BINDURA UNIVERSITY OF SCIENCE EDUCATION



NAME: CHIKWATA DOUGLAS

REG NUMBER: B231876B

PROGRAM: BScHAHPE

COURSE: DISSERTATION

CODE: AGA 420

PART: 4.2

LECTURER: DR CHABHANGA

ASSIGNMENT **Disease risk analysis in Zimbabwe livestock sector: an analysis of key performance indices for risk managers.**

DECLARATION

I assert that, the dissertation titled: **Disease risk analysis in Zimbabwe livestock sector: an analysis of key performance indices for risk managers.** The case study of Chikomba district is my own work, that it has not been submitted before for any degree or examination in any other University, and that all sources I have used or quoted have been indicated and acknowledged as complete references. I authorize the Bindura University to lend this dissertation to other institutions or individuals for purposes of scholarly research only.

CHIKWATA DOUGLAS

SIGNATURE

DATE: 20/08/2026



APPROVAL PAGE

The undersigned certify that they have read and recommended to the Bindura State University for acceptance, a dissertation titled:**Disease risk analysis in Zimbabwe livestock sector: an analysis of key performance indices for risk managers. The case of Chikomba district** submitted by Chikwata Douglas in partial fulfilment of the requirements of the Department of Animal Science Bindura University of Science Education.

APPROVED BY:  DATE: 20/8/26

(Signature)

DEDICATION

This study is dedicated to my family members. I am what am today because of the dreams they had for me and their help.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to all those who contributed to the successful completion of this dissertation.

First and foremost, I thank my supervisor, Doctor Chabhanga, for their invaluable guidance, patience, and insightful feedback throughout the research process. Your knowledge and reassurance have been instrumental in shaping this study.

I am also grateful to the veterinary officers, agricultural extension workers, and livestock farmers of Chikomba District who generously shared their time and knowledge, making this research possible.

Special thanks to the Department of Animal Science at Bindura University of Science Education for providing the academic resources and support necessary for this study.

Finally, I acknowledge the steadfast support of my family and friends, whose encouragement sustained me through challenging times.

Table of contents

Acknowledgements i

Table of Contents ii

List of Figures iii

List of Tables iv

List of Abbreviations v

Chapter 1: INTRODUCTION 8

1.1 Background to the Study 9

1.2 Statement of the Problem 10

1.3 Justification 11

1.4 Aim and Objectives 13

Chapter 2: LITERATURE REVIEW 1 7

Chapter 3: METHODOLOGY 38

3.1 Study Area 40

3.2 Study Design 42

3.3 Data Collection 43

3.4 Data Analysis 44

Chapter 4: RESULTS 45

DISCUSSION 59

Chapter 5 CONCLUSIONS AND RECOMMENDATIONS 27

REFERENCES 68

ABSTRACT

The sector of livestock production is a crucial component of Zimbabwe's agricultural economy, supporting food security, rural livelihoods, and national revenue. However, infectious diseases continue to challenge output and economic stability within the sector. Active disease risk analysis is vital for early detection, timely response, and sustainable control of livestock diseases. This study investigates the use of key performance indices (KPIs) by risk managers in disease risk analysis within Zimbabwe's livestock sector, focusing on Chikomba District—specifically wards 8, 14, 15, 18, 20, and 26.Employing a mixed-methods research design, data were collected through structured questionnaires administered to veterinary officers, extension workers, and livestock farmers, complemented by semi-structured interviews and secondary data review. The study assessed KPIs such as disease detection time, outbreak response rate, vaccination coverage, and farmer compliance with biosecurity practices.Findings indicate that while KPIs are recognized and partially implemented by risk managers, challenges such as resource limitations, delayed disease detection, suboptimal vaccination coverage, and unreliable farmer compliance hinder their full effectiveness. The study highlights disparities in disease control between commercial and communal farming systems and emphasizes the need for improved data management, capacity building, and stakeholder engagement.The research concludes that strengthening the application of KPIs within disease risk analysis frameworks can significantly enhance livestock disease control efforts in Chikomba District, contributing to improved animal health, productivity, and rural livelihoods. Recommendations include enhanced surveillance systems, increased resource allocation, farmer education programs, and improved coordination among veterinary services.

CHAPTER 1

1.0 Introduction

Agriculture serves as a primary pillar of economic stability and rural development for many developing nations, with Zimbabwe being a prominent example. Within the Zimbabwean context, this sector plays a critical role in generating employment, generating household income, and driving poverty reduction initiatives. Statistical data from ZIMSTAT (2020) indicates that agricultural activities account for approximately 15% to 18% of the country's Gross Domestic Product (GDP) while simultaneously supporting the livelihoods of nearly 70% of the rural population. The country's agricultural framework is broad, encompassing crop production, forestry, and livestock farming, each playing an interconnected role in securing national food systems and bolstering family survival. Within this system, livestock production stands out as a highly vital sub-sector. According to Nhokwara et al. (2023), the livestock industry contributes an estimated 35% to 38% to Zimbabwe's overall agricultural GDP.Despite its immense value, this critical sector faces continuous vulnerability due to an array of persistent animal diseases. These recurring health crises heavily restrict production capacities and cause widespread economic damage across farming communities (Maposa et al., 2023). Consequently, the implementation of proactive disease risk analysis has become essential to protecting animal health, stabilizing rural investments, and fostering long-term agricultural sustainability.To explore these dynamics, this research is structured to systematically review the background of the study, the statement of the problem, the core research objectives, specific research questions, and formulated hypotheses. Additionally, it provides the justification for the study, a detailed methodology, and clear definitions of key technical terms. Ultimately, this study aims to evaluate the specific key performance indices (KPIs) employed by veterinary risk managers to conduct disease risk analysis within Zimbabwe’s livestock industry, focusing closely on the practical realities of the Chikomba district.

1.2 Background study

Agricultural production serves as a primary foundation for economic development worldwide, with global statistics consistently positioning farming as the backbone of numerous national economies (World Bank, 2023). The sector's influence extends from mitigating widespread rural poverty to stabilizing household income streams, marking it as an indispensable economic pillar. Within this broader agricultural framework, the livestock sub-sector represents a vital component

of the agrarian economy, particularly within developing nations (FAO, 1995). Beyond its direct contribution to food production and nutritional security, livestock farming plays a multi-functional role by driving capital accumulation and providing essential secondary resources, including draft power, fuel, organic fertilizers, hides, and natural fibres (FAO, 1993).

Historically, the management of animal health has been a central priority for agricultural systems due to the direct link between livestock vitality, human food security, and macroeconomic stability. During the late 19th and early 20th centuries, regions heavily reliant on livestock production began transitioning toward formalized disease control mechanisms, introducing structured interventions such as animal quarantines, mandatory vaccinations, and the establishment of dedicated veterinary departments. Over time, these foundational efforts matured into structured disease risk analysis frameworks. As noted by the World Organisation for Animal Health (WOAH, formerly OIE, 2019), modern veterinary science now prioritizes systematic risk identification, hazard assessment, strategic mitigation management, and transparent risk communication, all anchored by quantifiable performance metrics.

The integration of specific Key Performance Indices (KPIs) into livestock health monitoring systems gained significant traction during the latter half of the 20th century. This shift occurred as international organizations and national governments sought objective, evidence-based tools to evaluate the performance of disease surveillance networks and the agility of emergency outbreak responses (FAO, 2020). Across the African continent, colonial and post-colonial livestock policies were heavily driven by the commercial need to shield export-oriented cattle industries from devastating transboundary animal diseases. Consequently, veterinary departments depended on highly centralized, top-down enforcement methods, including strict animal movement controls and compulsory communal dipping programs. While post-independence African nations inherited these institutional frameworks, they simultaneously inherited structural challenges, navigating these rigid systems alongside severe resource constraints, expanding communal farming landscapes, and increasingly complex disease dynamics.

In Zimbabwe, formal livestock disease management dates back to the early 20th century with the creation of veterinary services under the colonial administration, which primarily protected commercial cattle ranches. Following independence in 1980, agricultural policies were

progressively restructured to extend these essential veterinary services to previously neglected communal and smallholder farming communities. Despite these institutional expansions, the country's livestock sector has been continuously battered by recurrent outbreaks of major diseases—including Foot and Mouth Disease (FMD), tick-borne East Coast Fever (commonly known as January disease), anthrax, lumpy skin disease, and Newcastle disease in poultry. The persistence of these outbreaks over the decades exposes systemic vulnerabilities in national surveillance coverage, slow operational response times, and weak tracking systems (Scoones et al., 2019).

Ideally, the continuous monitoring of key performance indices—such as shifting disease occurrence trends, vaccination coverage percentages, outbreak containment speeds, and local reporting compliance is crucial for maintaining biosecurity. However, the practical application of these metrics remains highly irregular, particularly at the district level. While these KPIs are formally recognized within national policy frameworks, local veterinary risk managers face persistent operational barriers, including inadequate data collection systems, transport shortages, and limited diagnostic resources (Chikerema & Makoni, 2020).This investigation focuses directly on the Chikomba district, situated within the Mashonaland East Province. This area possesses a rich history of livestock production alongside a documented vulnerability to frequent animal disease outbreaks. The district's agricultural landscape is dominated by a mix of communal holdings and small-scale commercial farms that manage cattle, goats, poultry, and pigs, with cattle serving as the primary livestock asset. Given these dynamics, this study establishes a localized critique of the disease risk analysis frameworks and specific key performance indices utilized by veterinary risk managers, focusing on the distinct operational realities of the Chikomba district.

1.3 Statement of the Problem

Despite Zimbabwe possessing established disease control policies and a network of risk managers, the livestock sector suffers from high disease prevalence and frequent animal losses. This ongoing health crisis directly undermines agricultural productivity and threatens the income security of local farmers. A critical driver of this issue is the inadequate utilization of clearly defined, quantifiable Key Performance Indicators (KPIs) by district-level risk managers, which severely hinders effective disease risk analysis and timely decision-making. Consequently, this

study evaluates the specific KPIs currently employed in disease risk analysis within Chikomba district to bridge this operational gap.

1.4 Aim of the study

The objective of the study was to analyze the key performance indices used by risk managers on livestock disease risk analysis in Zimbabwe, the case of Chikomba district .

1.5 Objectives

The study seeks to achieve the following objectives:

Main objective

- To analyze the key performance indices used by risk managers in livestock disease risk analysis in Zimbabwe, Chikomba district

Specific objectives

- To identify and describe major livestock diseases and their patterns in Zimbabwe and Chikomba district.
- To examine the key performance indices currently used by risk managers in livestock disease risk analysis in Zimbabwe, Chikomba district.
- To assess the effectiveness of risk managers in managing livestock disease risks using key performance indices
- To recommend strategies for improving the use of key performance indices in livestock diseases analysis in Chikomba district.

1.6 Research Questions

The study seeks to answer the following questions:-

- What are the major diseases that are affecting Zimbabwe's livestock sector?
- Which are the key performance indices currently used by risk managers on livestock disease risk analysis in Zimbabwe, Chikomba district?
- How effective are risk managers in managing livestock disease risks based on key performance indices?

- What strategies can be embraced to improve the effectiveness of key performance indices in livestock disease risk analysis in Chikomba district?

1.7 Hypotheses

- There is a substantial link between the prevalence of major livestock disease and reduced livestock productivity in Zimbabwe, Chikomba district.
- The effective use of key performance indices by risk managers significantly improves livestock disease risk management outcomes
- The embracing of structure, data driven key performance index frameworks significantly improves the accurateness and constancy of livestock disease risk analysis in Chikomba district.

1.8 Justification of the study

This study is highly significant as it addresses a critical gap in the existing literature regarding the use of Key Performance Indicators (KPIs) in livestock disease risk analysis, with a specific focus on Chikomba district. Current veterinary frameworks in Zimbabwe predominantly focus on active disease response mechanisms or climatic risk factors, largely overlooking the systematic performance assessment of risk management structures at the district level. By evaluating quantifiable KPIs for risk managers within Chikomba, this research shifts the paradigm from reactive crisis management to proactive risk mitigation in a district highly vulnerable to livestock diseases.Furthermore, this study provides actionable, evidence-based tools designed to enhance disease prevention, accelerate early detection, and optimize response efficiency within the local agricultural sector. The findings will expand the current body of academic knowledge while providing immediate practical value to multiple stakeholders. Specifically, policy makers, national veterinary services, and agricultural extension officers can utilize the localized insights from Chikomba to strengthen broader disease surveillance frameworks. At the community level, the insights gained will empower Chikomba's district authorities and communal farmers with targeted, data-driven strategies to minimize livestock mortality, thereby safeguarding rural livelihoods and boosting local income security.

1.9 Ethical Considerations

Participants were interviewed on a voluntary basis and confidentiality. The researcher uses pseudonyms of the respondents. Before asking questions, the researcher distributed informed consent forms to sign agreement with research conduct.

1.10 Scope of the study

The research analyze the key performance indices used by risk managers in livestock disease risk analysis in Zimbabwe. The study uses Chikomba district as the case study. This study only use 6 veterinary officers, 12 livestock farmers and 6 agricultural extension officer. The research focuses on Chikomba district, in Mashonaland East Province. In this study mixed research methods was adopted and purposive together with simple random sampling techniques. To collect data the researcher uses questionnaires, interview guides and desk review of literature.

1.11 Limitations

The major challenges to be faced are:

- The time frame for carrying out a well-researched work was limited.
- Financial problem affect the researcher to visit rural areas or all ward for interviews.
- Limited access to detailed veterinary records and unavailability of respondents

1.12 Delimitations

The research only focus on one district, Chikomba district and did not cover all districts in Zimbabwe which limits the scope of the study. The research also focus only on livestock disease risk analysis and not broader agricultural risk analysis.

1.13 Definition of key Terms

- **Disease risk analysis**

Is a systematic process used to identify, assess and manage risks associated with animal diseases, including the likelihood of disease occurrence and the potential impacts on animal health, production and livelihoods (OIE, 2019).

Risk analysis is also a tool that can be used to very good advantage for animal diseases emergency preparation and planning. It comprises of four components, risk identification, assessment, risk mitigation and risk communication.

- **Key Performance Indices**

Measurable indicators used to assess the effectiveness and productivity of risk managers in preventing, detecting and controlling livestock diseases including response time, disease reporting rate, vaccination coverage and outbreak containment success. Parmenter (2015) defines key performance indices as quantifiable measures that reflect critical success factors in organizational performance.

- **Risk Managers**

Individuals or institutions responsible for planning, implementing and monitoring strategies aimed at minimizing livestock disease risks. They includes veterinary officers, agricultural extension staff and district livestock authorities.

- **Chikomba district**

It is an administrative district located in Mashonaland East Province characterized by mixed communal and commercial livestock farming. It is the geographical case study area for the study.

Chapter Summary

Chapter 1 introduced the study on disease risk analysis within Zimbabwe's livestock sector, focusing specifically on the key performance indices (KPIs) used by risk managers in Chikomba District. The chapter highlighted the critical role of livestock farming in Zimbabwe's economy and rural livelihoods, while emphasizing the persistent threat posed by infectious livestock diseases. It outlined the historical context of disease management in Zimbabwe, noting the evolution from colonial-era . The chapter review background study, statement of the problem, research objectives, research questions, and hypotheses, justification of the study, methodology and definition of key terms. This study analyze the key performance indices used by risk managers in disease risk analysis in Zimbabwe's livestock sector, focusing on Chikomba district.

CHAPTER 2

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 INTRODUCTION

The previous chapter was general orientation of the study. The chapter gave a detailed presentation on background of the study. Outlines the research problem, aim of the study, objectives, research questions, delimitations and limitations. This chapter provides an in-depth overview of existing literature which has been published by scholars and researchers on disease risk analysis on livestock sector globally and within Zimbabwe. The chapter is divided into sections and the first section begins with theoretical framework followed by the meaning of the concept literature review and definition of terms.

2.2 Theoretical framework

This study is grounded in Risk Management Theory, tracing its conceptual origins to F. H. Knight's foundational work, Risk, Uncertainty, and Profit (1921), and later advanced by Harry Markowitz (1952) through his modern portfolio selection model. Markowitz demonstrated that strategic diversification and targeted minimization could systematically mitigate exposure and optimize outcomes. Although originally designed for financial and investment markets, Risk Management Theory provides a highly structured approach for agricultural systems like livestock production, which are routinely disrupted by volatile market shifts and sudden disease outbreaks.While Knight addressed economic uncertainty, subsequent researchers adapted these foundational principles to agricultural and veterinary contexts. Notably, B. Van der Meer (2008) operationalized the theory for animal health administration by mapping out a four-stage systematic process:Risk Identification: Disclosing specific biological threats and endemic diseases that jeopardize regional herd health.Risk Assessment: Quantifying the probability and severity of these threats using metrics like epidemiological incidence and animal mortality rates.

Applying Risk Management Theory to Zimbabwe's livestock sector equips district risk managers with a robust framework to transition from ad-hoc responses to data-driven, strategic planning. Leveraging KPIs within this theoretical structure allows authorities to accurately measure risk levels, evaluate the true impact of current control policies, and communicate clear, evidence-based metrics to agricultural stakeholders.

2.3 Understanding of terms

2.3.1 Literature review

For the purpose of this chapter, it is significant to first understand the concept literature review. Literature review is categorically a well understood process which collates related material and information about a certain phenomenon from a wide range of researchers. In this case the phenomena under study is disease risk analysis in livestock sector in Zimbabwe. Hart (1998) defines literature review as the use of ideas in the writings to justify a particular approach to the topic, the selection of methods and demonstration that this research contributes to something new. In general it is defined as a synthesis of what has been published on a topic by qualified researchers. Therefore with the definitions of literature review, it shows that the in-depth review of literature provide the necessary understanding of information about livestock disease risk analysis.

2.3.2 Disease risk analysis

Risk analysis processes have been established to provide an objective, repeatable, clear and documented valuation of the risks posed by a course of action or chain of decisions. Risk analysis is a tool proposed to provide decision makers with an objective, repeatable and documented assessment of the risks posed by a particular course of action (MacDiarmid, 1997). As the method has developed and differentiated, a more specific disease focused definition was proposed by Jakob-Hoff et al. (2014) who stated that, disease risk analysis is a structured, evidence-based process that can help in decision making in the face of uncertainty and determine the potential impact of infectious and non-infectious diseases on ecosystems, wildlife, domestic animals and people. The authors clarified how the results from disease risk analysis can be used to help decision makers to consider an evidence-based range of options for the prevention and mitigation of disease in the population(s) under consideration.

Disease risk analysis is an organized process that involves hazard identification, risk assessment, risk management and risk communication to reduce the likelihood and impact of disease outbreaks (OIE, 2018). Kambarage (2017) add on defining disease risk analysis in livestock and asserts that, it is a critical component of veterinary epidemiology, aiming to identify, assess and prioritize risk associated with animal disease. It is also a process of evaluating exposure pathways, livestock movement, prioritizing risks based on likelihood and impact on animal health, production and food security to inform targeted control strategies. In the context of livestock production, it focuses on identifying potential sources of infection, pathways of disease transmission and factors that influence disease spread. FAO (2019) purports that disease risk analysis in livestock is vital for enhancing control strategies and resource distribution.

Disease risk analysis consists of four interconnected stages: (1) hazard identification; (2) risk assessment; (3) risk management; and (4) risk communication (***Fig. 1.1).*** All the stages are interactive with the others—the process must not simply flow from stage 1 to stage 4 in chronologic order. A disease risk analysis is structured similar to that for other risk analyses.



Fig 1.1 Disease risk analysis four interconnected phases

Hazard identification

It is the identification of what may go wrong, must recognize which diseases have potential effects harmful enough to warrant inclusion in the risk analysis. Particular criteria used for ranking infectious disease hazards include occurrence and incidence data, infectivity, pathogenicity (e.g., morbidity, mortality, fitness costs, reproductive costs), transmissibility (e.g., routes, rates, competent vectors), susceptibility (e.g., species, humans), and economic impacts associated with wildlife species, domestic animals, humans, and the ecosystem. Ranking of

noninfectious diseases may include species vulnerability to injuries, physiologic stress, and genetic defects.

Risk assessment

It is the range of calculations required to estimate release, exposure, and consequence parameters for infectious diseases of concern. The process of assessing the risk will help understand the when, where, how, and why of a potential disease risk. With noninfectious diseases, it may involve calculations of the likelihood and consequences of the disease occurring (e.g., capture myopathy, toxicity) in a certain population or community. A subsequent estimate of the total risk may then be calculated based on the parameters for each of the identified hazards.

Risk management

Focuses on responses that may decrease the likelihood of an adverse outcome and reduce the consequences if such an outcome occurs. This element of risk analysis may best be viewed as the reason for performing the analysis so that science may move into action. Risk management can be the single most important component because it translates the identification of diseases and assessment of associated risks into management actions that may mitigate these risks.

Risk communication

It is a continuous process, requiring respectful communication among the multiple stakeholders throughout the risk analysis. Risk communication occur among field staff (those on the ground collecting data), modelers (those using data for a quanta and all potentially affected parties to ensure that management policies and efforts are equitably based on the risk assessment outcome. This requires a real-time communications network to be valued. All stakeholders must know about and understand the risks and options, with a clear statement of acceptable risk. Additionally, it must be clear as to who makes the risk management decisions. Different stakeholders often hold very different views on which risks are acceptable and who is in charge.

Development of Disease Risk Analysis

Disease risk analysis was developed by adapting environmental risk analysis techniques. The World Organisation for Animal Health (OIE) developed the OIE Risk Analysis Framework

(Murray 2004). This has shaped the basis of disease risk analysis systems developed by other organization such as the Department of Environment, Food and Rural Affairs and Biosecurity Authority, Ministry of Agriculture. The framework has been used for a range of situations beyond import risk analysis including domestic animal notifiable disease incursion, wildlife disease control (Hartley 2009; Hartley et al. 2012) and pest species entry (Tana and Daldry 2003).

2.3.3 Key performance indices

Key performance indices are crucial quantifiable elements that provide insights. Key performance indices are measurable indicators used to evaluate the effectiveness of disease prevention and control systems. In livestock disease analysis, KPIs help risk managers monitor animal health conditions, identify weaknesses, and improve decision-making processes.

Kaplan and Norton (2020) purports that, KPIs provide performance measurements that guide strategic planning and operational efficiency. In the livestock sector, the commonly used KPIs include: disease occurrence rate, mortality rate, vaccination coverage, recovery rate, outbreak response time, biosecurity compliance level, veterinary service accessibility and livestock productivity rates.

FAO (2021) conducted a research and it indicates that effective use of KPIs improves disease detection, reduces economic losses, and strengthens livestock productivity. Risk managers rely on these indicators to evaluate the success of vaccination campaigns and disease surveillance programs. In Zimbabwe, the use of KPIs remains narrow due to poor data collection systems and inadequate technological set-up. Many communal farmers keep limited livestock records, making it difficult to measure disease trends accurately. This creates challenges for veterinary officers and policymakers in implementing evidence-based disease control strategies.

2.4 Common livestock species and Characteristics in Zimbabwe

2.4.1 Cattle

Livestock kept in Zimbabwe are mostly cattle, goats, sheep and poultry with cattle dominating the livestock production sector. According to First Round of Crop ,Livestock and Fisheries Assessment for the 2024/2025 livestock production recorded notable improvements, with the national beef cattle herd growing by 0.4% to 5,741,397, while the dairy herd rose by 8.7% to

65,659, resulting in a 15% increase in raw milk production. . The cattle production in Zimbabwe is continuously being improved by addition of good genetic stud breeds like Brahmans and crossing between them. Many communal farmers perceives that the indigenous cattle are inferior, due to the small frame size. There are many types of cattle in Zimbabwe which include the Mashona (small framed Red & black cows) which is an Indigenous breed and statistically the most major in the country.Hardy and highly adapted resulting in excellent fertility, disease resistance, survival rates, calf productivity and good longevity. The Mashona type of cattle are highly mobile grazers that have the ability to browse.



Fig 1,0

Fig 1: Mashona type of cattle (black and brown)

Another type of cattle found in Zimbabwe are the Tuli cow Indigenous to Zimbabwe and Botswana. Like Mashona type they are hardy and highly adapted resulting in excellent fertility, disease resistance, existence rates, calf productivity and good longevity. They have good nursing ability, average growth rate and reach sexual maturity at a young age and they produces good young ones with good meat quality and 90% are polled.

The Nguni type of cattle is Indigenous to Zimbabwe and too many countries in Southern Africa. Cases of difficult birth (dystocia) are very minimal, resulting in easy calving in cross breeding systems. The Afrikaner Cow originated in South Africa and are hardy animals particularly

adapted to arid and dry conditions and are breeder for beef and draft power. Good grazers and make use of poor grazing conditions.



Fig 2:1 Nguni type of cattle

The Brahman Grey & Red Bull are originated from India but developed in USA have larger mature size than the indigenous breed and they adapt to environmental changes and fertility is much lower than that of the indigenous breeds. Therefore, overall productivity is generally lower.

Indigenous breeds like the Mashona (small-framed, red/black), Tuli (hardy, polled), and Nguni (medium size, disease-resistant) dominate communal areas due to their ability to survive harsh conditions, diseases, and feed shortages. Commercial farms focus on breeds like Brahman, Brangus, and Simmental and they are mainly found in communal areas in Masvingo and Midlands provinces are the leading cattle regions, with Matabeleland South also having a high concentration of hardy indigenous types. Livestock like cattle play many roles to livelihoods in African countries. Cattle can be used for spiritual roles and economic roles. Spiritually it can be used for rituals to pay bride price roora in Shona and payment of fines (kuripa ngozi) breach of custom or murder. Moreover cattle can be used to get intermediate products like manure and primarily for draught power, and social status in rural areas, at funeral as meat for those attending the funeral.

2.4.2 Goats

The second most numerous livestock, with over 5 million estimated, mainly kept for meat are goats. The value of indigenous goats in Zimbabwe especially for the smallholder sector can never be overemphasized. The Matebeleland goat (large, southern areas) and Mashona goat

(smaller, central/east) are common indigenous types. The major indigenous goat breeds in Zimbabwe are the ecotypes of Small East African and Matebele goats. The Small East African goats are phenotypically a small breed (Sikhosana & Senda, 2007) whereas the Matebele goat is much larger (Kusina, 2000). Most of the indigenous breeds are highly distributed in the agro ecological zones 4 and 5 compared to other parts of the country (Masunda, 2001). Exotic breeds also present include the Boer, Pafuri, Saanen and Angora goats. These are mainly found within commercial farming areas for meat and milk and production (Kusina, 2000). At least 90% of goats are raised in communal areas (Shabalala & Mosina 2002). In Zimbabwe the majority of goats are owned by females and flock sizes range from 6 to 10 per household.

Goats are mainly kept for meat, milk, manure and sales in times of financial constraints (Gwaze, Chimonyo & Dzama, 2009).They are commonly found in areas like Matabeleland South (Gwanda area) has the highest concentration. They are heavily concentrated in communal areas, particularly in semi-arid Natural Regions IV and V. Goats are the fast-reproducing asset that serves as "buffer capital" for households, particularly in drought-prone areas. The drought resistant indigenous goats are increasingly play prominent role in the livelihoods of smallholder farmers.

Goats can be used as meat, cultural and social roles during the post marriage ceremony (masungiro), commemorating of the dead (kurova guva), and exorcism of evil spirits (kurasira) and settlement of disputes (kuripa mhosva). Economically goats are sold to boast cash flow especially just before schools open when money is needed for school feel and tuition.



Fig 3: Indigenous goats

2.4.3 Poultry

Poultry such as Chickens, Ducks, Guinea Fowl are widely held by 82%-89% of smallholder farmers. Poultry production is one of the most popular business projects in Zimbabwe. According to First Round of Crops, Livestock and Fisheries Assessment for the 2024/2025 agricultural season poultry farming under the Presidential Rural Poultry Scheme also gained momentum, with over 751,000 indigenous chicks distributed to farmers, up from 200,161Poultry mainly comprises of 3 main focuses namely, broilers, layers, and roadrunners. Broilers and layers (exotic) dominate commercial, while free-range indigenous chickens (huku dzemusha) are common in rural areas. They are widespread, but commercial broiler farming is concentrated around urban centers like Harare and Bulawayo. Poultry plays a major role of being source of income, cheap protein, and rapid cash generation.



Fig 4: Different types of indigenous chickens in Zimbabwe

2.5 Major Diseases Affecting Livestock in Zimbabwe and Chikomba District

Livestock production in Zimbabwe, including Chikomba District, is greatly affected by several infectious and parasitic diseases. These diseases reduce production, increase mortality rates, affect household income, and threaten national food security. The prevalence of diseases is influenced by climate conditions, poor vaccination coverage, livestock movement, inadequate veterinary services, lack of disease knowledge and poor disease surveillance systems. The disease mostly affected are foot and mouth disease (FMD), January disease (theileriosis), Anthrax, Newcastle, fowl pox and tick-borne disease.

2.5.1 Foot and Mouth Disease (FMD)

Foot and Mouth Disease is one of the most serious viral diseases affecting cattle in Zimbabwe. It is highly contagious and spreads quickly in cloven hoofed livestock through contact between

infected animals, contaminated equipment or objects like transportation livestock trucks, and animal movement. The signs and effects of foot and mouth disease include fever, blisters in the mouth and hooves, excessive salivation, lameness and reduced milk production and weight loss.

According to the Department of Veterinary Services (2023), outbreaks of FMD have been reported in several provinces including Mashonaland East, where Chikomba District is located. The disease causes major economic losses because infected cattle cannot be traded internationally.

2.5.2. **January Disease (Theileriosis)**

January Disease is a tick-borne disease caused by Theileria parva and is usually expected between months of December and March but often peaks in January and February. It is one of the leading causes of cattle deaths in Zimbabwe, especially during the rainy season when tick populations increase. In Zimbabwe it has been reported since 2020 (Ruzvidzo, 2021). Musisi and Lawrence (1995) defines theileriosis as red water, heart water and gall sickness. The main cause of tick-borne disease in Zimbabwe and Chikomba district is failure to adhere to dipping calendar by the Department of Veterinary Services, resulting in failure to control tick populations. The high rate of disease effects is also caused by the strain in communication between farmers and veterinary services. According to the risk managers the signs of theileriosis are high fever, blindness, difficulty breathing, swollen lymph nodes, loss of appetite and sudden death.

Communal farmers in Chikomba District frequently experience cattle losses due to January Disease because of poor tick control measures and limited access to dipping chemicals. Studies by veterinary officers indicate that the disease has increased due to climate change and irregular dipping programs.

2.5.3 Anthrax

Anthrax is a bacterial disease affecting cattle, goats, sheep, and sometimes humans. It is caused by Bacillus anthracis. Anthrax outbreaks are common during dry seasons when animals graze close to contaminated soils. It spread to humans because mostly people share water sources with cattle and people buried the dead carcass in the ground and during dry season livestock graze close to ground. Signs and effects include sudden death, swollen body, and high fever before death bleeding from body openings.

Anthrax poses a public health risk because humans can become infected through handling contaminated meat or carcasses. Zimbabwe has experienced periodic anthrax outbreaks in rural farming communities.

2.5.4 Newcastle Disease

Newcastle Disease mainly affects poultry and is very common among smallholder farmers in Zimbabwe and Chikomba District. The disease spreads rapidly among chickens and can wipe out entire flocks. Signs and effects include sneezing and coughing, greenish diarrhea, twisted necks, paralysis and high mortality rates. The disease affects rural livelihoods because many households depend on poultry for food and income. Poor vaccination coverage contributes to frequent outbreaks.

2.5.5 Brucellosis

Brucellosis is a bacterial disease affecting cattle, goats, and sheep. It also affects humans through consumption of contaminated milk or contact with infected animals. The signs and effects

include abortions in pregnant animals, infertility, reduced milk production and weak offspring. The disease lowers reproductive performance and productivity in livestock farming systems.

In Chikomba district located in Mashonaland East Province, largely depends on communal livestock farming. The district frequently experiences livestock disease outbreaks due to, poor access to veterinary services, shortage of dipping chemicals, climate change and droughts, uncontrolled livestock movement and limited farmer knowledge on disease prevention. The most common diseases reported in Chikomba include January Disease, Foot and Mouth Disease and Newcastle Disease. These diseases reduce livestock populations, weaken draught power for farming, and increase poverty among rural households.

2.6 Overview of literature on disease risk analysis

2.6.1 Global overview of Disease Risk Analysis in Livestock Sector

Globally, livestock diseases continue to threaten agricultural productivity and international trade and several studies have explored disease risk analysis globally and within Southern Africa. Countries such as the United States, Brazil, China, and Australia have invested heavily in disease surveillance systems and risk management frameworks to reduce the spread of infectious livestock diseases. According to the World Organization for Animal Health (WOAH, 2023), diseases such as Foot and Mouth Disease (FMD), African Swine Fever (ASF), Avian Influenza, and Newcastle Disease remain major global concerns.

In Europe and North America, advanced technologies such as digital surveillance systems, geographic information systems (GIS), and artificial intelligence are increasingly used to monitor livestock diseases and predict outbreaks. Studies by Thompson et al. (2021) indicate that countries with strong disease monitoring systems experience lower economic losses compared to

countries with weak veterinary services. In many countries risk managers use key performance indices such as mortality rates, vaccination coverage, disease incidence rates, response time, and recovery rates to assess the effectiveness of disease control measures. For example in Australia they uses livestock traceability systems to monitor animal movement and reduce disease transmission risks. Similarly, the European Union has strengthened biosecurity regulations and disease reporting systems to improve livestock health management. However, despite technological advancements, livestock sector still faces challenges such as inadequate funding, poor veterinary infrastructure, and limited disease reporting systems.

Rich and Perry (2016) examined economic impacts of livestock diseases and emphasized the importance of integrating economic indicators into risk analysis. A research by Silva (2016) investigated practices in risk management in livestock production in the Netherlands. Research focused on how Dutch farmers managed risks linked to climatic changes, disease outbreaks and economic fluctuations. Outcomes of research alluded that risk management practices for instance enforcing insurance policies, expanding income streams from farm projects as well as adopting current health protocols, considerably boosted stability and revenue from livestock production projects. The study highlighted the value of government support and advancements in technology in fostering resilience and curbing risks.

In Ethiopia, a study conducted by Gilligan (2017) evaluated risk management techniques particularly in livestock production. The country confronts challenges like water scarcity and extreme temperatures. The investigation illustrated how Ethiopian livestock producers incorporated technological solutions, for example up-to-date cooling and hydration systems, to curb environmental stresses. At the same time, collaborating with local state agencies in risk-related financial support and subsidies proved vital in fostering livestock production. The

research findings indicated that enforcing tailored environmental risk strategies was instrumental in preserving livestock health and boosting productivity in arid conditions.

2.6.2 Regional Overview of disease risk analysis in livestock

In Southern African countries, livestock farming contributes significantly to rural livelihoods, food security, and economic development. Countries such as Zimbabwe, Zambia, Botswana, Namibia, and South Africa depend deeply on cattle production. However, the region experiences recurrent outbreaks of livestock diseases due to droughts, cross-border animal movement, and limited veterinary resources.

According to SADC (2022), Foot and Mouth Disease is one of the most persistent livestock diseases in Southern Africa. Botswana and Namibia have established stronger veterinary cordon systems and disease surveillance programs compared to many neighboring countries. South Africa has also capitalized in livestock disease monitoring and laboratory testing facilities to strengthen disease management. Research by Mupawaenda et al. (2021) revealed that many Southern African countries face challenges in disease reporting and response coordination. Smallholder farmers often lack access to veterinary services, vaccines, and disease information. Climate variability has also increased the spread of tick-borne diseases such as January Disease (Theileriosis), especially in Zimbabwe and Zambia. Chari and Mugabe (2021) also observed that climate change has increased disease trajectories such as ticks, leading to higher prevalence of January Disease in Mashonaland provinces.

Regional organizations such as the Southern African Development Community (SADC) and the African Union Inter-African Bureau for Animal Resources (AU-IBAR) promote regional disease surveillance and information sharing among member states. These institutions encourage

countries to improve risk analysis systems, strengthen veterinary services, and enhance livestock disease preparedness. Key performance indices commonly used in Southern Africa include livestock mortality rates, disease prevalence rates, vaccination coverage, frequency of outbreaks, and response efficiency. However, studies indicate that many countries still lack reliable livestock databases and monitoring systems needed for effective risk management.

In Botswana, research by Shrnhur (2017) assessed how local livestock producers controlled risks arising from extreme droughts and decreasing grazing fields, which consistently risked survival and productivity of beef cattle. Farmers adopted different risk management strategies, for example investing in drought-resistant cattle. Another approach employed is practising rotating grazing to curb land degradation. In the same vein, collective action through farmer cooperatives enabled pooled resources and sharing of knowledge. This enhanced resilience against environmental risks and uncertainities in the market. This combined methodology underpinned the efficacy of community-based risk management in boosting livestock production. In Botswana and South Africa, risk based surveillance systems have been implemented to monitor trans boundary animal diseases (Thomson et al., 2019).

A research performed in Kajiado County by Galvin (2016) focused on the risks connected to disease outbreaks and market shifts in livestock production projects. Research outcomes hinted that Nigerian farmers often lacked consistent risk mitigation resources. However, they embraced strategies such as informal savings groups and community health initiatives to cope with disease risks. Procedures in disease management for example vaccination initiatives enabled by regional veterinary services are critical in decreasing mortality rates of livestock. Findings from the research also stressed need for bolstered government involvement and formal training in risk

management. This is because they were found to be paramount for long-term growth and viability in livestock sector projects.

Perry and Grace (2015) conducted a global study on livestock diseases and concluded that infectious diseases reduce productivity in developing countries. They assertion that effective disease risk analysis must integrate epidemiological data with economic indicators to guide decision making. The study highlights the importance of measurable indicators such as mortality rates and productivity losses as key tools for risk managers.

Cartley et al.,(2020) conducted a study on participatory epidemiogy approaches in pastorsl systems and found that involving local farmers improves disease surveillance and early warning systems. The study asserts that KPIs systems often fail in rural areas due to lack of reliable data and propose integrating indigenous knowledge into risk assessment framework.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter outlines the research design and methodology used to analyze key performance indices for disease risk managers in the livestock sector of Chikomba District, Zimbabwe. It covers the study area, research approach, data collection methods, sampling techniques, data analysis procedures, and ethical considerations.

3.2 The study site description

The study was carried out in Zimbabwe, Chikomba district found in the eastern - central part of country. The district is on the eastern periphery of Mashonaland East Province which shares the same boarder with Buhera district in Manicaland Province. Chikomba district lies within natural region III of Zimbabwe and it receives moderate rainfall about 650-800mm per year and it based on crop and livestock farming. The study area has 30 wards and four of them are urban, namely ward 9, 10, 11 and 12 and they cover Chivhu township and the researcher uses only 6 wards, ward 8,14,15,18,20 and 26. In the district they farm cattle, poultry, goats and sheep. The district experiences semi-arid climatic conditions which influences disease patterns. Livestock movement and proximity to other districts contribute to increased disease risks and because of that it is appropriate site for the study.

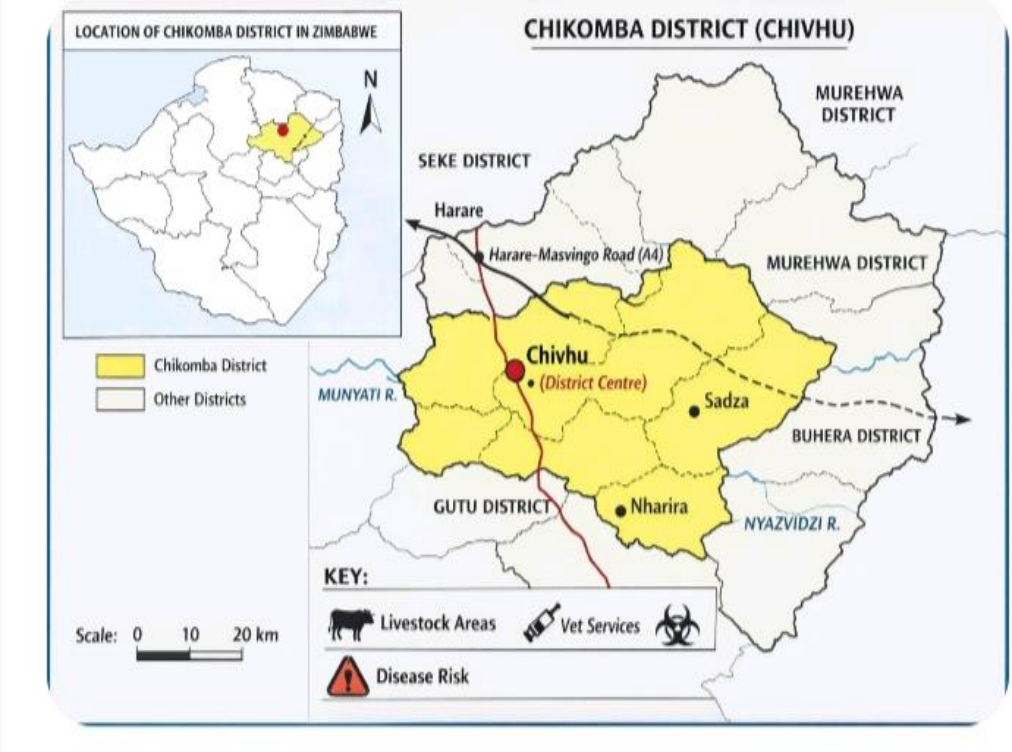

Fig 5: Map of study area, Chikomba district

3.3 Research Designs

Research designs are plans showing how the problem under study will be solved (Borg and Gall, 2018). Saunders et al., (2019) asserts that there are several research designs which are surveys, experimental design, case studies and ethnography to mention a few. The study adopted a descriptive case study design to analyze the key performance indices used by risk managers in livestock disease risk analysis in Zimbabwe.

3.4 Research Approach

Creswell (2014) defines a research approach as a procedure for research that span the steps from broad assumptions to detailed methods of data collection, analysis and interpretation. Research approaches are classified into quantitative, qualitative and mixed methods. This study employed

mixed research methods to collect data which integrate both qualitative and quantitative data on analysis of key performance indices by risk managers in livestock disease risk analysis in Zimbabwe, Chikomba district. The research adopted this approach because it enhances the depth and breadth of understanding by combining statistical analysis with descriptive narratives.

3.5 Target population

The target population in the study are the veterinary service officers, animal health authorities, agricultural extension officers and livestock farmers in Zimbabwe, Chikomba district. The researcher only use the selected district because there are many districts in Zimbabwe and many agricultural risk managers so it will be impossible to study them all.

3.6 Sample and Sampling Techniques

The study uses purposive and simple random sampling techniques:

3.6.1 Purposive Sampling

Purposive Sampling is a form of non-probability sampling and can be defined as type of sampling where specific persons or events are purposely selected for important information they provide. Kothari (1990) notes that purposive sampling method involves the choosing of particular units from a universal unit sample. Punch (2005) stresses that we cannot study everyone, everywhere or do everything hence there is need to employ purposive sampling techniques. This study employs purposive sampling techniques to select district veterinary officers, agricultural extension workers and animal health technicians because of their involvement in disease risk analysis. In this study the researcher selected only 6 veterinary officers, 12 livestock officers in all selected wards and 6 agricultural extension officers.

3.6.2 Simple Random Sampling

Simple Random sampling is a probability sampling method where each individual in the target population has an equal and independent chance of being selected for the study. It ensures that the study is unbiased and representatives which increases the validity and reliability of research findings. Fraenkel et al., (2012) define random sampling as a process of selecting a sample in such a way that all individual in the defined population have an equal and independent chance of being selected. In this study the researcher find a complete list of registered livestock farmers in Chikomba district from Department of Veterinary services and local agricultural extension offices (AGRITEX) and ward livestock committees. All were assigned unique identification numbers and sample size were determined using standard statistical formula based on total number of registered farmers and selection was done using lottery method.

3.7 Data collection Instruments/ tools

In this study data was collected through the use of primary data collection tool which include questionnaire, interviews and secondary data or desk review of literature which include review of reports, books, journals and google search.

3.7.1 Primary data

Questionnaires

A questionnaire is a set of questions assigned to elicit information from respondents or it refers to a set of questions that can be administered to yourself. Both closed and open ended questions are included in the questionnaire to allow respondents to express their general ideas as well as their specific responses to the questions. (Grawitz, 1995). The questionnaire for this study was

written in English an official language of communication in Zimbabwe and where necessary translate to Shona the local language.

Interviews

Interviews are defined as conversation with purpose and its purpose is to collect information from a respondent through a face to face conversation (Williams, 1998). Interviews is a data collecting method useful and highly specific where data can be obtained in a very short time. In this study the researcher use semi structured interview and conduct interviews with veterinary officers, animal health technicians and agricultural extension officers to collect qualitative data for the study.

3.7.2 Secondary data / desk review of literature

Secondary data can be used interchangeably with desk review of literature or desk based method where data can be collected without doing field work. It is the finding of information through researching from specific areas for example journals, books, and internet or document analysis. In this study the researcher collected data through analysis of documents such as district veterinary reports, surveillance records, vaccination statistics records, farmers' records, books and journals from internet thought the use of Google search engines. Secondary Data obtained from veterinary department reports, district animal health records, and previous studies on livestock disease management in Zimbabwe. This approach allows for a comprehensive evaluation of existing frameworks and identification of gaps in policy formulation and implementation that hinder effective risk mitigation against production (Chari and Sibongiseni, 2019)

.In order to gather background knowledge and learn about other studies on the same topic, (Cooksey, 2008)state that reading books and other resources including text books, the internet, reports, and brochures is one of the data collection approaches. The pertinent literature was reviewed for the sake of this investigation. This was done in order to find out more details on the issue.In order to get secondary data that helped in the completion of the study's goals, the researcher utilize documentation to analyse disease risk analysis on livestock sector in Zimbabwe. Using this approach, the research began by asking questions based on investigations, analyses, and illustrations of existing written materials, electronic resources.

3.8 Data Analysis and interpretation

Data was analysed using both quantitative and qualitative approaches of analysis. Dey (2005) outlines data analysis as a manner of determining data into its essential components. This is done to reveal its characteristic elements and structure. Thus, data analysis is critical to any research as it is the stage where the raw and meaningless data has meaning breathed into it. Dey (2005) further asserts that when analyzing data, one would want to do more than describe, one would want to construe, to explain, to understand perhaps even to predict based on the findings of the study. The quantitative gathered data during research were presented in form of descriptive statistics such as percentages, tables and graphs to summarize the key performance indices. Qualitative data analyzed and presented using thematic analysis to identify patterns and themes related to performance measurement and disease risk analysis. Graphs and tables were used to better explain the relationships that may exist between variables. The thematic approach to data analysis was used for qualitative data. The data were mainly be categorized in accordance with the research objectives, which formed the thematic areas. These themes and connections were then used to

CHAPTER 4

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter presents and analyzes the study findings on disease risk analysis in the livestock sector in Zimbabwe, an analysis of key performance indices for risk managers with special focus on Chikomba district. The data collected through interviews, questionnaire and desk review of literature was analysed thematically and response were presented in tables and graphs and narrative form organized by emerging themes. This study aims to answer the following research questions:What are the major diseases that are affecting Zimbabwe's livestock sector? Which are the key performance indices currently used by risk managers on livestock disease risk analysis in Zimbabwe, Chikomba district? How effective are risk managers in managing livestock disease risks based on key performance indices? What strategies can be adopted to improve the effectiveness of key performance indices in livestock disease risk analysis in Chikomba district? The research questions guided the researcher to get corresponding major themes emerging in data presented in this chapter.

Table 4.1 Distribution of participants by ward

Ward	Livestock farmer	Veterinary officers	Extension worker

Ward 8	2	1	1
Ward 14	2	1	1
Ward 15	2	1	1
Ward18	2	1	1
Ward 20	2	1	1
Ward 26	2	1	1
Total	12	6	6

The table show the distribution of participants by ward and each selected ward had one veterinary officer and one agricultural extension worker who participated in the study together with two livestock farmers.

4.2 Socio- demographic characteristics of Participants

Before discussing the findings of the study, the chapter look at the socio demographic data. Demographic data was gathered to provide background on the livestock species kept, wards, number of livestock kept, type of farmer. Demographic data of respondents are essential in this study as they contribute to clear understanding of participants' background. The study targeted only six wards in Chikomba district, 12 livestock farmers, 6 veterinary officers and 6 agricultural extension workers. For the purpose of confidentiality the researcher use codes to anonymize or replace original names of respondents like ‘Participant’ A for privacy. To summarise a table is provided below, followed by a discussion of the socio- demigraohic details of this study's sample.

Gender	Frequency	Percentage
Male	15	63
Female	9	37
Total	24	100

Table 4.2 Demographic characteristics of the participants by gender

The study sampled 24 respondents, 12 livestock farmers and 6 veterinary officers and 6 agricultural extension officers in Chikomba district. The demographic results shows that men headed the majority of household while women headed the few households reflecting the gendered nature of livestock production in Africa where man often dominate ownership. It shows that women also play a role in livestock production and management.

Table 4.3 Age distribution of participants

Age group(yrs)	Frequency	Percentage%
20-30 years	4	17
31-40 years	7	29
41-50 years	8	33
Above 50	5	21
Total	24	100

The study results indicated that the most respondents were between 41-50 years followed by 31-40 years indicating an economically active population and the age group is typically more receptive to embracing improved risk analysis strategies compared to older farmers. It also indicted that experienced and matured farmers and risk managers participated in the study.

Table 4.4 Participants' level of education and experience

Variable	Frequency
Level of education	
No formal education	3
Primary level	5
Secondary level	10
Tertiary	6
Experience	
Less than 5 years	**7**
6-10 years	**15**

Above 10 years	**2**

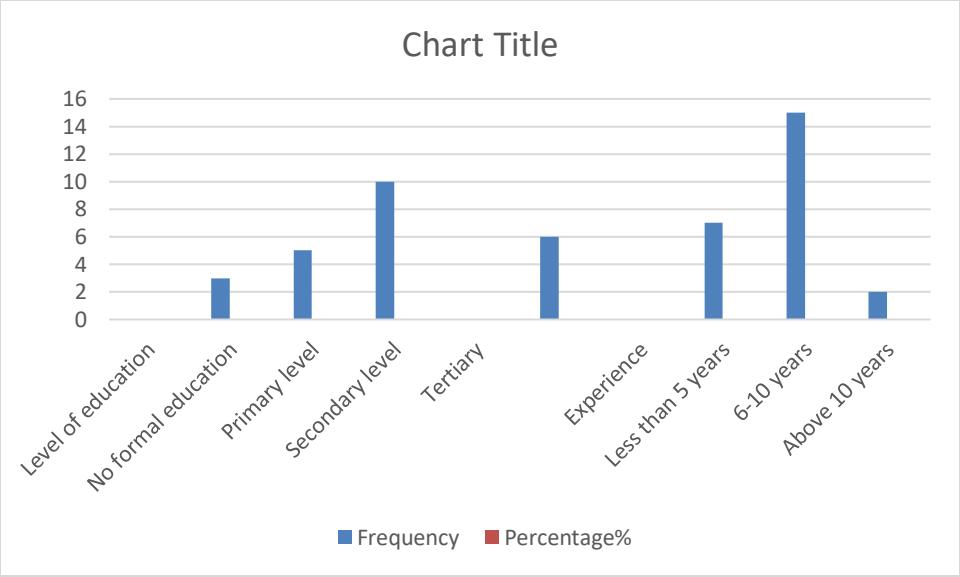

Fig 6: Bar graph showing participants level of education and experience

The research outcomes shows that the majority of respondents had completed secondary education followed by primary level and tertiary which suggest a moderate level of literacy and other hand there are others who had not completed any formal education. The level of education of a farmer is very important in livestock management performances in order to understand and interpret veterinary advices. Interms of experience in keeping livestock the majority of respondents indicated that they had more than 10 years experience in livestock analysis and managemnet. Others had an experience level below 5 years and some had experience level between 6- 10 years

4.3 Major Diseases Affecting Livestock in Chikomba District

Investigation of participant responses revealed that livestock disease burden remains a significant challenge in Chikomba District, with several high-impact diseases identified. The research

results outlined that tickborne or Theileriosis locally called January disease in Zimbabwe was reported to be the most common livestock disease and was recognized by 96% of participants in Chikomba district. Foot-and-mouth disease (FMD) emerged as the second widespread and economically damaging condition, reported by 88 % of respondents. This aligns with national trends, where FMD contributes to major production losses and trade restrictions. Poultry farmers also highlighted Newcastle disease as the major challenge in poultry production in the area.

These diseases contribute to long-lasting health problems and mortality, especially among calves and vulnerable stock. Other diseases reported by participants to pose problems in the area are Anthrax and Brucellosis disease.

Disease	Frequency	Percentage
Foot and mouth disease(FMD)	21	88
Tickborne disease (January disease/ theileriosis)	23	96
Anthrax	12	50
Newcastle disease	17	71
Brucellosis	10	42

Table 4.5: Major Livestock Diseases Reported by Participants

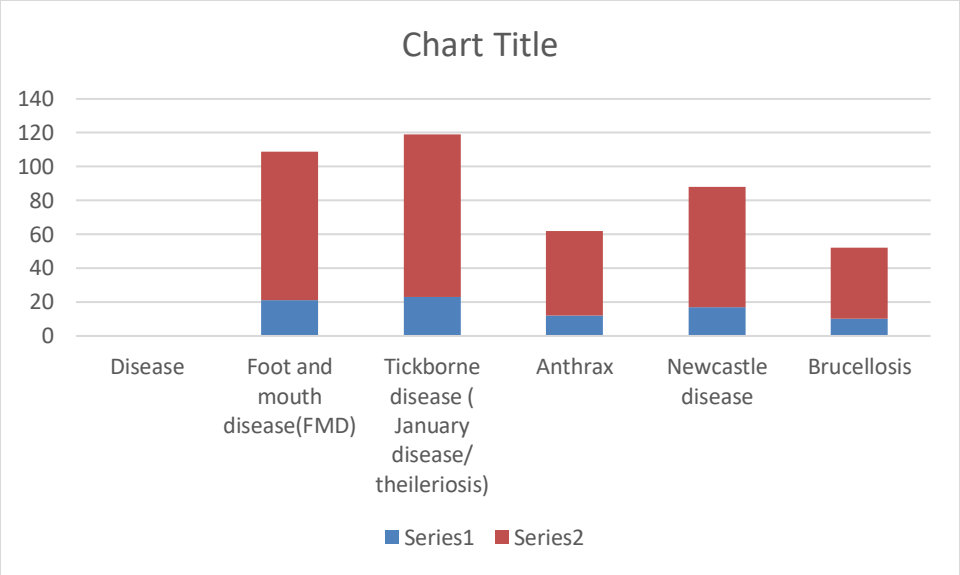

Fig 7 : Bar graph showing major diseases reported by participants in Chikomba district.

Participants were also questioned, what are the major diseases affecting the livestock and how they affecting their livestock and some participants responded that tickborne diseases, Newcastle and theileriosis (January disease), foot and mouth are the primary threat to the livestock in Chikomba district.

Participant A1 (Ward)

Theileriosis (January disease) wiped out half of my herd in 2023. We dip weekly, but the ticks seem resistant now.

(*Mombe dzangu dzakawanda dzafa nekuda kwechirwere ichi chinonzi January disease mugore ra2023. Taidhibhisa vhiki yega yega asi zvidari zvaingonetsa*.)

Participant A2

In this area of Chikomba everytime we struggle with foot and mouth because

our cattle often mix with those from other districts in search if grazing.

The data findings shows that the area is affected by disease some caused by animal movement from other districts like Buhera district.Participants stressed that these diseases cause not only direct losses through mortality but also indirect losses such as reduced fertility, growth delays, and market access challenges.

4.4 Key Performance Indices (KPIs) Utilized by Risk Managers

The study explored the adoption and application of KPIs by veterinary officers and extension workers responsible for livestock health management and analysis. Results showed a strong preference for disease incidence rate reported 92 percent, tracking vaccination coverage, reported by 88% of risk managers as a critical KPI. Disease detection outbreak reported 83% followed by mortality rate with 83 %.The risk managers were questioned about the key performance indices they are using to i analyse disease risk in Chikomba district. Some of the participants cited Dipping compliance rate a(DVS weekly reports and communal records).

Table 4.6 : Key Perfornance indices used in Livestock disease risk Analysis

Key performance indices	Frequency	Percentage%
Disease incidence rate	22	92
Mortality rate	20	83
Vaccination coverage	21	88
Response time to outbreak	18	75

Recovery rate of animals	16	67
Dipping compliance rate	19	79
Number of disease outbreak reported	20	83

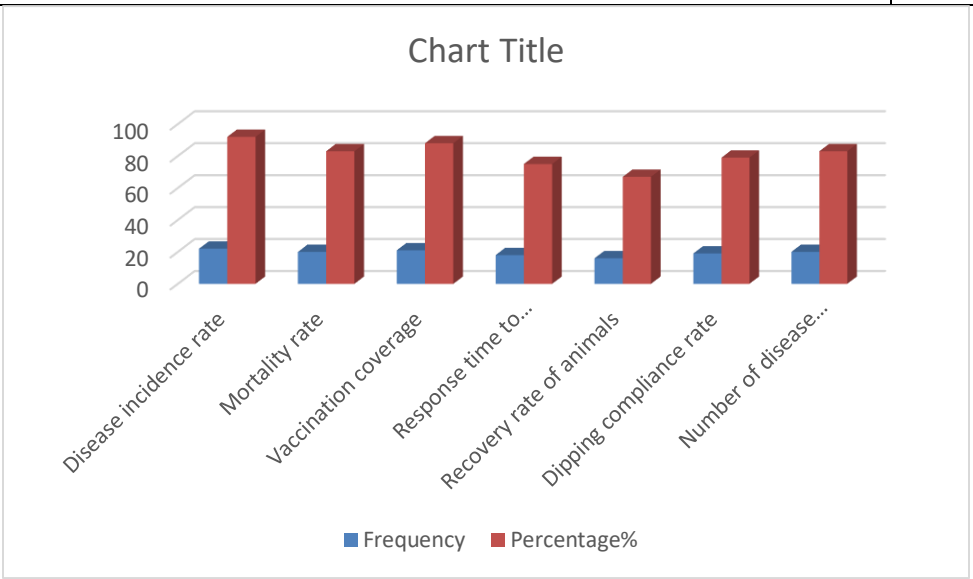

Fig 8 : Bar graph showing Usage of Key Performance Indices by Risk Managers

Participant B1, (Veterinarian)

'Our main Key Performance Indices are dipping adherence with goal of 90% weekly, and mortality under 5% per season. We use postmortem examination for case fatality and January disease '

4.5 Effectiveness of KPIs in Disease Risk Management

The investigator questioned the participants on how effective are the the key performance indices used by risk managers to analyze disease risk analysis and they responded that effectiveness is moderate rating from 4-6/10 due to resource shortages, farmer non compliance

inconsistent dipping and under reporting. Ndebele et al., (2007) asserts that Acaricide shortages led to weeks without dipping which causes problems. Risk managers indicated that higher vaccination coverage levels—generally were associated with notable reductions in disease outbreaks, particularly for theileriosis and foot and mouth disease (FMD). However, detection and reporting delays averaged seven days, which impaired rapid response and containment efforts.

Table 4.7 : Effectiveness of KPIs

Level of effective	Frequency	Percentage
Very effective	3	13
Effective	10	42
Moderately effective	7	29
Ineffective	4	10
Total	24	100

Farmer compliance showed significant variability. Commercial farmers tended to adhere more closely to vaccination schedules and biosecurity protocols, while compliance among communal farmers was limited by economic constraints and lack of awareness. This discrepancy was linked to ongoing disease transmission in communal areas, underlining the need for targeted education and resource support.

Participant C 1 (Risk manager) :

‘We work hard but money is lacking and at the other hand farmers

are not reporting deaths of the livestocks in time.’

P**articipant C2 Veterinary officer:**

‘Effectiveness is moderate, we are very good at identifying

outbreaks (disease occurrence rate) but we are slow to response due to lack

of transport (vehicles)’

4.5 Challenges Encountered by Risk Managers

Qualitative data from interviews and focus group discussions revealed multifaceted challenges undermining effective disease risk analysis and KPI utilization:Resource Limitations: Risk managers frequently cited shortages of vaccines, transportation, and diagnostic tools.

Participant C:

“We often have to delay vaccination campaigns due to insufficient

supplies,” explained a veterinary officer.

Data and Reporting Gap,Incomplete and inconsistent disease reporting from farmers compromised the reliability of surveillance data and KPI accuracy.

An extension worker noted,

“Many farmers do not report sick animals promptly, which affects

our ability to track disease trends.”

Farmer Engagement: Socio-economic factors, low literacy, and cultural beliefs contributed to poor adherence to biosecurity and vaccination protocols. These challenges collectively hinder the timely detection, reporting, and management of livestock diseases, limiting the potential benefits of KPIs as management tools.

4.6 Strateges to improve the effectiveness of Key Performance indices in Livestock disease risk analysis

Strategy	Frequency	Percentage
Increased vaccination programs	23	96
Improved disease surveillance system	22	92
Farmer training and awareness campaigns	21	88
Imprived dipping facilities	19	79
Increased government funding	20	83
Use of digital monitoring system	15	63
Improved veterinary staffing	18	75

Stronger stakeholder collaboration	17	71

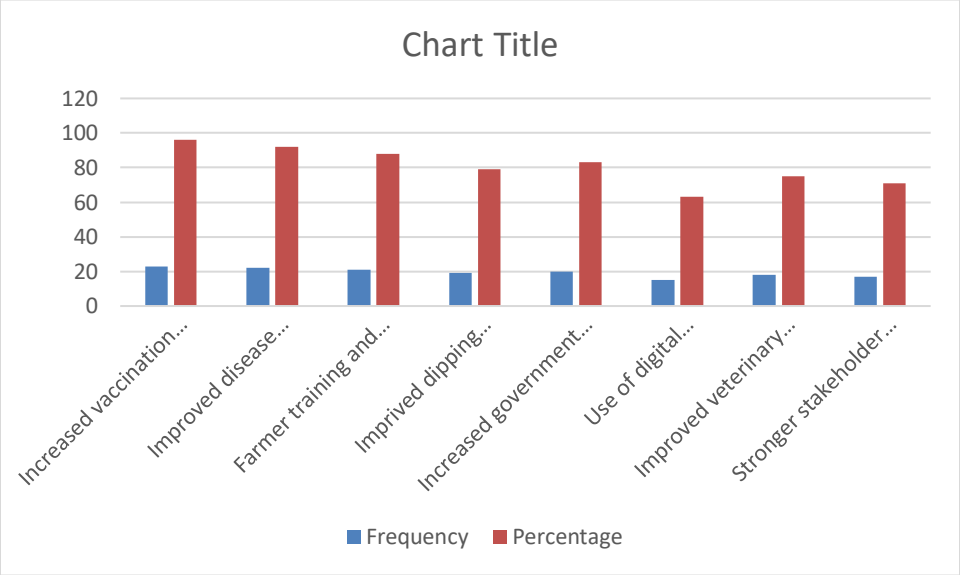

Fig: Bar graph showing suggested strategies to improve use of Key performance indices

The findings indicated that the participants when questioned to add the strategies to improve the effectiveness of disease risk analysis they employed different strategies to improve livestock disease risk analysis in the Chikomba district.

4.7 Summary of Findings

The study established that tick-borne diseases, Foot and Mouth Disease and Lumpy Skin Disease are the major diseases affecting livestock production in Chikomba district and Zimbabwe generally. Disease occurrence rate, vaccination coverage and mortality rate were identified as the major KPIs used by risk managers.

The findings further revealed that risk managers are moderately effective in controlling livestock disease risks despite facing several operational challenges such as inadequate resources and delayed outbreak responses.

The study also identified key strategies that may improve disease risk analysis and management, including strengthening vaccination programmes, improving disease surveillance systems, increasing government support and enhancing farmer training programmes.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the major findings of the study, conclusions drawn from the findings and recommendations for improving livestock disease risk analysis in Chikomba District. The chapter is based on the study objectives and research questions.

5.2 Summary of the Study

The study examined disease risk analysis in Zimbabwe's livestock sector with specific focus on key performance indices used by risk managers in Chikomba District. The study was inspired by cumulative livestock disease outbreaks which continue to affect livestock productivity, household income and national food security.

The study uses a descriptive research design. Data were collected from 24 respondents comprising 12 livestock farmers, 6 veterinary officers, and 6 agricultural extension workers from six selected wards, namely Ward 8, Ward 14, Ward 15, Ward 18, Ward 20, and Ward 26. Questionnaires,secondary data(documents and records) and interviews were used to collect data from respondents. Data were presented using tables, frequencies, and percentages. The study sought to Identify major livestock diseases affecting Zimbabwe and Chikomba district.

5.3 Summary of Major Findings

5.3.1 Major Livestock Diseases Affecting Chikomba District

The study found that tick-borne diseases, particularly January Disease (Theileriosis), are the major livestock diseases affecting Chikomba District. Most respondents specified that the disease has caused significant cattle deaths in recent years.Foot and Mouth Disease were also identified as major challenges affecting livestock production. Poultry farmers highlighted Newcastle Disease as one of the major diseases reducing poultry productivity.The study established that poor dipping facilities, shortage of acaricides, climate change, and delayed disease reporting contribute to increased disease outbreaks.

The findings from the participants and secondary data corresponds with Chimonyo et al., (2017) who assertion that tickborne diseases are major constraints in Zimbabwe's livestock productivity. Maposa et al., (2023) identified foot and mouth disease as a second critical challenge nationwide.

5.3.2 Key Performance Indices Used by Risk Managers

The findings revealed that disease occurrence rate, vaccination coverage, mortality rate and disease outbreak reporting are the major key performance indices used by risk managers in Chikomba District.Veterinary officers and extension workers indicated that these KPIs help monitor disease trends, evaluate disease control programmes and guide decision-making processes.However, the study also found that economic losses caused by livestock diseases are not consistently monitored due to limited resources and inadequate data management systems.

The findings align with Thompson et al., (2020) who emphasized that Key Performance indices are essential metrics for tracking disease control prigram effectiveness in African livestock systems. Chikerema and Makoni (2020) supported and assertion that reliance on KPIs in Zimbabwe but aware of inconsistences in their application due to limitations.

5.3.3 Effectiveness of Risk Managers in Managing Livestock Disease Risks

The study revealed that risk managers in Chikomba District are moderately effective in managing livestock disease risks.Some respondents acknowledged improvements in vaccination campaigns, disease surveillance and farmer awareness programmes. However, participants identified several challenges limiting effectiveness including ,Inadequate funding for veterinary services, shortage of vaccines and veterinary drugs, limited transport for field visits, delayed response to disease outbreaks,poor communication systems in remote areas and inadequate staffing levels.These challenges negatively affect disease prevention, monitoring and rapid response activities.

The study results was in relation to Scones et al., (2019) , Chikerema and Makoni who identified similar operational constraints affecting veterinary services in rural Zimbabwe.

5.3.4 Strategies for Improving Livestock Disease Risk Analysis

The study established that improving vaccination programmes and strengthening disease surveillance systems are the most important strategies for improving livestock disease risk analysis in Chikomba District. Participants also emphasized the importance of: farmer training and awareness campaigns, increased government funding, improved dipping facilities, recruitment of more veterinary personnel,strengthening collaboration among stakeholders and adoption of digital disease monitoring systems.The findings suggest that effective collaboration between farmers, veterinary officers, government departments and agricultural extension workers is important in controlling livestock diseases. Recommendations align with FAO (2020) which advocates for capacity building, resource mobilisation and technological integration to enhance disease risk analysis.

5.4 Conclusions

Based on the findings of the study, the following conclusions were made:

- Tick-borne diseases, Foot and Mouth Disease and Lumpy Skin Disease remain major threats affecting livestock production in Chikomba District and Zimbabwe generally.
- Risk managers mainly rely on disease incidence rates, vaccination coverage and mortality rates as key performance indices in livestock disease risk analysis.
- Risk managers are moderately effective in controlling livestock diseases despite facing operational and financial challenges.
- Inadequate resources, delayed outbreak responses and poor disease monitoring systems reduce the effectiveness of livestock disease risk management.
- Strengthening disease surveillance systems, improving vaccination programmes and increasing farmer awareness can significantly improve livestock disease control in Chikomba District.
- **5.5 Recommendations**

Based on the findings and conclusions of the study, the following recommendations are made:

5.5.1 Recommendations to Government

- The government should increase funding towards veterinary services and livestock disease control programmes.
- Government should ensure adequate supply of vaccines, acaricides and veterinary drugs in rural areas.
- The Ministry of Lands, Agriculture, Fisheries, Water and Rural Development should improve transport facilities for veterinary officers.

5.5.2 Recommendations to Veterinary Services

- Veterinary departments should strengthen disease surveillance systems for early detection and reporting of outbreaks.
- Veterinary officers should conduct regular vaccination campaigns and livestock inspections.
- More veterinary personnel should be deployed in rural districts such as Chikomba.
- Risk managers should adopt digital livestock disease monitoring systems to improve disease tracking and data management.

Mobile communication platforms should be used to improve information sharing between farmers and veterinary officers.

5.5.3 Recommendations to Farmers

- Farmers should regularly dip livestock and follow recommended disease prevention measures.
- Livestock farmers should report disease outbreaks immediately to veterinary officers.
- Farmers should actively participate in training workshops and awareness programmes.

5.6 Areas for Further Study

The study focused on Chikomba District only. Further studies should be conducted in other districts of Zimbabwe to compare livestock disease risk management practices.Future researchers may also examine:The impact of climate change on livestock disease outbreaks, the role of technology in livestock disease surveillance, economic impacts of livestock diseases on rural livelihoods, effectiveness of vaccination programmes in Zimbabwe.

5.7 Chapter Summary

This chapter presented the summary of the study findings, conclusions and recommendations. The study concluded that livestock diseases remain a major challenge affecting livestock productivity in Chikomba District. Although risk managers are making efforts to control disease outbreaks using key performance indices, several challenges continue to affect their effectiveness.The chapter recommended strengthening disease surveillance systems, increasing vaccination programmes, improving farmer awareness and increasing government support towards livestock disease management systems in Zimbabwe.

References

Borg, W. R., and Gall, M.D. (2018) *Educational Research: An Introduction (7th Ed).* University of Oregon. Boston: New York.

Chari, F., and Sibongiseni, N.B. (2019). A Synthesis of Risks in Dairy Value Chains in Southern Africa: Cases of South Africa and Zimbabwe.

Chari, F., & Mugabe, P. (2021). *Climate change and livestock disease prevalence in Zimbabwe.* Harare: University of Zimbabwe Press.

Chikerema, S. M., & Makoni, N. (2020). Challenges in livestock disease control: a Zimbabwean perspective. *Journal of Veterinary Medicine,* 12(1), 55-64.

Creswell, J.W. (2014). *Research Design: Quantitative, Qualitative and Mixed Methods Approaches (4th Ed)*. Thousand Oaks, CA: Sage Publications: Los Angeles, USA

Dey, I. (2005). Qualitative Data analysis: *A user friendly guide for social scientists.*

FAO, (1993). Livestock and improvement of pasture, feed and forage. FAO committee on Agriculture, 12th Session, Hem7, 26 April to 4 May 1993, Rome, Italy .19 pp.

FAO, (1995). Manual on livestock Disease Surveillance and Information systems.

FAO, (2020). The State of Food and Agriculture: Overcoming Water Challenges in Agriculture. Food and Agriculture Organization of the United Nations.

Gwaze, F., Chimonyo, M., & Dzama, K. (2009). Communal goat production in Southern Africa: a review. Tropical animal health and production, 41(7), 1157–1168. https://doi.org/10.1007/s11250-008-9296-1

Grawitz, D. (1995). *Introduction to scientific research.* Paris: Prince House.

Jakob-Hoff RM, MacDiarmid SC, Lees C, Miller PS, Travis D, Kock R (2014) Manual of procedures for wildlife disease risk analysis. World Organisation for Animal Health, Paris.

Published in association with the International Union for Conservation of Nature and the Species Survival Commission, pp 160

Kusina, N.T. (2000). *Goat productivity in smallholder farming areas of Zimbabwe*. Paper presented on Healthy, Production and Management of Small ruminants. Harare, Zimbabwe.

Kothari, C.R. (1990). *Research Methodology: Methods and Techniques* (2nd Ed). New Age International Ltd, Publishers. New Delhi

Maposa, L., Garwe, E.C., and Nyamushamba, G.G. (2023) Factors Influencing Smallholder farmers' Preference for Veterinary Services Providers in Zimbabwe.

Masunda, B. (2001). Reproductive activity of indigenous cows under traditional management in communal areas: A case study of Sanyati communal area. MPhill thesis. Department of Animal science, University of Zimbabwe, Harare, Zimbabwe.

MacDiarmid SC, Pharo HJ (2003) Risk analysis: assessment, management and communication. In Veterinary services: organisation, quality assurance and evaluation, Correa Melo E, Gerster F (editors). Revue Scientifique Et Technique-Office International Des Epizooties 22(2):397–408. [DOI] [PubMed]

Murray N, Macdiarmid SC, Wooldridge M, Gummow B, Morley RS, Weber SE, Giovannini A, Wilson D(2004) Handbook on Import Risk Analysis for Animals and Animal Products. Paris: Office of International Epizootics (OIE); [Google Scholar]

Ndebele et al. (2007).*Livestock production research in Zimbabwe in relation to crop production*, Sage Publications, McMillian.

Nhokwara, S.M, Kono, H., Kubota.S, and Jubenkanda .M. (2023). *Communication medium in theileriosis control: the factors that determine disease knowledge among Smallholder farmers' in Zimbabwe*. Trop Amin Health Produ. Feb 16; 55(2): 83.doi:10.1007/511250-023-03466-x.

OIE, (2019). World Organization for Animal Health. Animal Health Surveillance in Terrestrial Animal Health Code, 8th Ed.Paris

Parmenter, D. (2015). *Key Performance Indicators: Developing, Implementing and Using Winning KPIs (3rd Ed.).* John Wiley and Sons

Punch, F. K. (2005). *Introduction to Social Research: Qualitative and Quantitative Approaches*. London: Sage Publications

Perry, B., & Rich, K. (2019). *Poverty impacts of livestock diseases and their control in developing countries*. Veterinary Record, 184(3), 89–95.

Saunders, M.N. K, Lewis, P. and Thornhill, A. (2019). *Research Methods for Business Students.* 8th Edition, Pearson, New York

Sikhosana, J.L.N., & Senda, T.S. (2007). Goat farming as a business. Department of Agriculture Research and Extension. Matopos, Zimbabwe

Thompson, J., Smith, L., & Brown, R. (2021). Digital disease surveillance systems in livestock production. *International Journal of Veterinary Science*, 13(2), 101–115.

Williams, G. (1998). *Research Collected of data on computer.* N.Y: Paris