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THE PREVALENCE OF GOAT DISEASES AT BINDURA UNIVERSITY GOAT FARM

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The prevalence of goat diseases at Bindura University goat farm

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ABSTRACT

A stratified single-visit multiple-subject, formal survey was carried out to establish the prevalence of goat diseases at the Bindura University of Science Education (BUSE) goat farm. A survey was conducted at the goat farm covering January to June 2022 to gather data. This study found that out of a population of 233 goats, infection rate was as follows: Goat pox (31 goats), GID (16 goats), heart water (14 goats), pneumonia (9 goats), coccidiosis (3 goats) and bloat (1 goat). This translated to mean that 31% of the total goats at one point during the period under study got infected by a disease. The results also found that cross breeds had the greatest infection rates across species at the university farm. Nevertheless, their occurrence in this location was heavily influenced by predisposing factors such as humid circumstances and a huge production system. Other small ruminant diseases are widespread but not as prevalent as those mentioned above. The study recommends that farmers should provide a steady supply of food to prevent nutritional stress, and help animals that are more vulnerable to disease by feeding them a diet high in protein. Also there is need for farmers to be educated on the need for recordkeeping to collect data on production and the prevalence of diseases as most communal farmers reported disease symptoms but not the diseases themselves due to a lack of access to veterinary extension from the government. Likewise, the quality of cross-goat breeds needs to be improved by instituting genetic pool control to develop a more robust breed that is more resistant to diseases.

DEDICATION

This study is dedicated to my loving family.

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I want to thank my supervisors Dr Chatikobo and Dr Chikwanda for directing and guiding my efforts in this study. I am profoundly thankful to my family and friends for their moral and material support.

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LIST OF ABBREVIATIONS

ANF……Anti-nutritional factors

BUSE farm……Bindura University of Science and Education Farm

FAO……Food and Agriculture Organisation

FMD…….. Foot and mouth disease

SEA ……Small East African

CHAPTER ONE

1.0 Introduction

The Zimbabwe goat population is estimated at 4.7 million (Goat Breeders Association of Zimbabwe, 2019), the majority of which (97%), are raised by small-scale farmers in the rural areas (Christopher et al. 2020). Goat play critical roles in the livelihoods of the rural poor through provision of food (meat and milk), manure, savings, a source of income, employment creation, and are used in many religious celebrations and festivals.

Goats play very important socio-economic and cultural roles in the livelihoods of smallholder farmers. They contribute to food and nutrition security of the rural poor and help improve seasonal food unpredictability and availability directly via milk and meat production and indirectly through revenue generated from the sale of their products (Agrisystems, 2000). They can be sold for the family to acquire food and or meet other emergence needs such as school fees for children or settle hospital bills (Homann et al., 2007).

Raising goats is form of insurance against crop failure and droughts which normally decimates large ruminants (Kusina et al., 2000). Culturally, goats are used to settle obligations (dowry, loans, and penalties) and signify savings, riches, and security against danger and uncertainty (Dube, 2015 and Chikwanda, 2012). Goats play multiple important roles in the livelihoods of smallholder farmers. They contribute food security, poverty alleviation, income generation and cash flow. They are utilized to supplement household food requirements (meat, milk) and can be sold to generate cash income in times of emergencies (Kusina & Kusina, 2001), which is used to purchase food items and fund educational expenses (Assan, 2014; Chamboko & Ziteya, 2014).

Goats give higher social ranking and status and can be used as collateral or for paying crimes as fine to village head and chiefs. Goat owners can be able to have a consistent cash inflow throughout the year (Kusina & Kusina, 2001). The productivity and contribution of Zimbabwean goats to the national economic development is low due to a plethora of issues including high prevalence of endemic and parasitic diseases, inadequate nutrition which is acerbated by climate change induced drought, poor genetic quality of the animals, and neglect type animal husbandry system (Kosgey et al., 2008).

Many factors, some of which may vary by country, region, or even region of a community, can hinder goat breeding and productivity (Kosgey, 2004). For long-term success in goat improvement and production, these obstacles must be thoroughly comprehended and prioritised. High disease and parasite prevalence (Ben Salem & Smith, 2008); low level management; limited forage availability (Raghuvansiet al., 2007); and poor marketing management are the primary challenges (Kusina and Kusina, 1999). Many rural communities in Zimbabwe are plagued by endemic infectious diseases that pose serious threats to communal goat production (Githioriet al., 2006). According to Loforte (1999), diseases are the primary factor limiting Africa's goat production. High rates of morbidity, mortality, abortion, or subclinical effects such as weight loss or diminished gains, as well as the costs associated with disease prevention and treatment, all contribute to society's vulnerability to the effects of disease (Mahusoon et al., 2004).

1.1 Problem statement

The productivity of Zimbabwean goats is low and this has been attributed to diseases, poor nutrition, and poor quality breed types (Lüscher et al., 2005). Communal goats are usually neglected by researchers, veterinarians, extension workers, and various other stakeholders (de Vries, 2008) leading to lack of improvement in productivity of these invaluable genetic

resources. Goats are affected by high disease prevalence which leads to reduced goat productivity. Despite their despite their importance, very little is known about the prevalent diseases impacting the production and productivity of especially indigenous and crossbred goat types. It is hypothesised that both indigenous and exotic goats and their crosses succumb to parasitic and infectious diseases such as worms, GID, heartwater, cheezy gland and others.

1.2 Justification

This study aims to determine the prevalence of diseases affecting the production and productivity of goats at BUSE farm. Knowledge of such diseases will enable development of strategies to address the problems, leading to improved health, production and welfare of university goats. At the national level, improved disease control will lead to improved health, growth, re-production, welfare, and survival of goats.

1.3 Research Objectives

The main objective of this study was to improve the health and welfare of goats at BUSE university goat farm. The specific objectives are:

i. To establish the prevalence of goat diseases in the flock.
ii. To determine goat morbidity and mortality rates at the farm; and
iii. To determine the most susceptible goat breed.

1.4 Hypothesis

i. H0 There is no pattern of goat diseases prevalence at Bindura University Farm
ii. H0 Tropical seasons do not affect the prevalence of goat diseases
iii. H1 Exotic purebred goats are more susceptible to diseases compared to indigenous Mashona or Matabele goats.

CHAPTER TWO

2.0 Literature review

2.1. Overview of Goat Production

Most goats in Africa are owned by resource-constrained communal farmers, and as a result, the continent's goat population suffers from poor management and low productivity (Masika and Mafu, 2004). There are approximately 746 million goats in the world (Food and Agriculture Organisation Statistic database, 2003). Goats in Zimbabwe are primarily kept for subsistence purposes by smallholder farmers who rely on an extensive system that is notorious for its inefficient management and low productivity. Traditional small-scale farmers in Zimbabwe keep 90% of the country's more than three million goats under a system known as communal farming (Masika and Mafu, 2003). (Hargreaves, 2008). Farmers in communal areas typically own indigenous Mashona or Matebele breeds of goats. The average litter size of these breeds is over 1.5, and they are said to be hardy and prolific (Kusina and Kusina, 2001). Five distinct kinds of goats, including the Mashona, Matebele, Boer, Saanen, and Angora, have been identified by Kusina (2000) in Zimbabwe. The Small East African (SEA) and the Matabele goat are two of the most common types, as noted by Sibanda (2005).

During the wet season, farmers often tether or herd goats so that they can't easily access the crops they've worked so hard on. This type of management limits the amount of time the animals can spend grazing, which in turn decreases the animals' ability to consume food and their overall output (Mhere et al., 2002). Goats' freedom of movement is limited when they are tethered, or restrained, by ropes or chains attached to stakes or trees (Ben and Smith, 2008). The restraints are placed along roadways, in crop alleys, or on shared pastures (Nyamangara, 2001). According to Heffernan et al. (2004), tethering frees up farm workers

who would otherwise be responsible for herding the flocks to focus on other tasks (Chikura, 2009). Goats are tethered in pens overnight to keep aggressive animals from hurting or killing their fellow goats in a charging incident (Ben and Smith, 2008). Tethering can be accomplished in a number of ways, including with a swaying rope, a running lead, or a center peg (Chikura, 2009). Goats that are herded, as opposed to tethered goats, have more freedom in choosing which plants and pods to eat (Agrisystems, 2000). According to Shumba (2003), fast-moving foraging goats are capable of easily jumping over fences and venturing into crop fields.

As a result, during the wet season, goats were typically kept indoors until late in the afternoon, when workers' attention would no longer be needed for cropping or school, and they would be released to be herded (Kusina and Kusina, 2001). Goat productivity decreases as a result, because longer periods in the pen mean less time for the animals to eat (Chikura, 2009). Goats raised using the free ranging management system are let out into the morning to roam freely, grazing on veld forages and crop residues (Agrisystems, 2000). After the harvest has been stored away safely, this system is typically put into practise during the dry season. The goats have easier access to food, but the forages aren't very good right now (Hamudikuwanda et al., 1999).

Goats that are allowed to roam freely are more likely to be preyed upon and suffer from malnutrition. According to Campbell et al. (2005), goats kept in captivity spend their entire lives inside of enclosures. Concentrates and forages are harvested and delivered to the pens for the animals to eat (Gambiza and Nyama, 2000). Goats are typically kept in small, confined areas on large-scale goat farms (Beffa, et al., 2004). High labour, feed, veterinary drug, and management costs are necessary for this production system, but the resulting milk yield and meat quality are well worth the expense (Masunda, 2011).

Although goats are seasonal breeders, a doe (an adult female goat) can be bred and give birth (or kid) three times every two years, as stated by Campbell et al. (2005). In addition, goats have a greater number of reproductive cycles per unit of time than cattle do (Gambiza and Nyama, 2000). Due to their high twinning rate, does can have as many as six offspring in two years, while cows typically only have two calves (Obwolo, 2003). The producer benefits from this fast turnover rate in two ways: increased cash flow and a larger herd.

Campbell et al. (2005) conducted research to compare two ecologically distinct resource-poor communal farming systems in the Eastern Cape Province of South Africa to identify goat production practices, constraints, flock dynamics, body condition, and weight variation. He came to the conclusion that lack of feed, disease, and parasite were cited as the three most significant constraints in both regions. The majority of waste in both regions was likely caused by poorly built goat housing. The months of December and September and the months following the rains in April saw the highest rates of child mortality. Based on the results of his research, he concluded that the relationship between seasonality and goat age as it relates to body weight was significant. The post-rainy and autumn seasons saw the highest (p 0.05) increases in body weight for both young and adult females. Therefore, he argued, it is crucial to develop cost-effective interventions that account for regional ecological differences in order to boost the goats' nutritional status in communal areas, which in turn will boost goat productivity and, by extension, the poor resourced farmers' human nutritional and livelihood needs.

Nyamangara (2001) conducted a cross-sectional study of the factors influencing goat production in Ethiopia through interviews with 150 randomly selected farmers. The research questions were answered using a combination of descriptive statistics and the Tobit model. Goat production was found to be significantly influenced by factors such as distance to market, access to credit, farmer experience, disease, parasites, housing conditions, and land

area. According to the research of Makuza et al. (2013), in the semi-arid tropics of Zimbabwe, the provinces of Matabeleland North and South were surveyed across six districts to determine the factors that influence goat productivity. There are six districts total, three of which are located in Natural Region IV (Matabeleland North) and three in Natural Region V (Matabeleland South), both of which experience low annual rainfall but are equipped to produce crops and raise livestock. The study found that goat mortality was the primary limiting factor. Farmers with small flocks can't make ends meet, while those with larger flocks still lose out on goats' potential benefits due to high mortality rates. It was also found that the most important immediate factors contributing to high kid mortalities were dry season feed shortages, inadequate housing, and a lack of access to animal health support. Limitations in government and non-profit organisation (NGO) support services for the small stock sector are a major cause of these problems.

2.2 Animal Health Management

Goats native to Zimbabwe are known for their resilience, yet they suffer high mortality rates in herd settings (Chikura, 1999). Kids are especially susceptible to flock mortality, which has been reported to be over 50% (Kusina et al., 1999). Kusina et al. (1999) found that the primary cause of such high mortality rates was a lack of access to adequate health care. 39% of all deaths, according to Obwolo (1991), were caused by illnesses. The key to successful sheep and goat farming is keeping the animals healthy. There is a need for goat farmers to ensure the health and productivity of their herd or flock, which calls for particular attention to be afforded to each animal. A less-than-optimal operation is inevitable if a herd's health is at risk. Regular vital signs, body condition, and coat checks should be performed on the herd or flock. As the maternal antibody disappears between 12 and 16 weeks of age, it is recommended that lambs and kids be vaccinated annually. Using vaccine for several years in enclosed farming systems can completely eradicate the disease, provided that all young stock

is vaccinated annually and great care is taken to introduce only vaccinated stock from clean areas. This method allows for complete disease-free maintenance on individual farms and, with coordinated national programmes, can have a significant impact on disease overall.

Biosecurity is another step to minimise the spread of diseases from external factors to animals. The primary objective of biosecurity is to stop infectious diseases from spreading from infected to healthy animals. Direct animal-to-animal contact, interaction with wild animals or other domesticated species, airborne transmission, contaminated feed or water, and visitors or cars coming onto the farm are some potential vectors that must be considered when devising a biosecurity plan.

Avoiding the introduction of disease pathogens is the first and foremost disease control strategy in isolated herds or flocks. Animal producers should maintain a confined herd or flock if at all practicable. There is a high risk of spreading contagious diseases in an operation whenever fresh animals are brought in. Introducing new breeding animals, exposure to other animals during a fair, exhibition, or sale, or interactions with wild animals are all potential vectors for spreading disease on a farm. Animals should be quarantined if keeping a herd or flock closed is not an option. Separate water systems and other measures to avoid cross-contamination are essential components of any effective isolation programme. Sanitation of facilities (especially shared livestock trailers), sufficient ventilation or air turnover, proper stocking or animal density rates, and a strong feeding programme are critical management responsibilities that can prevent or aid limit disease risks.

In endemic regions, it is crucial to implement a regular cleaning programme for winter housing in order to eradicate any latent virus. Cases reportedly appear when owners bring their animals indoors for the winter. When there have been confirmed cases of disease, this is of utmost importance because viruses can live for months in organic matter. Viruses can be

eliminated through thorough cleaning and removal of the dung, followed by treatment with phenol, alkali, or other suitable disinfectants. Cleansers are effective against viruses because they dissolve the virus's outer lipid membrane (Nandi et al., 1999).

2.3 The Role and Place of Goats in the Livelihoods of Rural Communities

It is widely acknowledged that goats are vital to the economies and traditions of Africa's poorest peoples (Boomker, Horak & Ramsay 1994). Their resilience during short-term droughts and their ability to alleviate cash flow issues make them a valuable economic reserve for farmers with limited access to other means. In most Zimbabwean communal households, goat is raised for its meat and milk, making it a secondary source of protein after chicken. Goat meat is eaten by everyone in the area, regardless of their beliefs or background. Additionally, vegetable gardens benefit from the use of goat manure as a fertiliser. Goats serve a variety of cultural and social functions, including the exchange of lobola (a form of bride price) and participation in traditional rituals. Goats are a good livestock choice for families with limited space or no space at all, such as those headed by women or children.

Smallholder farmers raise livestock for a variety of reasons, including food security, economic stability, and social standing. Livestock are also used for other purposes, such as providing manure for crops, generating income, and mitigating risk (Kusina 2000). Farm diversification, risk distribution, and the chance to incorporate marginal form resources, such as crop residues, into the human food chain are all aided by small-scale animal farming (Masunda 2011). Livestock policies that aim to better the lives of smallholder farmers are hampered by divergent views on smallholder livestock production. In spite of unfavourable

conditions, small-scale farmers in many parts of the world have persisted in making a living by raising livestock.

Small- and medium-scale livestock production is also practiced by many rural households in Southern Africa, especially in countries like Botswana, Zimbabwe, and South Africa. The informal market is a major source of income for many families because of the frequent exchange of small livestock such as goats (Ben and Smith, 2008). The empowerment of women, people living with HIV/AIDS, orphans, the elderly, and the poor in general is facilitated by encouraging livestock production, which also helps to reduce the risk of drought in areas prone to it. Because of this, raising livestock is commonly included in the activities of smallholder farmers.

Small-scale farmers in developing countries rely heavily on goats for their income (Chikura, 2009). Directly through milk and meat production and indirectly through cash earned from the sale of their products, they help to ensure food security and reduce seasonal food variability and availability (Agrisystems, 2000). Goats excel where cattle fail: in the semi-arid climate of the American Southwest. They can survive longer without water because they eat more things and breed at a faster rate (Shumba, 2003). Farmers can make better use of the land because goats and sheep are browsers and consume different plant material than cattle (Mhere et al., 2002).

Goats also serve a vital function in human society and culture. According to research by Mhere et al. (2002), the export of skins to Zimbabwe's domestic tannery and leather craft sector generates significant foreign exchange earnings and allows for import substitution. Mats, tool handles (knives, dancing costumes, ropes, drums, and shields), ornamental articles, footwear, strings, and musical instruments all benefit from the raw materials provided by traditional technology (Beffa et al., 2004). In Zimbabwe, goats are crucial for their meat and

skins (Singh and Kumar, 2007). According to Makuza et al. (2013), a substantial demand for goat meat in Zimbabwe is one of the primary reasons to encourage goat production in the country.

Campbell et al. (2005) claim that empowering marginalised groups (women, people living with HIV/AIDS, the poor) by encouraging goat production helps reduce risks, especially in drought-prone areas. Goats are crucial to the food and nutritional security of the rural poor in rain-fed regions, where crop production is unpredictable and rearing large ruminants is restricted due to acute scarcity of feed and fodder. Sibanda (2005) argues that raising goats is preferable to raising other livestock due to the economic and administrative benefits. Low starting costs, low input needs, high productivity, early sexual maturity, and simple marketing are just some of the benefits.

2.4. Factors Affecting Goat Production

2.4.1 Poor Housing

It has been reported that inadequate housing contributed to the deaths of more than half of all goats who passed away in Zimbabwe (Chikura, 1999). The substandard housing provided no protection from the elements, including the wind, the cold, the rain, and the dirt (Shumba, 1993). According to Shumba (1993), the primary reason behind the development of substandard goat housing structures is a lack of understanding of the detrimental impacts of keeping goats incorrectly. Diseases like pneumonia, foot rot, and internal parasites became more prevalent as a direct result of the insufficient availability of suitable shelter. Foot rot, as described by Obwolo (1993), was the root cause of lameness. This ailment caused the affected animals to have painful and swollen legs (Linklater, 1993) and hampered their ability to forage for food. Because of this, the animals lose their body condition and become more prone to contracting various ailments. It was observed that the reduction of pre-weaning kid

mortality was correlated with the improvement of goat housing, preventative therapy and improved feeding (Matika and Sibanda, 1993; Mtenga et al., 1994).

Goats are more likely to contract infections due to the lack of supplemental nutrition, which may not even exist, and poor housing during harsh weather when the animals are foraging for food. According to Hall (1986), a predisposing factor is a many management or environmental drawbacks that produce stress in an animal. Some examples of these types of drawbacks include high temperatures or humidity, and dirty environments. A range of biological creatures may be found in poorly maintained housing environment and this might cause goat ailments. Bacteria, viruses, mycoplasma, Chlamydia rickettsia, fungus, protozoa, and parasites are the disease agents (external, internal, and blood) that can enter the goat directly, for example, by eating grass contaminated with infective parasite larvae. Disease agents can also be transmitted by a vector such as a tick or biting fly, such as the Amblyomma spp. Furthermore, goats can become ill due to physical trauma when they live and reproduces in an environment that may permanently, seasonally, or infrequently contain several disease agents and associated vectors.

2.4.2 Limited forage availability

In Zimbabwe, many goats are housed in disadvantaged regions with poor and unpredictable rainfall, leading to dry season feed shortages and high mortality rates due to climate variability and repeated droughts (van Rooyen and Homann- Kee Tui, 2009). Because of dietary stressors, goats suffer weight loss, and their production suffers. Pregnant goats are especially vulnerable, as this stress can cause premature births and abortions. Most goats in arid areas kid during the dry season, and smallholder farmers can lose as much as half of their goat babies yearly due to harsh conditions (Sikosana et al., 2001). The animals' body condition suffers from a lack of nutrients, and the younger animals' productivity suffers in the

long run (Joshi et al., 2004). Generally speaking, infants born during the rainy season (December–April) fare well and have a higher chance of survival since feed quantities and quality are at their peak (van Rooyen and Homann- Kee Tui, 2009). This indicates that kid mortality is related to the doe's nutritional state, influencing goat productivity.

The goat that is well-nourished and in good condition, especially when supplemented with protein, has been demonstrated to have a lower worm burden than livestock that is not (Vatta et al., 2003). Feed shortages in the dry season may be alleviated through many interventions, including expanding access to tree fodders, boosting fodder production, enhancing feed resource management, better feed utilisation, and introducing external inputs (Joshi et al., 2004). In the semi-arid regions of Zimbabwe, the Acacia thornveld is the primary source of nutrition for goats (Mlambo et al., 2004). If goats are fed low-quality roughage during the dry season, storing fruits from the wet season could give a protein supplement (Mlambo et al., 2004). Most browsing species include anti-nutritional factors (ANFs), so care must be given when deciding how much to feed the animals to boost their resistance to diseases.

2.4.3 Low levels of animal management

Minimal management is to blame for low goat output in community settings. Poor housing puts goats at risk of predation and adverse weather conditions. Poor housing severely impacts goat productivity, especially in kids, who are vulnerable when exposed to extreme weather conditions (Gwaze, 2008; Sikosana, 2008). Foot rot is another prevalent concern during the rainy season when goats are kept in muddy or waterlogged circumstances, and dry, well-ventilated housing is particularly helpful in minimising wet season fatalities (Sikosana, 2008).

Furthermore, even though rangelands provide feed such as leguminous trees such as acacia pods and leaves, farmers in community areas rarely offer pregnant and breastfeeding goats supplements (Kindness et al., 1999). During the dry season, they could effectively be protein

supplements to prevent metabolic diseases like pregnant toxaemia. Pregnancy toxaemia is a metabolic condition that affects does during the final stages of pregnancy, most commonly in twins (Rook, 2000). Pregnancy toxaemia is a disease characterised by an undernourished pregnant doe mobilising bodily reserves to the expanding foetuses (Chikwanda, 2004). It frequently leads to high death rates and, as a result, a loss of output.

Sikosana (2008) addresses the significance of good goat breeding management. Breeding in community settings is unrestricted, making planning for mating seasons difficult, and goat kids any time of year. At managed mating, kidding may occur during increased feed availability or planned extra feeding. Uncontrolled breeding makes keeping reproductive records difficult and increases inbreeding, which lowers growth rates (Gwaze et al., 2009).

Goats are typically seen as a source of meat, and they are rarely dipped or vaccinated in community areas (Bryson et al., 2002). This significantly raises mortality rates. Farmers require access to knowledge on farm-level disease management as well as relevant support services (animal health care clinics) and inputs for effective disease prevention and treatment (vaccines, dipping, dosing and medical care). This will necessitate more government or donor agency investment in human resources, infrastructure, and input supply (Sikosana, 2008).

2.5 Environmental risk factor

Environmental determinants play a great role in the occurrence of diseases. The environmental conditions in the tropics are conducive to a wide variety of life, both macro and micro; nevertheless, microorganisms are particularly important because they are developing numerous diseases. These diseases are increasing the production costs for the farmers, some of which are zoonotic and can be passed from animals to people. Most critically, they endanger food security not only in Tanzania but on a worldwide scale (Kawooya, 2011).

It is believed that both endemic diseases and disease outbreaks pose challenges to maintaining sustainable goat production in the semi-arid region of Zimbabwe. Infectious disorders such as foot and mouth disease (FMD), diarrhoea, pneumonia, foot root, and contagious caprine pleuropneumonia are the most famous of these conditions (CCPP). Other debilitating illnesses include those caused by parasites, such as endoparasites or ectoparasites, like helminthisis and manges (Chenyambuga et al., 2012).

Diseases in livestock are linked to substantial economic losses due to morbidity and mortality in livestock, and it is estimated that Zimbabwe loses between 15% and 20% of its annual income from the livestock sector due to diseases that affect cattle (Akerejola, 1980, Egbe-Nwiyi et al., 1999). Disease prevention and eradication should therefore be at the forefront of efforts to develop microruminants. Disease is widely acknowledged to be the primary limiting factor in humid zone goat and goat production, according to Williamson and Payne (1985) and Magona and Musisi (1999), while Phiri et al. (1998) cite Phiri (1998) as saying that helminthes in livestock are a major cause of production losses in the livestock industry. Disease is widely acknowledged as the primary barrier to goat and goat production in humid climates, as reported by Williamson and Payne (1985) and Magona and Musisi (1999). It is possible that the environment plays a larger role, either as the true cause of a disease or in determining its severity. The words "predisposing," "exciting," and "contributory" can be used to indicate the relative importance of individual causes when there are multiple (Parker, 1980).

2.6. Diseases and their Effects on Goat Production

Traditional methods of goat husbandry are used to sustain the continent's large goat population. While there are certainly benefits to raising goats in the area, diseases pose a significant threat to efficient and cost-effective production. The high prevalence of diseases is

a major problem for the goat industry in Zimbabwe. Parasite infections are a common cause of death in goats, which has reduced productivity and undermined any advantages of keeping goats. Inadequate health is a major contributor to lower goat output (Kosgey et al., 2008). In communal settings, the production of goats is severely hampered by a number of infectious diseases and parasites (Nwosu et al., 2007; Gwaze, 2008). Disease and parasites have been named by Loforte (1999) and Kindness et al. (1999) as the main factors limiting goat production in Zimbabwe. Anemia caused by the gastro-intestinal parasite Haemonchus contortus and tick-borne diseases like heart-water cause significant losses in tropical goat herds (van Wyk, 2006). Infectious diseases and parasites are the leading causes of mortality, abortions, and economic losses in goat production operations.

Parasitic illnesses, which can reduce annual goat weight by 6-12 kg and have a mortality rate of 40% in goat herds, are a major limiting factor in goat health and productivity, as reported by Kusiluka et al. (1998). (Githigia et al. 2001). Infections with gastrointestinal helminths and enteric protozoan parasites in goats have been linked to significant economic losses, including morbidity and mortality, especially in young animals (Waller 1999; Badran et al. 2012; Majeed et al. 2015). Among the most economically significant and dangerous parasites that can infect small ruminants, Strongyle nematodes are said to be in a recent study (Perry et al. 2002; Jurasek et al. 2010). Taenia hydatigena, an adult tapeworm infection, has greater economic and clinical significance, and goats serve as an intermediate host (Smith and Sherman 1994; Oryan et al. 2012). More importantly, coccidiosis caused by the genus Eimeria is one of the most common parasite infections seen in the clinic and the wild among small ruminants in Africa and elsewhere (Agyei et al., 2004; Gadelhaq et al., 2015; Majeed et al. 2015).

Coccidian parasites cause gastrointestinal sickness, and they kill a disproportionate number of kids, especially in young goats or stressed goats in poor farming conditions (Ratanapob et al. 2012). Gram-negative bacteria like Balantidium coli (B. coli) and Entamoeba spp. The risk of zoonotic transmission has been demonstrated in multiple studies to pose a significant threat to human health from infections (Mhoma et al., 2011; Elmadawy and Diab, 2017). Research into the frequency and severity of parasite infestations is still needed to better protect livestock. Helminthic and protozoal infection prevalence in Zimbabwe's small ruminants has been monitored (Soliman and Zalat 2003; El-Shahawy 2016; Sultan et al. 2016; Elmadawy and Diab 2017; Mohamaden et al. 2018). To reduce economic impact, it is thought that determining the most common GIP is essential.

Nematode infections can cause peracute, acute, or chronic illness in goats. Goats may exhibit a wide range of clinical signs depending on the specific parasite involved and whether the disease is peracute, acute, or chronic. Parasite-related hypoproteinaemia can cause a wide variety of symptoms, including sudden death, haemorrhagic gastritis, anaemia, inappetence, diarrhoea, poor growth, rapid or chronic weight loss, and oedema of varying degrees, especially the submandibular form and ascites. Because of the animals' poor health, there is a risk of reproductive failure due to low fertility.

The hosts, parasites, and environments all play important roles in determining the spread of infectious diseases. There are four main factors that contribute to the spread of parasitic diseases: an increase in the number of infective stages, a shift in host susceptibility, the introduction of susceptible stock, and the introduction of infection (Urquhart, Armour, Duncan, Dunn & Jennings 1988). Nutritional status, physiological state, age, sex, breed, and acquired or innate resistance levels are all examples of host factors. The health of an animal's digestive system has a direct impact on its resistance to disease. Animals that are well-fed can

better withstand the effects of parasitism than those that aren't, and vice versa, so poor nutrition makes hosts more vulnerable to disease (Faizal & Rajapakse 2001). Parasite-infected animals, including those with Haemonchus, can keep their haemoglobin levels constant so long as they get enough iron in their diet (Urquhart et al. 1988).

Animals often begin to die at the end of or after winter, when the quality of the food they eat is poor enough that they cannot absorb enough iron to survive. Similarly, if protein intake is adequate, growth rates may not be affected. Disease prevalence was found to decrease in small ruminants when they were fed better in the winter and early summer (Papadopoulos, Arsenos, Sotiraki, Deligiannis, Lainas & Zygoyiannis 2002). Goats may be more susceptible to disease because of changes in their physiological state, such as during pregnancy and lactation. This is especially true if the host's diet is not adjusted to provide enough foetal and milk nutrients. In these conditions, even moderate worm loads can impair the dam's ability to convert food into energy, which can have a negative impact on the development of the fetus or newborn. Goats are especially vulnerable during gestation and early lactation (Urquhart et al. 1988). Age is widely acknowledged as a major factor in determining one's propensity to contract an illness. This has been linked to the development of immunity as a result of consuming even modest amounts of larvae at a young age, which provides protection against infection and re-infection as one ages (Assoku 1981). Although some of these animals may develop immunity as they age, the vast majority won't be protected until they've been exposed to the infection, such as by being relocated to an endemic region. Adults who have not been exposed to the helminths are particularly vulnerable if they are relocated to an endemic area (Urquhart et al. 1988).

A decrease in the mean nematode burden was observed with increasing goat age, as reported by Boomker et al. (1994). However, infants and toddlers were found to have low burdens,

which was attributed to their diets of mostly milk and only a small amount of vegetation containing infective larvae. Some goat breeds may be naturally more resistant to diseases than others, and this variation appears to be inherited (Urquhart et al. 1988). As an example, the Red Masaai sheep, a native East African breed, has been shown to be more resistant to Haemonchus contortus than the Dorper, an exotic breed (Nginyi et al. 2001). Particularly in areas where people may lack access to anthelmintics due to financial constraints, the selection of resistant animals and culling of poor responders could be of critical importance. There is also some suggestion that male animals as a whole are more predisposed to certain helminth infections than their female counterparts (Urquhart et al. 1988). In societies where castration is not commonplace, this may be useful. In spite of this, parasites are notoriously versatile, so research in this area will continue to be vital to the welfare of animals and the success of agricultural enterprises (Coles 2001). The prevalence of infectious diseases caused by parasites has increased as a result of widespread parasite resistance to anthelmintic drugs (Coles 2001).

When studying the spread of disease, environmental factors cannot be ignored. Infectious stage development is temperature and moisture dependent, with variations in pasture contamination levels occurring after rainfall (Nginyi et al. 2001). Parasitic diseases may be facilitated by climate change. Parasites may flourish in new environments where the temperature is too high for them to survive in the past (Coles, 2001), or they may be wiped out if the temperature rises too high. Thousands of eggs can be laid by a single female parasite in warm, humid conditions. As a result, the environment becomes contaminated with the parasite's eggs. Nematode infection severity is correlated with goat stocking density (Cabaret & Gasnier, 1994), but only if the goat population is highly susceptible to the parasite. That's why the host animal's immune status is so crucial. New stock introductions can play a significant role in the dissemination of parasitic infections.

2.7 Types of Parasites causing diseases

The most common internal parasites of goats are Haemonchus contortus, Oesophagostomum colombiunum, Trichostrongylus spp, and Bunostomum spp (Obwolo, 1991; Chikura, 1999; Kusina et al., 1999). After a rainy season in Zimbabwe, parasite infections were at an all-time high (Kusina et al., 1999). Rainy weather provided ideal circumstances for the parasite eggs that were transferred in faeces to hatch and spread (Kusina et al., 1999). As a result of their infestation, animals with gastro-intestinal parasites have a slower growth rate and worse bodily condition (Vatta, Krecek, Letty, Van der Linde, Motswatswe and Hansen, 2002). Kids, in particular, were particularly vulnerable due to the high prevalence of worms, which brought about the diarrhoea, anaemia, and, in extreme cases, death (Obwolo, 1993). Howlader et al. (1997) reported that the adult and fourth-larval stages of Haemonchus contortus drew blood from goats and caused haemorrhaging in the lining of their abomasums, leading to anaemia. The authors also noted that Trichostrongylus infestation had a profound effect on the reproductive success of does and their young.

The parasite damage in small ruminants was exacerbated by poor diet, as reported by Nfi and Ndamukong (1997). Malnourished kids often lose a lot of weight due to parasite infestation and develop bottle jaws (Nfi and Ndamukong, 1997). Reduced milk production and dramatic drops in youngsters' live weight gains have been linked to Ostertagia circumcinta and Haemonchus contortus infestations in does (Howlader et al., 1997). The investigators also noted that dam infestation did not impact infant weight at delivery but significantly impacted infant growth rates three weeks and above. After discovering a mixed nematode infestation in goat poop, Maphosa (1993) recommended using anthelmintics to combat strongyle worms. To prevent newborns from being exposed to contaminated pastures, Temberly et al. (1996) suggested treating breeding females just before they gave birth. It was proposed by Waghorn and Shelton (1995) that goats be fed tannin-rich plants to prevent parasites in the

gastrointestinal tract. Contrarily, Kusina et al. (1999) advocated for better goat housing to reduce goats' interaction with worm eggs.

2.7 Conclusion of the Literature Review

The chapter noted that lack of health care for the goats has also impacted the viability of smallholder goat rearing. Worm infestations, lower live weight gains, subpar reproductive performance, and high kid mortality were all outcomes of the goats' subpar housing and the diseases they contracted. The chapter also noted that pneumonia, helminthiasis, and diarrhoea were the most common diseases in goats and the prevalence of these diseases is largely influenced by predisposing factors like humid climate and poor system management of production. The same disease will affect small ruminants wherever the same environmental factors play a role. The next chapter will present the research methodology that was adopted in gathering the data which was used to answer the research objectives.

CHAPTER 3

3.1 Materials and Methods

This investigation was carried out effectively at the Bindura University farm. The farm's district is equally diverse, with a moderate climate for most of the year and a hot summer from August to February. The area experiences rainfall beginning in late summer, with the coolest months being May and July. The location was chosen specifically for its relevance to the study's objectives, as there is already a goat project. The farm's land area is cultivated, although some natural vegetation remains. Mosaic grassland/forest - shrubland dominates the landscape.

3.2 Study design

The investigation was carried out using an observational study design (Dohoo et al., 2003; Thrusfield, 2005) from January 2022 to November 2022 to investigate the prevalence of goat diseases and the molecular characterisation of diseases circulating in goats. Goats at the Bindura University farm were purposefully chosen based on the occurrence of suspected goat diseases and lists of outbreak reports collected from the Bindura district livestock and fishery

office. Physical inspections of clinically sick animals were performed in the outbreak scenario to document clinical observations and the disease presentation date at the university and the farm. A total of 233 goats from the university farm were chosen at random and clinically evaluated. As a result, animals with obvious indications and symptoms of being sick with any goat disease were purposefully chosen.

3.3 Experimental animals

The study population consisted of the goats kept in a community setting at the Bindura University farm. In total, 233 goats from the university farm were surveyed, representing a wide range of breeds, ages, and sex. Goats were separated into three categories based on their age: young goats (0 to twelve months), and adults (twelve months and up). Native and foreign breeds were distinguished, as were male and female animals of each sex. All goats, including those close to disease outbreaks, were included in the study if they were clinically infected with and exhibited clinical indications of any goat disease. Throughout the study, all animals of any age, gender, or species exhibiting clinical indications of any disease in goats were taken into account. Nearly every species was native to the area, except a small number of goats with alien blood. All of the animals in the study were native to the area and were representative of both sexes of the species. Goats fed primarily on natural pasture were managed by a large group of people who supplemented their diet with crop wastes and forage tree leaves. The absence or presence of treatment for internal parasites played no role in the selection of goats.

3.4 Data collection.

Primary and secondary data were collected for this investigation. Secondary data came from veterinary records of farmers and reports, primarily from the Department of Veterinary Services, while primary data came from incidences of diseases at the university farm and

responses to questionnaires. Case files of diagnosed goats at the university goat farm were scoured for data and information in 2002. To re-evaluate the data acquired, we looked at the daily treatment numbers of the various diseases treated at the farm and conducted oral interviews with Ministry of Agriculture staff and stockholders (farmers) on goat disease occurrence in the three local areas under study. Fifteen participants were chosen randomly from the surrounding villages in the study area. Two questions were posed to the students working on the farm, both of which pertained to information on the farm's administration. Data about the goats' current and past conditions were gathered using the questionnaire. The questionnaire also recorded the animals' current conditions, including their general appearance, any outward symptoms of illness, and any care previously given. Age, sex, breed, and time of year were recorded as epidemiological risk variables. By tallying up the number of goat deaths attributable to each condition, we could rank the diseases from most prevalent to least. Observed frequencies for each risk factor were displayed in contingency tables.

3.5. Field clinical examination

Goats in this study were inspected thoroughly for the presence and presentation of clinical indications of goat disease as soon as specific epidemic regions were reported, analysed, and identified. All exposed mucous membranes, mouth, ears, perineum, less wool-covered body parts, and scrotal areas were examined during each outbreak. Also, a rectal temperature was recorded. Nodular lesions were found through visual inspection and by gently palpating the skin. Based on the outbreak's severity and the samples' timing, the study integrated clinical assessment with ongoing disease investigation. The goats were checked for ticks, fleas, foot difficulties, respiratory issues, abscesses, and skin illnesses like mange, orf, and other dermatitides. A person's age range, sex, breed, amount of recent movement (within the past month), and overall body condition score were also recorded. The nutritional status of the

goats in the university farm's goat management system was assessed by measuring their body condition score (BCS). Any time a goat disease outbreak was suspected or confirmed, a field investigation was conducted near the problem's epicentre, selecting cases randomly. Additionally, a participatory epidemiological investigation determined the seasonal prevalence of sheep and goat pox (Catley et al., 2012).

3.6. Questionnaire and participatory epidemiological (PE) survey

This questionnaire aims to collect data on the prevalence of goat diseases, people's familiarity with these diseases, and their impact on goat productivity. To determine the prevalence of goat diseases in the study area, a questionnaire survey was conducted at this stage. Fifteen respondents from the surrounding communal areas completed a structured questionnaire about goat management practices (feeding and health management), production constraints, and goat mortality. The survey's goal was to learn the local names for the most common goat diseases, as well as the symptoms of those diseases, and to rank those diseases in order of how frequently they were seen (SSI). Because of the significant concentration of goat farms in this region, the selection was also informed by local knowledge of the shared pastures used by sheep and goat herds. Through ranking diseases, the top five were chosen for in-depth research utilising participatory epidemiology. The purpose of the questionnaire was to collect data on goat health (common diseases, curative and preventative practices) and other management practices (such as nutrition, housing, and breeding). The herd-level survey included a series of questions, some of which were asked more than once to ensure the answers' accuracy. A thorough individual goat data sheet was utilised to capture information particular to each sampled goat and

3.7 Data Analysis and Presentation

Montgomery's three-factor analysis of variance was used to analyse the data (1984). Microsoft Excel was used to enter and manage all data. Descriptive statistics were used to summarise common goat diseases, and explain descriptive statistics were used too. A basic cross-tabulation of various management techniques and disease occurrences was used to preliminary analyse disease frequency, perceived restrictions, and distinct management practices.

3.8 Limitations of the study

Some major issues encountered during the survey included poor participation of farm workers and their inability to recall some of the required information. Furthermore, the research was not completed satisfactorily due to financial constraints and adverse weather conditions. It is recommended that a larger study be conducted in all communities throughout the Province, as this would reveal the majority of the major goat disease prevalence. However, the findings of this study will serve as a guide for the larger picture of what is happening on the ground.

CHAPTER 4

4. Presentation of Findings

4.1 Goat distribution frequency

Table 4.1: Goat breeds (%) at the Bindura University of Science Education Farm

Goat breed	Quantity	(bucks)	(does)
Mashona	2	2	
Matebele	2	2	
Red Kalahari	12	4	8
Cross breed	205		205
Boer	12	5	7

Table 4.2: The infection proportion of goat diseases within species, sex and age groups at the university farm

Risk Factor	Specie	Specie	Specie
GID	Cross breed15	Mashona 1	
Heartwater	Cross breed 12	Boer 1	Kalahari Red 1
Pneumonia	Cross breed 9		
Coccidiosis	Cross breed 3		
Bloat	Cross breed 1		
Goat Pox	Cross breed 28	Mashona 3	

During a clinical field examination at the university farm, 31 goats were found to have pox lesions all over their skin. Still, they were largely localised to locations with little or no hair, such as the face, ears, crotch, reproductive region, and beneath the tail. Furthermore, near the conclusion of illness progression, the surviving animals developed skin sores and scabs. Goat pox (31 goats), GID (16 goats), and heart water (14 goats) had the greatest infection rates across species at the university farm. They were largely observed among crossbreeds and different age groups, with infection being most prevalent in the young age group. There was a statistically significant variation in the infection rate of diseases such as bloat and coccidiosis among species and sex groups but no statistically significant difference in pneumonia-related infections.

Table 4.3: The mortality % of goat diseases within sex and age groups at the university farm

Risk factors	Category	No of examined	No Died	Mortality rate (%)
Age	**Adult**	155	10	6.45
	Young	78	16	20.5
Sex	**Male**	278	9	2.2
	Female	110	17	15.5

Overall proportion	**388**	**26**	**6.7**

4.2 Livestock husbandry practices both at the farm and in surrounding communal areas

Table 4.4 Frequency distribution according to systems of production

System of production	University Farm	Communal farms
Semi-intensive	1	3
Free range/backyard	0	12
Other		3

Table 4.5 Frequency distribution according to the type of housing used for goats in the study area

Housing	University Farm	Communal farms
Kraal	1	12
Stall	0	3
Yard	0	0

Eighty-three percent of the farmers surveyed in the study area said they did not use hired shepherds, and 69 percent said they used the free grazing system with their goats. As

for where goats slept at night, research showed that 54% of goat owners slept with their goats in a kraal, 17% slept with their goats in stalls, and 29% slept with their goats in the yard.

Table 4.6: Frequency distribution (%) according to water sources for goats in the study area

Water source	University Farm	Communal farms
Animals go to a water source	0	9
fetched/provided	1	4
Both		2

Further investigation revealed that 60% of goat owners brought their animals to the river so that they could drink the water, while 26.6% of farmers brought water for their animals, and only 13.3% of goat owners both took their animals to the source of water as well as brought water to their yards or farms.

4.3 Prevalence and infection intensity of goat diseases

Goat diseases occur at different rates in herds depending on factors like management style, time of year, climate, geography, age of animals, and sex. The increased occurrence and severity of GID, diarrhoea, heart water, coccidiosis, bloat, and goat pox may be explained by the causative parasite's short generation interval and capacity to replicate at an alarming rate if environmental conditions are favourable. Variability in management practices like feeding, watering, housing, rearing, stocking rate, and health control measures, as well as differences in age, genetic diversity among goat breeds, and agroecological zone conditions, may all be attributable to differences in herd size. Subclinical prevalence of multiple diseases in

apparently healthy flocks may have two possible implications: First, sick goats may serve as vectors, increasing the risk of disease transmission to a susceptible population of kids. In addition, goat output may be negatively affected by infections that are too mild to be detected by routine diagnostic procedures (e.g., reduced growth and milk production).

4.4 Questionnaire and participatory epidemiological (PE) survey: communal farms

The primary obstacles in goat production were mentioned during the initial questionnaire survey. The interview questions examined major infectious and non-infectious disease concerns within the informant's knowledge set. The informants reported the types of diseases that occurred in the area, together with clinical definitions and local names (vernacular names). Some diseases' vernacular names differ significantly from one respondent to the next, and all names were documented for cross-checking purposes. Based on the clinical manifestations reported by the informants, the relevant scientific name of these disorders was also assigned.

The community informants unanimously defined four seasons a year, with the rainy season as a reference point. Farmers listed various sheep and goat diseases and their symptoms depending on their frequent occurrences.

According to informants, the high prevalence of goat pox, GID, heart-water, and diarrhoea was especially noteworthy during the rainy season, and this was related to rain and congregation in limited regions that favour disease transmission. Increasing humidity (rain) throughout the long rainy season was also explained as a risk factor and the explanation for the disease's maximum occurrence during the season. The infections were reported to primarily affect young goats that were allowed to graze during the wet season. Increased contact with other goats and grazing on green pastures and abundant bushes during wet seasons were identified as risk factors for the disease, particularly in young goats. On the

other hand, the dry season was associated with other selected goat ailments such as laminitis/wounds and blackleg. This was primarily owing to a lack of feed, famine, and floods (due to prolonged rain) during these seasons.

4.5 Factors contributing to disease prevalence

4.5.1 Effect of season on the prevalence of goat diseases

Several diseases have been connected to the onset or intensity during specific seasons (diarrhoea, heartwater, GID, and cheesy gland abscesses). Wet hot months/winter season has a greater disease prevalence and infection rate than the dry winter, according to the study's findings. Conditions favourable to the pre-parasitic stages of illnesses, including high humidity and temperature, are desirable for their development, optimal sporulation/hatching, survival, and transmission. Most parasites that infect goats, including strongyles, enter hypobiosis during the winter due to the harsh conditions. Additionally, less time spent grazing reduces host-parasite contact, leading to less parasite prevalence during the winter. Next, there was a dramatic decline in worm numbers, with the lowest percentage recorded during the driest part of the year. Host animals can transmit infection from one favourable season to the next, which may explain why there is a higher disease incidence in the research area during the dry season when environmental conditions hinder the formation and survival of the parasites' pre-parasitic stages.

4.5.2 Effect of geographical location/agro-ecological zones on GIP prevalence

Parasite prevalence and severity shift from agro-ecological zone to agro-ecological zone. Coccidiosis is the most common GIP in goats in the area, while the most common GIP in the area is Eimeria spp. The study found that temperature, rainfall, and moisture, all characteristics of the agro-ecological zone, are crucial to successfully hatching viable eggs, survival, and development of the parasites responsible for the varying GIP prevalence. Hence, parasite-environment interactions play a role in the spread of disease.

4.5.3 Effect of animal sex on disease prevalence and intensity

Several sources have noted the prevalence of certain diseases in male and female goats. The female reproductive cycle, including pregnancy, parturition, and lactation, strains the female goat's immune system and lowers her natural resistance to parasites. This is why females have a higher parasitic abundance than males in goat herds. However, males are more likely to become infected than females. Due to the same management method in which both sexes are kept, small ruminant animals like goats have been found to have a similar prevalence and intensity of infection between sexes. Variations in genetics within and across goat breeds, geographical differences in sampling sites and sample sizes, and the passage of time all contribute to the fact that the prevalence of diseases in goats of different sexes has been observed to vary widely across studies.

4.5.4 Effect of animal age on disease prevalence

Multiple sources have noted the prevalence of sickness in goats of varying ages. Parasite infections were more prevalent in young goats than in older goats. Repetition of the challenge process results in immunity, and the adult animal can successfully eliminate the parasite before it can cause infection. As their immune systems are not fully developed yet, young animals are easily infected by overgrazing infected pastures, being kept together with adult stock before they are ready to be weaned, and other similar factors. However, some researchers have observed adult goats have a higher incidence than young goats. Weaners (6-12 months) had a higher risk/prevalence of diarrhoea and GID than adult goats (>12 months) were observed by Dabasa et al. and Verma et al. Sucklings and weaned children had a similar rate of pneumonia.

4.6 Discussion

GID, goat pox, heartwater, diarrhoea, pneumonia, and cheesy gland abscesses were the most common small ruminant diseases observed at Bindura University farm and its neighbouring

communities, with coccidiosis and bloat attracting attention on a minor scale. The farm's goat disease frequency and preponderance revealed that GID was the most common, followed by heart water and diarrhoea. Economides (1983) discovered that adding tetracycline antibiotics to their full meal might treat pneumonia. It is only feasible if farmers pay more attention to the health and nourishment of their livestock. As a result, it is a sign of these tiny ruminants' predisposition to poor husbandry management techniques, a comprehensive system, and the presence of the Mycoplasma mucoides bacterium, which causes pneumonia.

Pneumonia can strike most animals undetected unless they are extremely anxious (Hunter, 1996). Seasonal changes in nutrient availability and the susceptibility of these small ruminants to living in dirty conditions were the primary contributors. Foraging for food causes an individual to lose any weight they may have put on during the wetter months. Lack of concentrate supplementation during the dry season and low protein feeding, as observed by Acharya (1986), negatively impacted goat production. High prevalence of heart-water infections in goats, especially in the humid high altitude zone and semi-humid zone, may be explained by the existence of climatic conditions that support the prolonged survival of nematode in goats, according to a study by Waruiru et al. (1995) cited by Magona and Musisi (1999). This study found that GID was one of the greatest single impediments to the development of goat production in areas with high rainfall.

Ademosun (1994) and Doma et al. (1999), as cited by Odeyinka and Ajayi, argue that inadequate nutrition is a major obstacle to ruminant production in Africa (2004). A total of 52% of the goats examined at the University farm died from GID, according to the findings of the investigation. However, helminths present in the gastrointestinal tracts of domestic animals can cause inflammation, which may or may not manifest as diarrhoea. It is important to determine whether diarrhoeic animals have been ill for a long time or not, as diarrhoea can

be a reflection of animals' normal faeces while adapting to a new environment as well as a symptom of certain chronic and rare diseases (Hunter,1996). The cases that were documented, treated, and analysed for this study were broken down by age group.

The most common illnesses observed in goats included pneumonia, worms, mange, mastitis, painful foot, conjunctivitis, and anorexia. The pathogenic effect of helminth infections on farm production directly correlates to the magnitude of economic losses, so the severity of an infection is the primary determinant of the treatment approach and duration (Over et al. 1992).

Although the number of goats with reported diseases and that were subsequently treated was low compared to the total number of goats available at the farms in the surrounding villages, this was due to a lack of healthcare concern; however, the number of goats with reported diseases and that were subsequently treated was increasing as a result of progressive animal health awareness in these areas.

Transboundary animal diseases include infectious diseases such as goat pox and coccidiosis (Brown, 2011). Diarrhoea, coughing, neck paralysis, bloating, and fever were also mentioned. Bloating is widespread among high-producing pure and crossbred dairy goats and is associated with management (Wang et al., 2012). (Kifaro et al., 2009). According to the report, several of these diseases are suspected of being brought to the university farm by other stock purchased from outside sources. Another theory is that they were spread by other stock found in the adjacent communal lands, which are located near the university farm. Some of the diseases mentioned, such as coughing, neck paralysis, fever, and abortion, were only symptoms of other diseases (Albuquerque et al., 2011; Bamaiyi et al., 2015). Poor cleanliness, management, and feeding are usually to blame for high mortality rates (Masikate, 2010). Mating at the university farm is uncontrolled and happens all year, posing

management challenges. Production failure is more likely in livestock production, frequently carried out under unstable and hazardous conditions and further threatened by bush encroachment (Bakunzi et al., 2012).

4.7 Conclusion

This study found that GID, Goat pox, and pneumonia dominated the study area; nevertheless, their occurrence in this location was heavily influenced by predisposing factors such as humid circumstances and a huge production system. Goats in the same geographical area will be exposed to the same health concern. Other small ruminant diseases are widespread but not as prevalent as those mentioned above. On the other hand, effective pasture management has proven to be promising. It offers solutions that can be successfully transferred to most farming situations with applied knowledge about host-parasite interactions and interrelationships, laying the groundwork for low pasture infection rates for grazing animals. Several management measures can help optimise animal health status (for example, stocking rate decrease and regular intensive monitoring of animal condition). Selective breeding has also shown promise as a viable control strategy. Animals with high infection resistance are selected for future breeding lines, resulting in flocks of animals with stronger resistance. The impact of nutritional status on the husbandry system was also explored in the context. It was discovered that improved nutrition enhances animals' ability to cope with the negative consequences of worm infestation. A protein diet is important because it is required for both growth and immunological responses.

CHAPTER 5

5.0 Conclusion and recommendations

5.1 Conclusion

According to the research, cross-breed goats are abundant at the Bindura University farm, whereas Mashona goats are more common in rural areas. The research found hybrid breeds were more vulnerable to diseases than pure breeds, challenging efforts to boost productivity and manage diseases common in farming communities. Environmental conditions that encouraged the development of infections, inadequate nutrition, a lack of water, especially during the dry season, and a lack of veterinary support were major variables that raised occurrences of disease and mortality rates, as confirmed by research by Masikati (2010). It was also noted that the availability of watering spots is only sometimes abundant and that when it is, multiple animals will congregate at the same spot, increasing the risk of disease transmission. High disease prevalence was attributed to several factors, including those identified by Peeling and Holden (2004): a lack of veterinary services provided by the government and low fertility for forage production. However, farmers can "mitigate" these restrictions Masikate (2010).

5.2 Recommendations

The results of this study allow for the suggestion of multiple actions. For the sake of their animals' health, farmers should provide a steady supply of food to prevent nutritional stress, and farmers can help animals that are more vulnerable to disease by feeding them a diet high in protein. Farmers must manage their operations better and cooperate to increase productivity for mutual gain. Since no communal goat farmers in this study kept accurate records, farmers must be educated on the need for recordkeeping to collect data on production and the prevalence of diseases. Farmers reported disease symptoms but not the

diseases themselves due to a lack of access to veterinary extension from the government. Therefore this area of service provision needs work as well. Promoting other management parts, such as production and financial record-keeping, is important so that farmers can acquire the knowledge and skills necessary to enhance the entire communal production system. Likewise, the quality of cross-goat breeds needs to be improved by instituting genetic pool control to develop a more robust breed that is more resistant to diseases.

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