41-50	31	20.7	86.1
>50	21	14	100.0
TOTAL	150	100.0	

4.7 Descriptive statistics on dipping intervals per month

Results from the study show that 41.8% of farmers do not dip their cattle, 32% of the farmers dip their cattle once per month, 20.2% dip their cattle twice a month while 6% of the farmers dip more than twice a month. Table 4.7 below gives a summary of the study findings.

Table 4.7: Monthly dipping interval

Table 4.7: Monthly dipping intervals

Dipping interval	Frequency	Percentage	Cumulative%
No	63	41.8	41.8
Once	48	32	73.8
Twice	30	20.2	94
> twice	9	6	100
Total	150	100.0	

4.8 Reasons for inconsistent dipping

Results from the study showed that there were basically four major reasons for inconsistent cattle dipping and these were age, lack of knowledge, distance to the dip tanks and unavailability of funds to pay for levies. These were categorised and presented on table 4.8 below.

Table 4.8: Reasons for inconsistent dipping

Table 4.8: Reasons for inconsistent dipping

Reason of inconsistent dipping	Frequency	Percentage	Cumulative %
Age	63	42	42
Lack of knowledge	4	2.7	44.7
Distance	12	8	52.7
Lack of funds	71	47.3	100
Total	150	100.0	

4.9 Number of cattle deaths due to tick-borne diseases

Results from the survey showed that cattle deaths due to various tick-borne diseases are rampant in the District. Examples of the tick-borne diseases which are prevalent in the district are January disease, heart water, and red water among others. Table 4.9 below shows number of deaths recorded over a period of 6 months in the 2023/24 farming season.

Table 4.9: Number of cattle deaths to tick-borne diseases

Table 4.9: Number of cattle deaths

Cause of death	Frequency	Percentage	Cumulative%
January disease	104	69.3	69.3
Red water	16	10.7	80
Heart water	30	20	100
Total	150	100.0	

4.9.1 Reliability analysis, construct validity and correlation of variables

In the study, an investigation on the reliability of questions administered was done. There was one independent variable, which was inconsistent dipping and two branches of dependent variables which were the causes and effects of the independent variable. The second dependent variable was the social impact which comprised of education, cultural effect, mental effect as well as emotional disturbances. For each variable to be reliable, it must have an alpha value which is 0.7 and above but below 0.95 otherwise the results might be unreliable and biased. Results for analysis of reliability are shown on table 4.8 and they show that all variables were reliable since the indices alpha are all greater than 0.7. This meant that the data from participants can be relied upon and can be further used for analysis.

Table 4.9.1: Reliability analysis

Table 4.9.1: Reliability analysis

Variable	Cronbach's Alpha
Inconsistent dipping	0.87
Old age of cattle owners	0.74
Lack of knowledge on dipping	0.76
Long distances to the dipping facilities	0.71
Unavailability of funds to pay dipping levies	0.82
Tick-borne diseases	0.82

4.9.2 Regression analysis

4.9.2.1 Regression between tick-borne diseases and production

Inconsistent dipping was regressed against cattle production as a dependent variable. Results showed inconsistent dipping had an effect on production of cattle (Sig=0.00<0.05). The coefficients of the regression model are significant (t=16.09 and t=6.58) as shown in the ANOVA table 4.9. The Sig values are all 0.00<0.05 and the regression equation is given as:

Prod=3.461-0.412*inconsistent dipping

Table 4.9.2: Regression coefficients for inconsistent dipping

Table 4.9.2: Regression coefficients for inconsistent dipping and cattle production

Model	Unstandardized coefficients		Standardized coefficients	T	Sig
	B	Std error	Beta		
Constant	3.416	215		16.09	0.00
Inconsistent dipping	-282	0.43	-412	-6.58	0.00

4.9.2.2 Regression between inconsistent dipping and its effects on cattle production

Inconsistent dipping had a negative effect due to prevalence of tick-borne infections (Sig 0.000<0.05). The coefficients of the regression model are significant (t-values greater than 2 and Sig =0.000). 61% of validity in the model is being explained by the independent variable as shown on Table 4.9.1 below. Hence, the regression equation is given as: Tick-borne diseases=2.67+0.445*inconsistent dipping

Table 4.9.4: Regression coefficients for inconsistent dipping

Table 4.9.4: Regression coefficients for inconsistent dipping and disease effect

Model	**Unstandardized coefficients**	**Unstandardized coefficients**	**Standardized coefficients**	**T**	**Sig**
	B	Std error	Beta		
Constant	2.670	0.303		8.818	0.000
Inconsistent dipping	0.468	0.065	0.445	7.238	0.000

CHAPTER FIVE

5.0 DISCUSSION

Results from the study showed that 42 % of the total participants were over 50 years of age and males having the greatest proportion. Age could have contributed hugely to inconsistent dipping as they could not drive their cattle for longer distances to dipping facilities. The data showed that most of the participants attained secondary education, and this made the questionnaire easy to administer as most of the participants were literate. The survey showed that most respondents were males. This survey was conducted in the early hours of the day, and this could have contributed to low numbers in female respondents as woman usually attends to household chores in the morning.

About 58.7% of the respondents had less than ten cattle and this showed that in communal areas farmers do not have cattle which exceed twenty and the numbers are mainly affected by rampant tick-borne disease outbreaks mainly caused by inconsistent dipping. From the survey it also showed that the respondents' main source of income was from farming which constituted 62 % and cattle production is one of major sources of income in the area. However, cattle production, which is the main contributor to family income, was affected by tick-borne diseases as most of the cattle died during the period under study. Cattle deaths because of tick-borne diseases greatly affected farmer's disposable income and from the current study, 44% of the interviewed respondents had an average disposable income of less than $30 per month. This is far too low considering commodity prices in the country thus affecting the social and economic lives of many communal livestock farmers.

Shortage of disposable income resulted in inconsistent dipping as farmers could not afford the levies and this exposed cattle to tick-borne diseases. Most respondents indicated that they were not dipping their cattle at all (41.8%) or dipping only once a month (32%) even in summer when ticks are rampant. The analysed data showed that tick-borne diseases influenced cattle production as many farmers who were interviewed lost cattle due to these diseases. This was noticed by comparing the total number of cattle the respondents had at the time of the survey against the total number of cattle they had lost to the diseases mainly because of inconsistent dipping. Most farmers reported having been affected by the disease socially, morally, and financially. Socially, respondents could no longer perform social events like paying lobola and other social functions that required use of cattle as they no longer had enough cattle to do those activities leaving them morally strained. The negative

coefficient on the independent estimate indicates that tick-borne diseases had negative effects on food security and nutrition, meaning that 1% increment in the disease causes a percentage decrease in food security. Food reduction was attributed to this loss in cattle as communal farmers use cattle for ploughing; therefore area to crop production was negatively affected. The disease had a negative effect on education as most of the farmers could no longer afford to send their children to school. Most farmers indicated that they withdrew their children from school because they could no longer afford the fees as they had lost cattle to the disease which were the source of revenue. This also affected most farmers socially and morally.

On the financial aspect, most farmers could not get revenue from the enterprise since cattle prices decreased. The quality of the beef was also affected by the disease and therefore, not safe for consumption. The analysis clearly showed that tick-borne diseases had negative financial implications to farmers as they were incurring high costs of veterinary drugs and vaccines in preventing and treating the affected animals.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

The research findings have shown that inconsistent dipping by farmers is a cause of the spread of tick-borne diseases like January disease, Heart water and Red water and these diseases impacted negatively to cattle producers in many aspects including financial, social and moral aspects.

To minimize these losses incurred by farmers, the government should provide enough dipping acaricides for adequate dipping especially in summer where there is high rainfall and high tick infestations which are vectors of the disease. Awareness campaigns on the causes and effects of the disease should be increased so that every cattle farmer is fully knowledgeable about the disease. An adoption and implementation of the 2020 sustainable cattle dipping model can also be a solution to the problem of inconsistent dipping. Under this model, farmers contribute money and buy acaricides straight from the suppliers and these suppliers deliver the acaricides to dip tanks in various villages. This helps immensely as most farmers, according to the survey, cannot afford to pay dipping levies to the Government. The previous model by the Government of paying levies resulted in farmers getting the acaricides late as the monies would go through several offices from village where the money was collected to the provincial veterinary offices to head offices in the Capital city Harare, who then centralise and has the mandate to purchase the accaricide for ten Provinces of the Country and its Districts. So, there was a long-time lag between levy payment by the farmer and receiving of acaricides at the dip tank thus resulting in inconsistent dipping programs.

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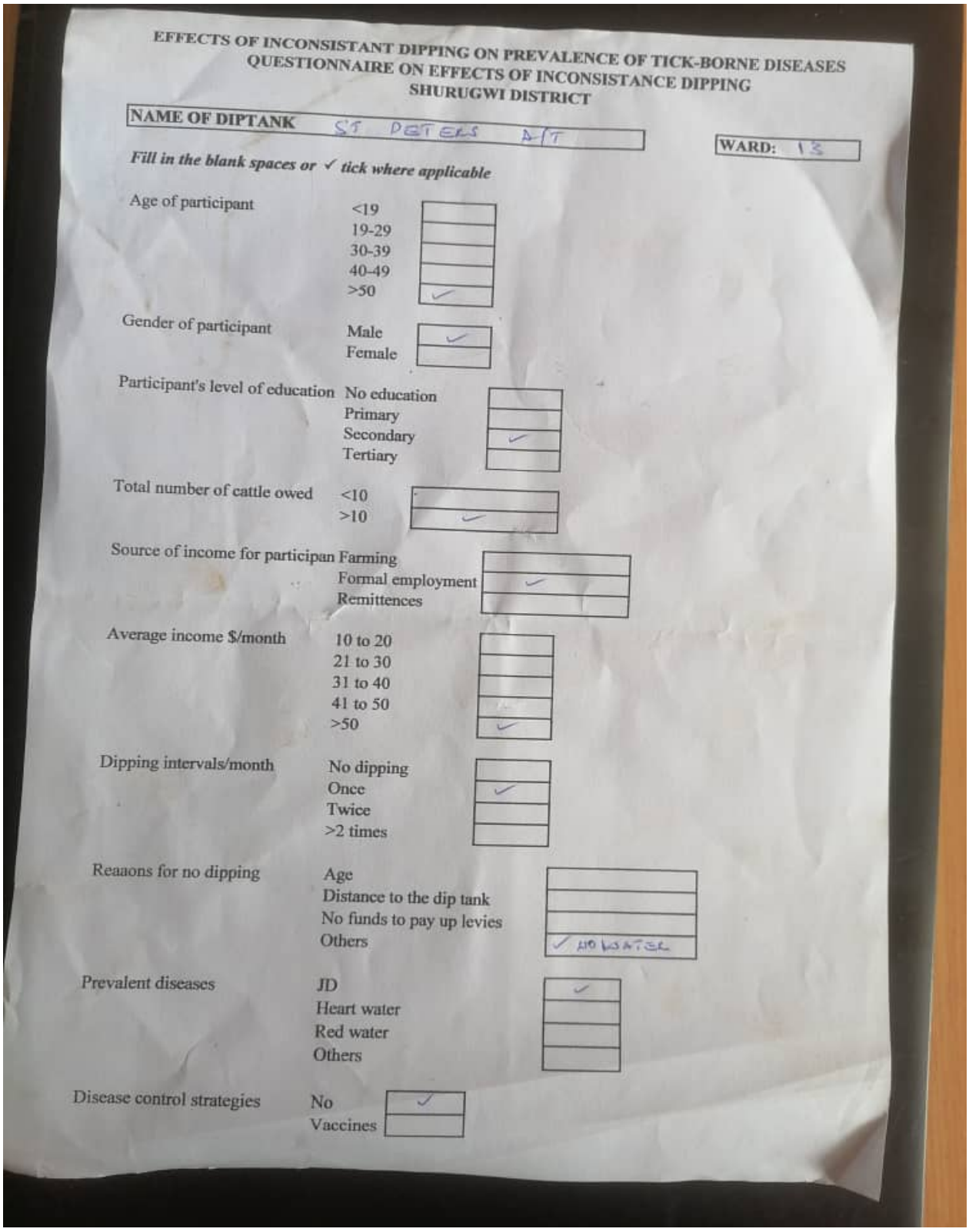
Appendix Section

Questionnaire used on effects of inconsistence dipping



EFFECTS OF INCONSISTANT DIPPING ON PREVALENCE OF TICK-BORNE DISEASES
QUESTIONNAIRE ON EFFECTS OF INCONSISTANCE DIPPING
SHURUGWI DISTRICT

NAME OF DIPTANK ST PETERS A/T WARD: 13

Fill in the blank spaces or ✓ tick where applicable

Age of participant	<19	
	19-29	
	30-39	
	40-49	
	>50	✓
Gender of participant	Male	✓
	Female	
Participant's level of education	No education	
	Primary	
	Secondary	✓
	Tertiary	
Total number of cattle owed	<10	
	>10	✓
Source of income for participan	Farming	
	Formal employment	✓
	Remittences	
Average income $/month	10 to 20	
	21 to 30	
	31 to 40	
	41 to 50	
	>50	✓
Dipping intervals/month	No dipping	
	Once	✓
	Twice	
	>2 times	
Reaaons for no dipping	Age	
	Distance to the dip tank	
	No funds to pay up levies	
	Others	✓ NO WATER
Prevalent diseases	JD	✓
	Heart water	
	Red water	
	Others	
Disease control strategies	No	✓
	Vaccines	

EFFECTS OF INCONSISTANT DIPPING ON PREVALENCE OF TICK-BORNE DISEASES
QUESTIONNAIRE ON EFFECTS OF INCONSISTANCE DIPPING
SHURUGWI DISTRICT

NAME OF DIPTANK ZVAMABANE | **WARD:** 10

Fill in the blank spaces or ✓ tick where applicable

Age of participant	<19	
	19-29	
	30-39	
	40-49	
	>50	✓
Gender of participant	Male	
	Female	✓
Participant's level of education	No education	
	Primary	✓
	Secondary	
	Tertiary	
Total number of cattle owed	<10	✓
	>10	
Source of income for participan	Farming	✓
	Formal employment	
	Remittences	
Average income $/month	10 to 20	✓
	21 to 30	
	31 to 40	
	41 to 50	
	>50	
Dipping intervals/month	No dipping	✓
	Once	
	Twice	
	>2 times	
Reaaons for no dipping	Age	
	Distance to the dip tank	
	No funds to pay up levies	✓
	Others	
Prevalent diseases	JD	✓
	Heart water	
	Red water	
	Others	
Disease control strategies	No	✓
	Vaccines	