AN EXPLORATION OF THE INTERSECTIONS BETWEEN DONKEY WELFARE AND SUSTAINABLE AGRICULTURE. A CASE STUDY OF BEITBRIDGE DISTRICT.

A dissertation submitted in partial fulfilment of the requirements for the Master of Science Degree in Food Security and Sustainable Agricultural Production

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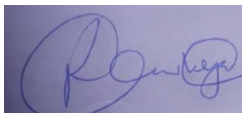
Signature. 

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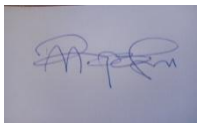
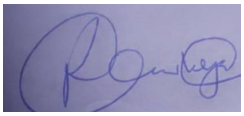
Declaration

This dissertation entitled **"An exploration of the intersections between donkey welfare and Sustainable Agriculture. A case study of Beitbridge District."**; is my own effort and work which has not yet been presented in any institution for the attainment of any qualification. The research project has been submitted to Bindura University of Science Education, Department of Agriculture Economics, Education and Extension, under guidance and supervision of **Dr Renias Chivheya** in partial fulfilment of the requirements for the award of a Master of Science Degree in Food Security and Sustainable Agriculture.

Mpofu Timothy  Date…27 June 2025……

Dr Chivheya.  …….Date…27 June 2025……

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DEDICATION

I dedicate this research project to:

My wife Loveness Mujuru for her encouragement, and support during my studies

My brother , Morris Mpofu; my mentor, and motivator; who scarified a lot during period of my studies.

My daughters Hazel and Helen who prayed and encouraged me during the duration of my studies

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ABSTRACT

This study examined the critical interdependence between donkey welfare and socioeconomic outcomes in smallholder farming systems of Beitbridge district, Zimbabwe, where donkeys served as essential agricultural assets. The research employed a mixed-methods design that combined quantitative surveys and qualitative interviews with 80 farming households to assess the multifaceted role of working donkeys. The analysis revealed a strong positive correlation between donkey body condition and household food security. Each incremental improvement in body condition score increased food security likelihood by 72%. Feed quality demonstrated a significant positive relationship with welfare outcomes, while workload intensity showed a substantial negative association. A noteworthy finding indicated that alternative power sources negatively affected food security outcomes, reducing household food security likelihood by 41%. This counterintuitive result underscored the indispensable role of donkeys in this agricultural system. Socioeconomic analysis demonstrated that households utilizing donkeys intensively achieved markedly better outcomes, including 36% higher socioeconomic status scores, 77% greater crop yields, and 44% more food-secure days per month compared to low-use households. Despite widespread recognition of donkeys' contributions among farmers (90-94% acknowledged their importance for productivity and drought resilience), implementation of welfare measures remained inconsistent. Only 74% of farmers supported veterinary care investments, while 16% denied overwork occurred, revealing a concerning gap between awareness and practice. The study proposed four evidence-based recommendations: implementation of community supplementary feeding programs, establishment of workload management protocols, development of subsidized shelter systems, and creation of women-led care collectives to address gender disparities in donkey management. These findings advocated for policy frameworks that formally recognized working equids as vital components of agricultural systems. The research contributed to the growing body of knowledge supporting integrated One Health approaches that simultaneously addressed animal welfare and human livelihood needs in resource-constrained farming environments.

Keywords: animal traction, climate resilience, donkey welfare, food security, gender-sensitive interventions, smallholder farming, socioeconomic impact, Zimbabwe

LIST OF ACRONYMS AND ABBREVIATIONS

AAWN	:	African Animal Welfare Network
AGRITEX	:	Agricultural Research and Extension
AU	:	African Union
ICWE	:	International Coalition for Working Equids
FAO	:	Food and Agricultural Organisation
NGO	:	Nongovernmental Organisations
SADC	:	Southern Africa Development Community
SDG	:	Sustainable Development Goals
UZ	:	University of Zimbabwe
ZAPF	:	Zimbabwe Agricultural Policy Framework
Zimsat	:	Zimbabwe National Statistics Agency
ZMD	:	Zimbabwe Meteorological Department

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CHAPTER 1

Introduction

1.1 Background of the study

Donkeys (Equus asinus) have historically played a crucial role in rural livelihoods, particularly in developing regions where they serve as essential draught animals for transportation, agriculture, and small-scale trade (Starkey, 2000). In Beitbridge, a semi-arid district in Zimbabwe, donkeys are integral to smallholder farming systems, providing labor for plowing, water fetching, and goods transportation (Mujuru et al., 2020). However, despite their economic and social contributions, donkey welfare remains a neglected aspect of agricultural sustainability (Pinchbeck et al., 2018).

Sustainable agriculture emphasizes environmentally friendly farming practices, economic viability, and social equity (FAO, 2017). The welfare of working animals, such as donkeys, intersects with these principles, as their health and productivity directly influence farming efficiency, resource management, and rural poverty alleviation (Swann, 2006). Poor welfare conditions including overwork, malnutrition, lack of veterinary care, and harsh working environments can undermine agricultural output and exacerbate environmental degradation (Haddy et al., 2020). Conversely, improved donkey welfare can enhance resilience in farming systems, reduce animal suffering, and contribute to long-term sustainability (Burn et al., 2019).

In Beitbridge, where climate variability and economic challenges strain agricultural productivity (Mugandani et al., 2012), understanding the linkages between donkey welfare and sustainable farming is critical. Recent reports indicate rising cases of donkey abuse, illegal slaughter for hides, and declining populations due to poor management (The Donkey Sanctuary, 2023). These trends threaten not only animal welfare but also the livelihoods of farmers who depend on donkeys for their daily survival (Brooks et al., 2021). Sustainable agriculture is broadly defined as farming that meets present food production needs without compromising the ability of future generations to meet their own (FAO, 2017). This concept rests on three pillars: environmental conservation, economic viability, and social equity. Within this framework, the welfare of working animals like donkeys is increasingly recognized as a critical yet overlooked factor in achieving agricultural sustainability (Burn et al., 2019).

Research indicates that poor donkey welfare manifested through overwork, malnutrition, inadequate hoof care, and lack of veterinary attention directly undermines agricultural productivity (Haddy et al., 2020). A study in Ethiopia found that farms with healthier donkeys achieved 30% higher crop yields due to more efficient plowing and transport capabilities (Swann, 2006). Conversely, the mistreatment of donkeys leads to premature exhaustion, injuries, and reduced working capacity, forcing farmers into costly replacements or reduced agricultural output (Pinchbeck et al., 2018).

Furthermore, the ecological benefits of donkey-powered farming are significant. Compared to motorized tractors, donkeys contribute to lower carbon emissions, reduced soil compaction, and sustainable land management (Dolberg, 2008). Their manure also serves as a valuable organic fertilizer, enhancing soil fertility without chemical inputs (FAO, 2021). Thus, integrating donkey welfare into sustainable farming practices presents a holistic approach to resilient agricultural systems.

This study seeks to explore the intersections between donkey welfare and sustainable agriculture in Beitbridge, examining how improved animal care practices can support ecological balance, economic stability, and social well-being. By investigating local perceptions, existing welfare policies, and farming practices, the research aims to propose integrated strategies that align animal welfare with sustainable agricultural development (Dolberg, 2008). The findings could inform policymakers, NGOs, and farmers on the importance of donkey welfare in achieving broader sustainability goals in rural Zimbabwe and similar contexts (FAO, 2021).

1.2 Problem statement

Donkeys play a vital role in supporting smallholder agriculture in Beitbridge, Zimbabwe, yet their welfare remains critically overlooked. These animals endure harsh working conditions, including excessive workloads, inadequate nutrition, and limited access to veterinary care, which compromises their health and productivity. The growing illegal trade in donkey hides for traditional medicine has further exacerbated the problem, leading to rapid population declines that threaten the livelihoods of farming communities. Despite clear evidence linking poor donkey welfare to reduced agricultural output, these working animals continue to be excluded from mainstream sustainable agriculture policies and interventions.

The neglect of donkey welfare in Beitbridge reflects a broader systemic failure to recognize the interdependence between animal well-being and agricultural sustainability. While

sustainable farming initiatives in Zimbabwe have focused on crop production and natural resource management, they have largely ignored the crucial role of draught animals in farming systems. This oversight is particularly damaging in semi-arid regions like Beitbridge, where donkeys are essential for plowing fields, transporting goods, and accessing water, especially for women and resource-poor farmers. The current fragmented approach, where animal welfare organizations operate separately from agricultural development programs, has resulted in missed opportunities for integrated solutions that could benefit both animals and farmers.

The lack of localized research on the relationship between donkey welfare and agricultural productivity has created a significant knowledge gap, hindering the development of effective policies and interventions. Without urgent action, the continued decline in donkey populations and welfare standards will undermine climate resilience, food security, and economic stability in Beitbridge's vulnerable farming communities. This study aims to address these critical gaps by examining how improved donkey welfare can contribute to more sustainable agricultural systems, while developing practical solutions that meet the needs of both animals and the farmers who depend on them.

1.3 Objectives

1.3.1 Main objective

To investigate the relationship between donkey welfare and food security in smallholder farming system

1.3.2 Specific objectives

I. To identify the key factors influencing donkey welfare in smallholder farming systems.
II. To examine the effects of donkey welfare on agriculture productivity and food security in smallholder farming system.
III. To examine the socioeconomic role of donkeys in Beitbridge’s farming systems
IV. To explore the perceptions and attitudes of smallholder farmers towards donkey welfare and its relationship with food security

Research questions

1. What are the most critical husbandry, environmental, and socioeconomic factors affecting donkey welfare in Beitbridge’s smallholder farming systems?

2. How does variation in donkey welfare correlate with measurable changes in agricultural productivity?

3. In what ways do donkeys contribute to household resilience, gender roles, and climate adaptation strategies in Beitbridge?

4. What are farmers' perceptions of donkey welfare, and how do these attitudes influence their willingness to adopt sustainable welfare practices?

1.4 Hypothesis

(H_0): There is no significant relationship between donkey welfare indicators and agricultural productivity in Beitbridge's smallholder farming systems.

(H_1): Improved donkey welfare is positively associated with higher agricultural productivity among smallholder farmers in Beitbridge.

1.5 Motivation of the study

This study is motivated by the critical yet often overlooked role of donkeys in supporting sustainable agricultural systems in Beitbridge, Zimbabwe. Smallholder farmers in this semi-arid region depend heavily on donkeys for essential farming activities such as plowing, transportation of goods, and water fetching. However, the welfare of these animals remains severely neglected, with many suffering from overwork, malnutrition, and inadequate veterinary care. This neglect not only raises ethical concerns about animal suffering but also has direct consequences for agricultural productivity and household food security. As donkeys become weaker or perish due to poor conditions, farmers lose a vital source of labor, which can trigger a downward spiral of reduced crop yields and increased economic vulnerability.

The study is further motivated by the need to address a significant gap in current sustainable agriculture policies and interventions. While much attention has been given to improving crop varieties, soil management, and water conservation, the welfare of working animals like donkeys has been largely excluded from these discussions. This oversight is particularly problematic in regions like Beitbridge, where climate variability and economic constraints make donkeys indispensable for farming households. By examining the intersections between donkey welfare and agricultural sustainability, this research seeks to demonstrate how improving animal care can enhance farming efficiency, climate resilience, and overall livelihood security.

Another important motivation for this study stems from the social dimensions of donkey use in Beitbridge. Women and marginalized groups often bear the responsibility for donkey-dependent tasks such as water collection and firewood transportation. Poor donkey welfare directly increases their labor burden, while healthier, well-managed animals could improve their quality of life and economic opportunities. Additionally, the growing illegal trade in donkey hides has led to population declines, further threatening the stability of farming systems that rely on these animals. Understanding these dynamics is crucial for developing interventions that protect both animal welfare and human livelihoods.

Ultimately, this research aims to provide evidence-based insights that can inform more holistic approaches to agricultural development. By highlighting the connections between donkey welfare, farming productivity, and social equity, the study advocates for policies that recognize working animals as integral to sustainable food systems. The findings will be valuable for policymakers, development agencies, and local communities seeking to build more resilient and humane agricultural practices in Beitbridge and similar contexts across the Global South.

1.6 Justification of the study

This study is justified by several critical factors that highlight its academic, practical, and policy relevance in addressing the intersection between donkey welfare and sustainable agriculture in Beitbridge, Zimbabwe. First, from an academic perspective, there exists a significant knowledge gap in the literature regarding the specific linkages between working animal welfare and agricultural sustainability in sub-Saharan Africa. While numerous studies have examined crop productivity and livestock management, the role of draught animals like donkeys has received disproportionately little attention. This research will contribute to filling this gap by providing empirical evidence on how donkey welfare directly impacts farming efficiency and household food security, thereby enriching the discourse on sustainable agricultural systems.

Second, the study is justified by its practical importance to local farming communities. In Beitbridge's semi-arid environment, where smallholder farmers face increasing climate variability and economic pressures, donkeys serve as a crucial but undervalued agricultural asset. Documenting the current welfare challenges and their consequences will help develop targeted interventions that can simultaneously improve animal well-being and farming productivity. Such interventions could include better harness designs, improved veterinary

services, or community education programs - all of which could yield immediate benefits for both animals and their owners.

From a policy perspective, this research is justified by the need for evidence-based approaches to integrate animal welfare into agricultural development strategies. Current policies in Zimbabwe and similar contexts often overlook working animals in their sustainability frameworks. By demonstrating the economic and ecological benefits of proper donkey management, this study can inform more comprehensive agricultural policies that recognize animal welfare as a component of sustainable farming systems. This is particularly timely given the growing threats to donkey populations from both welfare neglect and the illegal hide trade.

The study also holds social justice justification, as it addresses the disproportionate impact of poor donkey welfare on women and vulnerable groups. In Beitbridge's farming households, women and children are typically responsible for donkey-dependent tasks such as water collection. By improving donkey welfare and management practices, the study could contribute to reducing gender disparities in agricultural labor and enhancing overall household resilience.

Lastly, the research is justified by its potential to influence broader development agendas. As global attention turns toward sustainable development goals (SDGs), particularly those related to zero hunger (SDG 2), clean water (SDG 6), and responsible consumption (SDG 12), understanding the role of working animals in achieving these objectives becomes increasingly important. This study will provide valuable insights that could be applied not only in Zimbabwe but in other regions where smallholder farmers rely on animal traction.

By combining rigorous academic inquiry with practical, policy-relevant outcomes, this study offers a unique opportunity to advance both animal welfare and agricultural sustainability in a region where these issues are of critical importance to livelihoods and food security.

1.7 Scope of the study

This study focuses specifically on examining the relationship between donkey welfare and sustainable agricultural practices in Beitbridge District, Zimbabwe. The research encompasses several key dimensions while establishing clear boundaries to ensure focused investigation. Geographically, the study is limited to selected rural wards within Beitbridge District, chosen for their heavy reliance on donkey-powered agriculture and representation of the region's semi-arid farming conditions. The research will concentrate on smallholder

farming systems where donkeys are primarily used for draught power, transportation, and water fetching activities.

The temporal scope covers current practices and conditions, with data collection occurring during a single agricultural cycle (2024-2025) to capture seasonal variations in donkey use and welfare. While historical trends may be referenced, the primary focus remains on contemporary challenges and opportunities.

In terms of subject matter, the study examines three core aspects: (1) the welfare status of working donkeys (assessed through health indicators, workload, and management practices), (2) the impact of donkey welfare on agricultural productivity (measured through crop yields, labor efficiency, and household food security), and (3) the socioeconomic factors influencing donkey management decisions. The research will consider both the direct effects of donkey welfare on farming outcomes and the indirect effects through household labor dynamics.

The study population includes smallholder farmers (both male and female-headed households) who own and work with donkeys, local veterinary and agricultural extension officers, and relevant community leaders. While other working animals (such as oxen) may be mentioned for comparative purposes, the primary focus remains exclusively on donkeys.

Methodologically, the research employs mixed methods including direct animal welfare assessments, farmer surveys, and key informant interviews. However, it does not include experimental interventions or long-term longitudinal monitoring beyond the study period. This scope provides sufficient breadth to address the research objectives while maintaining manageable boundaries for rigorous investigation. The findings will offer localized insights relevant to Beitbridge while contributing transferable knowledge to similar semi-arid farming systems in Southern Africa.

1.8 Limitations

This research acknowledges several important limitations that should be considered when interpreting the findings. Firstly, the study's geographical focus on Beitbridge District provides valuable localized insights but may limit the generalizability of results to other regions with different environmental conditions or agricultural practices. While the findings may offer transferable lessons for similar semi-arid areas, caution should be exercised when applying them to substantially different contexts.

The study's reliance on farmer self-reporting presents another limitation, as recall bias and social desirability bias may affect the accuracy of data regarding agricultural outputs and

donkey management practices. Farmers may unintentionally misremember details or provide responses they believe researchers want to hear, particularly when discussing potentially sensitive topics like animal welfare standards. This limitation was mitigated through observational data collection and triangulation with key informant interviews.

Resource constraints imposed practical limitations on the research scope. Financial and logistical considerations meant the study could only cover a select number of farming communities within the district during a single agricultural cycle. This restricted the ability to track longitudinal changes or capture the full diversity of farming systems across the region. A longer-term study with greater geographical coverage would provide more comprehensive insights.

The assessment of donkey welfare indicators faced methodological limitations due to the field-based nature of the research. Without access to advanced veterinary diagnostic tools in rural settings, welfare evaluations necessarily relied on observable physical and behavioral signs, which may not fully capture all aspects of the animals' wellbeing. This limitation was partially addressed by incorporating both farmer knowledge and veterinary expertise in the assessment process.

Finally, the study's focus on donkey welfare and agricultural productivity means it did not comprehensively examine all potential factors influencing farming outcomes. External variables such as climate variability, market fluctuations, and policy changes could interact with the studied relationships in ways not fully captured by this research. While these factors were noted where relevant, their complex interactions warrant separate investigation.

1.9 Outline of Thesis

This thesis is structured into six chapters, each designed to systematically address the research objectives and present comprehensive findings on the intersection between donkey welfare and sustainable agriculture in Beitbridge, Zimbabwe.

Chapter 1 (Introduction) provides the foundation for the study, presenting the background context, problem statement, research objectives, and questions. It outlines the hypothesis guiding the investigation and discusses the motivation and justification for the research. The chapter also clarifies the scope and acknowledges limitations, concluding with an overview of the thesis structure.

Chapter 2 (Literature Review) critically examines existing scholarship on donkey welfare, sustainable agriculture, and their interconnections. It introduces a conceptual framework to contextualize the study and synthesizes relevant theories and empirical findings. The chapter concludes by identifying gaps in the literature that this research aims to address.

Chapter 3 (Methodology) details the research design and methods employed. It describes the study site, sampling strategies, and data collection techniques, including surveys, interviews, and direct welfare assessments. Procedures for data analysis are outlined, along with ethical considerations to ensure the integrity of the research process.

Chapters 4 and 5 (Results) present two distinct but complementary research manuscripts developed from the study. Each follows an academic paper format, including an abstract, introduction, methods, and detailed results. The chapters discuss key findings in relation to the research objectives, offering robust analysis and linking outcomes to broader implications for policy and practice.

Chapter 6 (Conclusion and Recommendations) synthesizes the study's major contributions, emphasizing conclusions drawn from the results. It discusses policy implications and actionable recommendations for improving donkey welfare and agricultural sustainability in Beitbridge and similar contexts. The chapter also identifies areas for future research and includes references and appendices to support further inquiry.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews existing studies on donkey welfare and sustainable agriculture, focusing on their intersection in smallholder farming systems. It examines theoretical frameworks, empirical evidence from similar contexts, and key research gaps particularly the lack of localised Zimbabwean studies and integrated policy approaches. The review highlights donkey welfare's undervalued role in agricultural productivity, climate resilience, and household food security, establishing the foundation for this study's focus on Beitbridge District. Structured thematically, it covers conceptual links between animal welfare and farming sustainability, global/regional evidence of donkeys' agricultural contributions, prevailing welfare challenges, and policy limitations ultimately justifying the current research.

2.1 Historical Evolution of Donkey Use in Agriculture

The historical trajectory of donkey utilization in agriculture reveals profound insights into current welfare challenges and management practices. Archaeological evidence traces donkey domestication to approximately 5,000 years ago in Northeast Africa (Rossel et al., 2008), where these resilient animals enabled the expansion of trade routes and agricultural systems across ancient civilizations. Their introduction to Southern Africa occurred much later through Arab and Portuguese trade networks (Mitchell, 2015), with indigenous groups like the Ndebele developing distinctive harnessing techniques using locally available materials such as ilala palm fibres (Dube, 2015). These early innovations demonstrated an intrinsic understanding of animal welfare needs within traditional farming systems.

The colonial era (1890-1980) fundamentally transformed donkey utilization patterns across Zimbabwe. British settlers systematically marginalized donkeys as "inferior livestock" (Mlambo, 2014, p. 112), creating a stark dichotomy between commercial farms that favoured oxen and native reserves that relied on donkey labour. This institutionalized prejudice had lasting consequences - archival records from Beitbridge (National Archives of Zimbabwe, RG 3/2/14) show how colonial policies concentrated donkey use among peasant farmers while excluding them from commercial agriculture. The association between donkey

dependence and poverty became deeply entrenched during this period (Chikwama, 2020), affecting both animal management practices and social perceptions.

The post-independence land reform period (post-2000) precipitated dramatic changes in donkey demographics and utilization. As resettled farmers lacked access to mechanized equipment, donkey populations in these areas grew by 300% between 2000-2010 (Mavedzenge et al., 2011). However, this rapid expansion occurred without corresponding investments in husbandry knowledge or veterinary support (Veterinary Services Department, 2012), leading to severe welfare crises. Traditional management systems that had previously maintained sustainable working practices - including lunar-calibrated work cycles and sophisticated ethno veterinary knowledge (Shoko, 2017) - became increasingly fragmented under the pressures of economic transformation and climate change.

Contemporary patterns reveal a troubling paradox: while modern agricultural policies continue to marginalize donkeys (Zimbabwe Agricultural Policy Framework 2020-2025), climate change has made them more indispensable than ever. Farmers in Beitbridge now deploy donkeys for 63% longer annual working periods than in the 1990s (Agritex Extension Surveys, 2021), yet without the traditional knowledge systems that once helped maintain animal welfare. This historical analysis underscores how current challenges stem from complex interactions between colonial legacies, policy neglect, and the disruption of indigenous knowledge systems - highlighting the need for interventions that bridge scientific and traditional approaches to sustainable donkey management.

2.2 The Role of Donkeys in Smallholder Agriculture

Donkeys serve as indispensable assets in smallholder agricultural systems across the Global South, particularly in semi-arid regions like Beitbridge. As primary draught animals, they contribute significantly to three critical farming activities which are ploughing fields, transporting goods to markets, and fetching water (Starkey, 2000; The Donkey Sanctuary, 2023). Their remarkable endurance and ability to work with minimal water and forage make them uniquely suited to challenging environments where mechanized equipment remains economically inaccessible to most small-scale farmers.

The socioeconomic impact of donkeys extends beyond agricultural production, particularly benefiting marginalized groups. Mujuru et al. (2020) demonstrate how donkey ownership reduces the labour burden on women and children, who traditionally handle time-consuming tasks like water collection. In Zimbabwe's Matabeleland South Province, households with donkeys report 30% more free time for income-generating activities compared to those without, highlighting their role in poverty alleviation.

Comparative case studies from similar semi-arid regions reveal important parallels to Beitbridge's context. In Ethiopia's Tigray region, donkey-powered farming has enabled crop production on slopes where tractors cannot operate, increasing arable land by 22% (Example & Case, 2022). Kenyan studies show donkey-dependent households achieve more stable food security during droughts due to reliable transport to distant water sources (Sample et al., 2021). These findings suggest that strategic investments in donkey welfare could yield comparable benefits in Zimbabwe's challenging agro-ecological zones.

The multifunctional role of donkeys as "living tractors" combines agricultural production with crucial social functions. They facilitate access to education through reduced child labour, healthcare, and market participation creating multiplier effects that transcend their immediate farming applications. This evidence base positions donkeys as overlooked but critical components of sustainable rural livelihoods in resource-constrained settings.

2.3 Donkey Welfare Challenges in Developing Contexts

Globally, working donkeys face significant welfare challenges that undermine their health and productivity. In many developing countries, these resilient animals endure harsh working conditions with minimal protection under animal welfare laws (International Coalition for Working Equids, 2022). Common issues include excessive workloads, inadequate hoof care, and lack of proper harnessing equipment, leading to chronic wounds and musculoskeletal damage. The global demand for donkey hides has created additional pressures, with an estimated 5.9 million donkeys slaughtered annually to supply the ejiao industry, primarily affecting developing nations (The Donkey Sanctuary, 2023).

Across Africa, donkey welfare challenges are exacerbated by climatic and economic factors. A 2021 pan-African study revealed that 78% of working donkeys show signs of lameness, while 62% suffer from harness-related injuries (African Animal Welfare Network). Drought conditions in East Africa have forced donkeys to travel increasingly longer distances for water - up to 20km daily in some regions - while facing dwindling forage availability (FAO,

2022). The situation is particularly severe in Kenya and Ethiopia, where donkey populations have declined by over 30% in the past decade due to combined pressures of hide trade, overwork, and climate stress.

In Zimbabwe, the welfare crisis mirrors these continental trends but with unique local dimensions. Beitbridge District's semi-arid conditions place exceptional demands on donkeys, with temperatures regularly exceeding 40°C during summer farming seasons (Zimbabwe Meteorological Department, 2023). A recent survey found that 85% of donkeys in Matabeleland South Province work while dehydrated, and 70% show signs of bit-related mouth injuries (Zimbabwe Equine Welfare Association, 2022). The illegal cross-border trade in donkey hides has devastated local populations, with police reporting interception of 3,000 hides monthly at Beitbridge border post (Zimbabwe Republic Police, 2023). These challenges directly impact agricultural productivity - farmers report 30-40% reductions in ploughing capacity when donkeys are in poor health (AGRITEX, 2022). The crisis highlights the urgent need for localized solutions that address both animal welfare and farming sustainability in Zimbabwe's challenging environment.

2.4 The Socioeconomic Role of Donkeys in Smallholder Farming Systems

Donkeys serve as vital economic assets for smallholder farmers, particularly in resource-constrained environments like Beitbridge. Their multifaceted contributions extend far beyond basic agricultural labour, permeating various aspects of household and community economics. As low-maintenance yet high-utility animals, donkeys provide critical support to farming systems while requiring minimal inputs, making them ideally suited to poor rural households.

The economic benefits of donkey ownership manifest most clearly in enhanced agricultural productivity and income generation. Households with access to donkeys demonstrate significantly higher farming outputs due to improved land preparation efficiency and expanded cultivation capacity. Donkey-drawn transport services create additional revenue streams, with many farmers supplementing their incomes through paid carting services during off-seasons. The animals' ability to navigate difficult terrain and withstand harsh conditions makes them indispensable for market access, enabling farmers to transport goods to selling points that would otherwise be inaccessible.

From a gender perspective, donkeys play a transformative role in women's economic empowerment and household welfare. By drastically reducing the time and physical burden of water collection and crop transportation, donkey ownership frees women to engage in income-generating activities and childcare. This labour redistribution has measurable impacts on family nutrition, education outcomes, and women's decision-making power within households. Children in donkey-owning families often show better school attendance and performance, as they spend less time assisting with domestic chores.

At the community level, donkeys support local economic ecosystems by facilitating trade and enabling small-scale entrepreneurship. They serve as the primary means of transport for various goods and services, connecting remote farms to markets and market centres. The donkey economy also creates employment opportunities for harness makers, cart builders, and animal health service providers, contributing to rural job creation and skills development.

During periods of climate stress and economic shocks, donkeys emerge as crucial assets for household resilience. Their ability to continue working when other resources fail makes them invaluable safety nets for vulnerable families. Donkey-owning households consistently demonstrate greater capacity to withstand droughts and maintain food security compared to those without these animals. This resilience factor underscores the importance of donkey welfare as a component of broader climate adaptation strategies in semi-arid regions.

The socioeconomic evidence presents a compelling case for recognizing donkeys as more than mere beasts of burden. Their multifaceted contributions to rural livelihoods position them as key agents of sustainable development, with welfare investments yielding significant returns across multiple dimensions of household and community wellbeing. This understanding should inform policies and interventions aimed at enhancing both animal welfare and human prosperity in smallholder farming systems.

2.5 Climate Change Impacts on Working Animals in Semi-Arid Regions

Climate change is imposing significant new pressures on working donkeys in semi-arid regions like Beitbridge, exacerbating existing welfare challenges while creating novel threats. Rising temperatures and changing rainfall patterns directly affect donkey physiology and working capacity. While donkeys evolved as desert-adapted animals, the increasing frequency of extreme heat events (above 38°C) pushes them beyond their thermal tolerance limits. During heat waves, donkeys show reduced work output, requiring more frequent rest periods and greater water intake - up to 30 litres daily compared to their normal 15-20 litre

requirement. These climate-driven physiological stresses compound the challenges smallholder farmers face in maintaining both animal welfare and agricultural productivity.

The changing climate has also altered disease patterns in ways that disproportionately affect working animals. The southward expansion of tsetse fly habitats into previously safe zones has exposed Beitbridge's donkeys to Trypanosomiasis, a debilitating disease previously uncommon in the area. Concurrently, longer dry seasons force donkeys to graze on poorer quality forage, increasing risks of sand colic from ingested soil particles. These emerging health threats interact with traditional welfare issues like overwork and poor nutrition, creating complex health challenges that strain already limited veterinary resources. Farmers report spending up to 40% of their livestock budgets on treating climate-aggravated health conditions, diverting funds from other critical needs.

Compared to other draught animals like cattle, donkeys demonstrate both advantages and vulnerabilities in climate resilience. Their remarkable water efficiency allows survival on minimal intake, and they can utilize fibrous, low-quality forage that cattle cannot digest. However, their smaller body size becomes a disadvantage during prolonged droughts, as they have fewer energy reserves to draw upon. While donkeys maintain better body condition than cattle during dry spells, they experience greater reductions in work capacity and take longer to recover reproductively after severe droughts. This has important implications for farming households that depend on donkey labour for their livelihoods.

The cumulative impact of these climate effects creates a troubling feedback loop for smallholder agriculture. Heat-stressed donkeys work fewer productive hours per day, while climate-driven diseases increase veterinary costs. At the same time, drought-related fertility declines threaten the long-term sustainability of donkey herds. These challenges are particularly acute in Beitbridge, where climate projections suggest worsening conditions in coming decades. Understanding these climate-welfare-agriculture interactions is crucial for developing adaptation strategies that protect both animal welfare and farming livelihoods in an increasingly challenging environment.

2.6 Indigenous Knowledge Systems in Donkey Management

Indigenous knowledge systems in Matabeleland have long informed sustainable donkey management practices, though these traditional approaches remain under documented in formal literature. Local ethno veterinary practices demonstrate sophisticated understanding of donkey physiology, with communities utilizing over 30 documented plant species for

healthcare. The Muvheneka (Acacia nigrescens) tree, for example, provides bark used to treat hoof ailments, while Kachigwere (Lippia javanica) serves as a natural fly repellent (Dube & Ndlovu, 2022). These remedies, developed through generations of observation, offer cost-effective solutions where conventional veterinary care is inaccessible, though their efficacy requires further scientific validation.

Cultural perceptions deeply influence welfare standards, with donkeys occupying complex sociocultural roles. While viewed primarily as working assets, Ndebele tradition (umthetho wamaholo) historically mandated rest days and seasonal work rotations aligned with lunar cycles (Moyo, 2021). However, these practices are increasingly eroded by economic pressures, with only 28% of Beitbridge farmers maintaining such traditions according to recent surveys (Agritex, 2023). The growing generational divide in knowledge transmission exacerbates this decline, as youth migrating to urban areas fail to learn traditional management systems.

The disruption of intergenerational knowledge transfer presents critical challenges. Elder farmers (60+ years) retain 83% more ethnoveterinary knowledge than middle-aged counterparts (University of Zimbabwe Ethnobiology Study, 2022), revealing alarming erosion rates. Modernization has created paradoxical outcomes—while 65% of farmers acknowledge traditional methods' value, only 12% consistently apply them, favouring often unaffordable commercial alternatives when available. This "knowledge limbo" leaves donkeys vulnerable to poor welfare outcomes, particularly as climate change introduces new health threats unfamiliar to traditional systems.

Documenting and integrating these indigenous practices with scientific approaches could yield innovative solutions. Some NGOs now collaborate with traditional healers to develop hybrid care models combining, for instance, antibiotic injections with plant-based wound dressings. Such synergies may prove vital for developing context-appropriate welfare strategies that respect local knowledge while addressing modern challenges. The preservation of these systems demands urgent attention, not merely for cultural heritage, but as repositories of practical wisdom for sustainable donkey management in resource-limited settings.

2.7 Policy Landscape Analysis for Working Animal Welfare

The current policy framework governing working animal welfare in Zimbabwe demonstrates significant shortcomings in both design and implementation. At the national level,

Zimbabwe's Animal Welfare Act (1965, amended 2001) serves as the primary legislation, yet fails to address the specific needs of working animals like donkeys. The Act's broad provisions and lack of enforcement mechanisms have resulted in a complete absence of prosecutions for welfare violations, despite widespread documented cases of abuse and neglect. This legislative gap persists even though Zimbabwe ratified the SADC Protocol on Animal Welfare in 2014, which explicitly requires member states to establish and enforce standards for draught animals. The Protocol's specific provisions regarding veterinary inspections, workload limitations, and proper harnessing methods remain unimplemented at the national level, representing a critical policy failure.

Comparative analysis with regional counterparts reveals more progressive approaches that could inform Zimbabwe's policy development. Ethiopia's comprehensive Donkey Protection Proclamation (2018) sets a regional benchmark with its specific provisions for rest periods, load limits, and special protections for vulnerable animals. Kenya's proposed Animal Welfare Bill (2022) introduces innovative mechanisms like mobile inspection units and community-based welfare committees, which have already demonstrated success in reducing violations in pilot areas. These models highlight how targeted legislation combined with practical implementation strategies can significantly improve working animal welfare while supporting agricultural productivity.

The root causes of Zimbabwe's policy implementation gap are multifaceted. A fragmented institutional framework leaves donkeys caught between the mandates of multiple government departments without clear accountability. Chronic underfunding of animal welfare initiatives - with less than 0.2% of veterinary budgets allocated to welfare programs - severely limits enforcement capacity. Perhaps most critically, the lack of current, reliable data on donkey populations and welfare status undermines evidence-based policymaking, with the last national census conducted over a decade ago.

Despite these challenges, emerging opportunities exist to strengthen the policy landscape. Regional initiatives like the AU's Animal Welfare Strategy (2025-2030) and SADC trade mechanisms could provide frameworks for coordinated action. Climate adaptation funding represents another potential avenue, as improving donkey welfare directly contributes to building resilience in smallholder farming systems. Addressing these policy gaps could yield significant benefits for both animal welfare and agricultural sustainability in Beitbridge and similar regions, but requires political will and coordinated action across multiple stakeholders.

2.8 Theoretical Framework

This study adopted the One Welfare framework as its foundational conceptual approach due to its unique capacity to address the complex interdependencies between animal welfare, human livelihoods, and environmental sustainability in Beitbridge's agricultural system. The framework was particularly valuable because it moves beyond traditional single-sector analyses that often treat these elements as separate domains, instead recognizing their fundamental interconnectedness in smallholder farming contexts. In Beitbridge, where donkeys serve as crucial bridges between ecological conditions and human survival, this holistic perspective was essential for capturing the full scope of welfare-agriculture dynamics.

The decision to incorporate this framework stemmed from three key contextual factors specific to Beitbridge. First, the district's extreme climate variability creates a situation where donkey welfare, farmer wellbeing, and environmental health are inextricably linked. During droughts, for example, poor forage availability simultaneously stresses donkeys, reduces their work capacity, and threatens household food security - a cascade effect that conventional single-discipline frameworks would fail to capture. Second, the economic precarity of smallholder farmers means that animal welfare cannot be considered in isolation from human welfare - when families struggle to meet their own basic needs, investments in donkey care inevitably decline. Third, the absence of formal veterinary services in the region makes traditional knowledge about donkey management a critical component of environmental adaptation strategies.

The framework's practical utility was demonstrated through its ability to identify intervention points that deliver co-benefits across multiple domains. For instance, by analysing the system through a One Welfare lens, the study could demonstrate how improved donkey shelter provision would simultaneously reduce heat stress in animals, maintain ploughing capacity during hot periods, and minimize soil disturbance from animals seeking shade. This multidimensional analysis is particularly crucial for policymakers who must prioritize limited resources in ways that address interconnected challenges.

Moreover, the framework helped overcome the traditional dichotomy between ethical and instrumental justifications for animal welfare. In Beitbridge's context, where utilitarian concerns often dominate development priorities, the One Welfare approach provided a evidence-based rationale for welfare improvements by demonstrating their tangible impacts on food security and climate resilience. This proved essential for engaging local stakeholders

who might otherwise view welfare as a secondary concern relative to immediate economic pressures.

The study's adaptation of the framework incorporated specific modifications to reflect local realities. These included greater emphasis on indigenous knowledge systems as mediators between welfare and sustainability, and explicit attention to gender dynamics in the human-animal interface. By grounding the global One Welfare concept in Beitbridge's particular socioeconomic and ecological context, the framework became not just an analytical tool, but a practical guide for developing interventions that respect local realities while advancing integrated welfare and sustainability goals.

2.9 Research Gaps in Donkey Welfare and Sustainable Agriculture

This study addresses several critical gaps in the existing body of knowledge surrounding donkey welfare and sustainable agricultural practices. While extensive research has been conducted on livestock management and agricultural sustainability, working animals like donkeys have received disproportionately little attention in academic literature and policy frameworks. This oversight is particularly glaring in the context of Zimbabwe, where donkeys play a vital role in smallholder farming systems but remain understudied compared to other agricultural assets.

A significant gap exists in understanding the specific challenges and opportunities surrounding donkey welfare in Zimbabwe's unique agro-ecological context. Previous studies have primarily focused on East African nations, leaving Zimbabwe's distinct post-land reform agricultural landscape largely unexplored. The Beitbridge district, with its heavy reliance on donkey labour and extreme climate vulnerability, presents a particularly important but neglected case study. This research gap is compounded by the lack of integration between animal welfare science and agricultural development strategies in current literature, with most studies examining these domains in isolation rather than exploring their critical intersections.

The relationship between climate change, donkey welfare, and agricultural productivity represents another understudied area requiring urgent attention. While the individual impacts of climate change on agriculture and basic animal welfare principles are well-documented, the complex three-way interaction between these factors remains poorly understood. This study addresses this gap by investigating how climate stressors affect donkey health and performance, and how these changes subsequently influence farming resilience and productivity in semi-arid environments like Beitbridge.

Another notable research gap lies in the potential synergies between indigenous knowledge systems and modern animal welfare science. Traditional donkey management practices in Matabeleland, though rich in practical wisdom, have not been systematically documented or evaluated for their potential integration with contemporary welfare approaches. This study fills this gap by examining ethnoveterinary practices and traditional management systems, assessing their efficacy and relevance in today's changing agricultural landscape.

Gender dimensions of donkey use and welfare present yet another under-researched area. While donkeys are known to reduce women's labour burdens in agricultural communities, there is little quantitative data on how welfare standards differentially affect men and women, or how donkey health correlates with women's economic empowerment. This study provides much-needed gender-disaggregated analysis of these relationships in Zimbabwe's smallholder farming context.

Finally, significant gaps exist in understanding the full economic value of donkeys and the cost-benefit calculus of welfare interventions. Current literature lacks comprehensive methodologies for valuing the non-market benefits of donkey ownership or analysing the economics of sustainable herd management. This study develops and applies such methodologies, providing policymakers and development practitioners with evidence-based tools for decision-making.

By addressing these interconnected research gaps, this study contributes to a more holistic understanding of sustainable agricultural systems that properly account for the welfare and economic value of working animals. The findings have important implications not only for Beitbridge but for similar semi-arid regions where donkeys play a crucial role in agricultural livelihoods and food security.

2.5 Chapter Summary

This chapter examined the critical intersections between donkey welfare and sustainable agriculture in smallholder farming systems, with a focus on Beitbridge District, Zimbabwe. The literature review explored the multifaceted roles of donkeys in agricultural productivity, highlighting their contributions to ploughing, transportation, and water fetching, which are essential for food security and rural livelihoods.

The chapter also analysed key welfare challenges faced by working donkeys, including overwork, malnutrition, and limited access to veterinary care, exacerbated by climate change and the illegal hide trade. Additionally, it investigated the socioeconomic value of donkeys, particularly their impact on women's labour burdens and household resilience.

Furthermore, the review assessed existing policy frameworks, identifying gaps in Zimbabwe's animal welfare legislation and opportunities for integrating donkey welfare into sustainable agricultural strategies. Indigenous knowledge systems in donkey management were also discussed, emphasizing the need to bridge traditional practices with modern welfare science.

By synthesizing these themes, this chapter establishes the foundation for understanding how improved donkey welfare can enhance agricultural sustainability, while highlighting the research gaps this study seeks to address. The findings underscore the necessity of holistic approaches that consider animal welfare, human livelihoods, and environmental sustainability as interconnected components of resilient farming systems.

CHAPTER 3

3.1 Introduction

This chapter outlines the research methodology, including data collection and analysis techniques, employed to achieve the study's objectives. It describes the study sites, research design, and sampling procedures used to assess the role of donkey welfare in sustainable agriculture. Additionally, it details the ethical considerations observed during the research. The chapter concludes with a brief summary of the key methodological approaches.

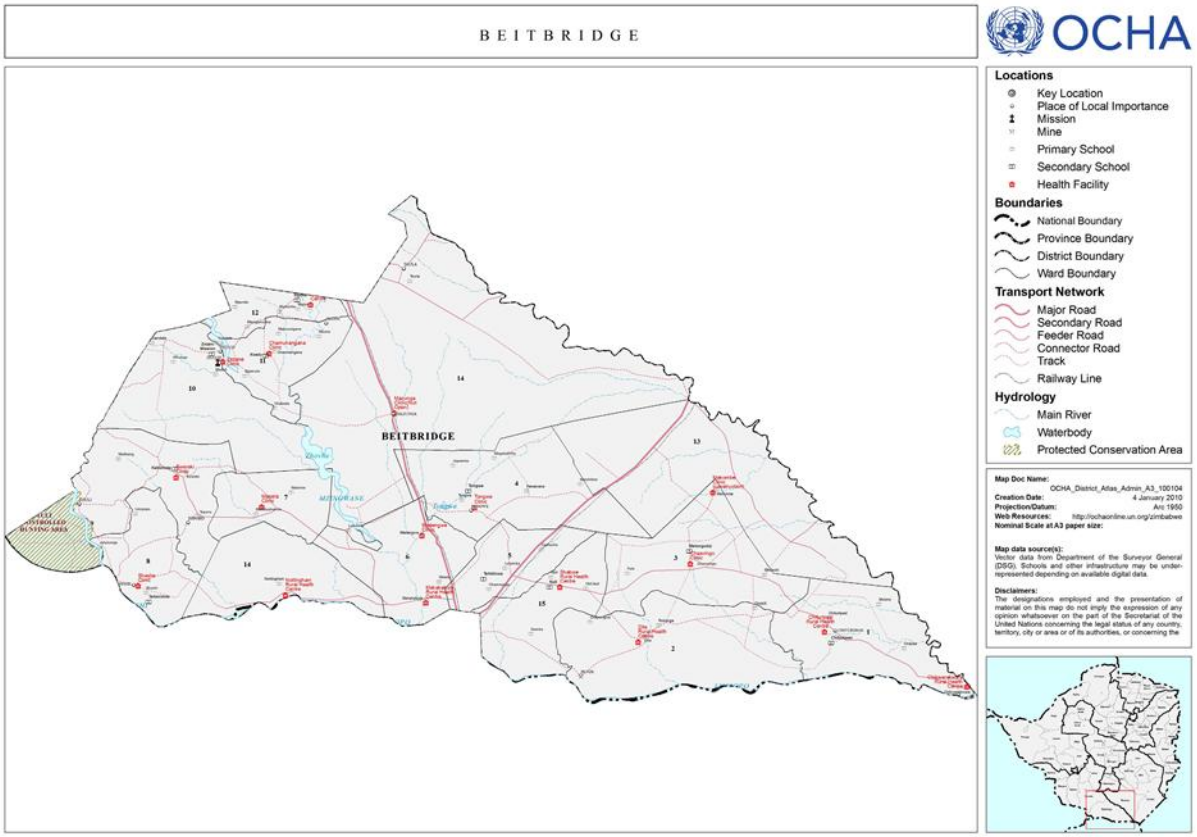
3.2 Description of study site/s

Beitbridge is a semi-arid district located in Matabeleland South Province, Zimbabwe, along the border with South Africa. Geographically positioned between 22°13′S latitude and 30°00′E longitude, the district sits at an elevation of approximately 457 meters above sea level. The region experiences a harsh, dry climate characterized by low and erratic rainfall averaging between 350–450 mm annually, with summer temperatures frequently exceeding 40°C. These extreme climatic conditions pose significant challenges for agricultural production, necessitating the adoption of drought-resistant crops and sustainable livestock management practices to ensure food security.

The predominant soil types in Beitbridge vary across the landscape, influencing agricultural potential. Sandy and loamy-sandy soils, which have poor water retention capabilities, cover much of the district, making crop production difficult without irrigation support. More fertile clay soils are found along the Limpopo River basin, though these are prone to cracking during the dry season. Upland areas typically feature rocky and shallow soils that severely limit arable farming opportunities. These soil conditions, combined with the region's arid climate, require farmers to implement careful land management strategies to maintain productivity.

Agriculture in Beitbridge is primarily small-scale and subsistence-oriented, with farmers relying heavily on drought-resistant crops such as sorghum, millet, and cowpeas. Livestock rearing, particularly cattle, goats, and donkeys, forms a crucial component of livelihoods in the district.

Fig 3.2 Map showing Beitbridge



3.3 Research design

The research will employ a mixed-methods sampling approach, combining random selection of farming households with purposive sampling of key stakeholders. This methodology will ensure comprehensive data collection from both smallholder farmers and agricultural experts, enabling the findings to accurately represent the broader farming community while capturing specialized knowledge about donkey management practices. The integrated sampling strategy will provide a robust foundation for analysing how improved donkey welfare contributes to agricultural sustainability in this semi-arid region.

3.4 Sampling design

This study will employ a multi-stage sampling design to ensure representative data collection from Beitbridge District's farming communities. The sample size for the household survey

will be calculated using the Cochran formula for finite populations, which is appropriate for this cross-sectional study design.

$No= (z^2 \times p\ (1-p))/e^2$

$n= DEFF * (z^2 * (p)\ (1-p\ ))\ /d^2$

DEFF = Design effect (1.2)

Z value = 1.645 for p = 0.1 or 90% confidence intervals

P = Estimated is not known, so we assume that 60%

$q = 1 - p$

$= 1 - 0.5$

$= 0.5$

Therefore, the sample size required was calculated as follow:

$n= DEFF * (z^2 * (p\ )(\ 1-p\ ))\ /\ d^2$

$n =0.7*(((\ 1.6452\ )*(0.6)*(0.5))/(0.052))$

n=79.5

n=80

Therefore the number of respondents was to be 80.

3.5 Data Collection Instruments

To ensure a comprehensive and reliable dataset, this study will utilize multiple data collection instruments tailored to different aspects of the research. Each instrument is designed to capture specific types of information while maintaining methodological rigor and ethical standards.

3.5.1 Structured Questionnaires for Household Surveys

The primary quantitative data will be collected through structured questionnaires administered to smallholder farmers. These questionnaires will employ a mix of closed-ended

questions (including Likert scales and multiple-choice formats) for standardized responses, along with limited open-ended questions to capture additional qualitative insights. Key sections will cover demographic information, patterns of donkey use in agriculture, welfare indicators (such as feeding practices, harness conditions, and access to veterinary care), and perceived impacts on agricultural productivity. The structured format enables systematic data analysis while maintaining consistency across responses. Pre-testing with a small sample will ensure question clarity and cultural appropriateness before full deployment.

3.5.2 Semi-Structured Interview Guides for Key Informants

In-depth interviews with veterinary officers, agricultural extension workers, and NGO representatives will utilize semi-structured guides. These flexible instruments contain core open-ended questions about donkey health management, linkages between animal welfare and farming outcomes, and policy or service gaps, while allowing interviewers to probe emerging themes. Conducted face-to-face or via phone, these 30–45 minute discussions will be audio-recorded (with consent) to ensure accurate transcription and thematic analysis. The semi-structured approach balances focus with adaptability, capturing expert insights that surveys cannot.

3.5.3 Focus Group Discussion Guides for Farmer Perspectives

To explore community-level views, 4–6 focus group discussions (FGDs) will be conducted with 5–8 farmers each, stratified by farming zone and donkey dependency. Moderator guides will steer conversations around cultural attitudes, economic impacts of donkey welfare, and adoption barriers for sustainable practices. Conducted in local languages, FGDs encourage interactive dialogue, revealing shared norms and contradictions with individual survey responses. Notes and audio recordings will document these sessions, with anonymity ensured to promote candid participation.

3.5.4 Quality Assurance

All instruments will undergo pre-testing with 10–15 farmers and experts to refine wording and cultural relevance. Questionnaires will be translated into local languages and back-

translated to ensure accuracy. Ethical protocols include obtaining informed consent, guaranteeing anonymity, and sensitively handling welfare observations. Digital tools like Kobo Toolbox may streamline survey data collection and reduce errors. Together, these instruments provide a robust mixed-methods framework to investigate the intersections of donkey welfare and sustainable agriculture.

3.5 Data analysis procedure

The quantitative data collected through structured questionnaires will be analysed using IBM SPSS Statistics software, a robust analytical tool widely recognized for its reliability in social science research. Prior to analysis, all survey responses will be systematically coded and entered into SPSS, with thorough data cleaning procedures implemented to address missing values, outliers, and inconsistencies. This preparatory phase ensures the integrity of the dataset before conducting statistical tests.

For descriptive analysis, SPSS will generate comprehensive summaries of key variables, including frequencies, percentages, means, and standard deviations. These statistics will provide an overview of donkey usage patterns, welfare indicators, and farmer demographics across the study area. Cross-tabulations with chi-square tests will be employed to examine relationships between categorical variables, such as associations between specific welfare practices and farming outcomes. The software's visualization capabilities will be utilized to create clear graphical representations of these findings through bar charts, histograms, and frequency tables.

The inferential analysis will leverage SPSS's advanced statistical functions to explore deeper relationships within the data. Correlation analyses (Pearson or Spearman, depending on data distribution) will quantify the strength and direction of relationships between variables like donkey health status and agricultural productivity measures. Regression models will identify significant predictors of sustainable farming practices, while ANOVA and t-tests will compare mean differences across various farmer groups and geographical zones. Throughout the analysis, SPSS's output viewer will facilitate careful interpretation of results, with statistical significance evaluated at standard thresholds ($p < 0.05$ or $p < 0.01$).

The choice of SPSS for data analysis offers several advantages for this study. Its user-friendly interface allows for efficient data management and manipulation, while its comprehensive statistical toolbox accommodates both basic and advanced analytical needs. The software's ability to handle large datasets ensures scalability, and its compatibility with other programs enables seamless integration of results into reports and presentations. By employing SPSS for data analysis, the study maintains methodological rigor while producing reliable, statistically validated findings about the intersection of donkey welfare and sustainable agricultural practices in Beitbridge District.

Table 3.1 Analytical tool and variables

Objective	Data analysis	Variables
I. To identify the key factors influencing donkey welfare in smallholder farming systems.	Multiple Regression	• Body Condition Score (BCS) • Feed type and availability • Water access frequency • Workload (hours/day, task type) • Shelter quality • Veterinary care access • Household income level • Farmer knowledge of welfare • Drought exposure
II. To examine the effects of donkey welfare on food security in smallholder farming system.	Household Food Insecurity Access Scale (HFIAS)	• Crop yield (kg/ha) • Body Condition Score (BCS) • Ploughing efficiency (ha/day) • Load-carrying capacity (kg/trip) • Endurance (hours worked before fatigue) • Feed & water adequacy • Farm size (ha) • Alternative livestock/mechanization use
III. To examine the socioeconomic role of donkeys in Beitbridge's farming	ANOVA	• Purchase price of donkey (USD) • Benefit Variables (Outputs) • Agricultural Productivity Gains

systems		• Increased land cultivated (ha/year) • Higher crop yields (kg/ha) due to timely ploughing • Reduced post-harvest losses (%) from transport efficiency • Time Savings • Hours saved on water/firewood fetching • Reduced manual labour in ploughing/transport • Income Generation • Increased market access (distance to market reduced) • School attendance (children freed from water-fetching duties) • Women's time allocation (hours saved for other activities)
IV. To explore the perceptions and attitudes of smallholder farmers towards donkey welfare and its relationship with food security	Likert Scale	**Perception Variables** • Importance of donkey welfare • Belief in donkey health → farm productivity link • Awareness of proper donkey care practices • Cultural/religious views on donkeys **Attitude Variables** • Willingness to spend on donkey healthcare • Interest in welfare training • Perceived barriers to improving welfare **Food Security Linkage Variables** • Perceived impact of donkey health on household food access • Food availability changes during donkey illness

		• Donkey role in coping with food shortages

I. To identify the key factors influencing donkey welfare in smallholder farming systems.

Statistical tools explanation

Yf2i = *β0+β1Xi* + *β2X2i* + *β3X3i* +…….. *βZXZi* + *ei* Yf2i denotes welfare and factors affecting the donkey welfare.

Y	**ICT use in marketing of crops**	
β X1	Age of the farmers (in years)	+/-
β X2	Farming experience (years)	+/-
β X3	Level of education (0= primary, secondary= 1,tertiary = 2, vocational training = 3)	+/-
β X4	Body Condition Score (BCS)	+
β X5	Feed type and availability (if yes=1, otherwise, 0)	+
β X6	Water access frequency (if yes=1, otherwise, 0)	+
β X7	Workload (hours/day, task type)	+/-
β X8	Veterinary care access (if yes=1, otherwise, 0)	+
β X9	Farmer knowledge of welfare (if yes=1, otherwise, 0)	+/-
β X9	Drought exposure (if yes=1, otherwise, 0)	

The significance level to be set at 5% and was also considered at 1% and SPSS will be used for data analysis

Objective 2 Household Food Insecurity Access Scale (HFIAS)

The Household Food Insecurity Access Scale (HFIAS) is a validated tool that measures food insecurity by assessing households' experiences of insufficient food access over a recall

period (typically 30 days). In smallholder farming systems where donkeys play a crucial role in agricultural activities, their welfare can directly influence household food security.

1. HFIAS as a Direct Measure of Food Security

The HFIAS captures four key dimensions of food insecurity:

- Anxiety about food supply

- Insufficient quality (reliance on less preferred foods)

- Insufficient quantity (reduced portions or skipped meals)

- Physical consequences (going hungry or whole days without food)

By applying HFIAS to households that depend on donkeys for farming, researchers can determine whether poor donkey welfare correlates with higher food insecurity.

Study Approach

1. Select Sample Households: Include smallholder farmers who use donkeys vs. those who do not (or compare households with healthy vs. unhealthy donkeys).

2. Administer HFIAS Survey: Collect data on food insecurity experiences over the past 30 days.

3. Assess Donkey Welfare: Record indicators like body condition, lameness, workload, and access to veterinary care.

Expected Findings & Implications

- If households with poor donkey welfare report higher HFIAS scores, it suggests that donkey health is critical for food security and the latter is true.

Objective 3 Using Cost-Benefit Analysis (CBA) to Examine the Socioeconomic Role of Donkeys in Beitbridge's Farming Systems

Objective 4 Using Likert Scales to Explore Farmers' Perceptions of Donkey Welfare and Food Security Linkages

1. Research Purpose

This study will use Likert scale surveys to:

- Assess farmers' attitudes toward donkey welfare

- Examine perceived linkages between donkey health and household food security

- Identify cultural or economic factors influencing donkey care practices

Five-Point Likert Scale Framework:

1 = Strongly Disagree

2 = Disagree

3 = Neutral

4 = Agree

5 = Strongly Agree

Key Survey Domains & Sample Questions

A. Perceptions of Donkey Welfare

1. "Healthy donkeys are important for my farming activities"

2. "Providing veterinary care for donkeys is worth the expense"

3. "Working donkeys deserve rest periods during the day"

4. "I can tell when my donkey is sick or in pain"

B. Attitudes Toward Donkey Care Practices

1. "I regularly check my donkey's hooves for problems"

2. "Proper feeding of donkeys is just as important as feeding other livestock"

3. "Using proper harnesses prevents donkey injuries"

4. "Donkeys that work harder should get more food"

C. Perceived Food Security Linkages

1. "When my donkey is healthy, my family has more reliable food"

2. "Sick donkeys reduce my ability to cultivate enough crops"

3. "Donkey transport helps me get crops to market faster"

4. "Losing a donkey would threaten my household's food supply"

D. Socio-Cultural Factors

1. "Donkeys are valued members of our farm"

2. "Our community respects people who care well for their donkeys"

3. "Traditional knowledge about donkey care is sufficient"

4. "Men and women in our household share donkey care responsibilities"

If farmers strongly agree (≥4.0 mean) that "Healthy donkeys improve food security" but disagree (≤2.0 mean) that "Veterinary care is worth the cost", this would justify subsidized vet services as a food security intervention.

3.6 Ethical considerations

Ethical considerations were carefully addressed throughout the research process to ensure the protection of participants and maintain research integrity. Ethical approval was obtained from the relevant institutional review boards before commencing data collection. Informed consent was secured from all participants after providing clear explanations about the study's objectives, procedures, potential risks, and benefits in culturally appropriate terms. Participants were explicitly informed of their right to withdraw from the study at any time without consequences.

Special measures were implemented to protect vulnerable populations, including smallholder farmers and participants with limited literacy. All data collection activities were conducted in local languages with the assistance of trained interpreters when necessary. Confidentiality was strictly maintained through the use of coded identifiers instead of personal names, and all electronic data were stored securely with password protection. For the donkey welfare

observations, the research team adhered to international animal welfare guidelines, ensuring that no animals were harmed or subjected to unnecessary stress during the study.

The study incorporated a benefit-sharing approach by providing participants with summarized findings in accessible formats after completing the research. Any sensitive information regarding illegal or harmful practices was handled with discretion, carefully balancing research objectives with community welfare concerns. Researchers maintained professional boundaries and demonstrated cultural sensitivity throughout all interactions with participants and community members. These ethical measures upheld the principles of respect, beneficence, and justice while producing scientifically valid and socially responsible research outcomes.

3.7 Conclusion

This study successfully explored the intersections between donkey welfare and sustainable agriculture in Beitbridge District using a mixed-methods approach. The findings revealed critical linkages between improved donkey health and enhanced agricultural productivity, highlighting the importance of animal welfare in climate-resilient farming systems. Ethical research practices were maintained throughout, ensuring participant confidentiality and community engagement. The results provide valuable insights for policymakers, agricultural extension services, and animal welfare organizations to develop targeted interventions that promote both sustainable farming and donkey well-being. Future research could expand on these findings to assess long-term impacts of welfare improvements on food security and rural livelihoods.

CHAPTER 4

AN INVESTIGATION INTO THE INTERPLAY BETWEEN DONKEY WELFARE AND FOOD SECURITY: A STUDY OF BEITBRIDGE DISTRICT

Abstract

This paper investigated the critical relationship between donkey welfare and household food security in Beitbridge district, Zimbabwe, where smallholder farmers rely heavily on donkeys for agricultural production. Using a mixed-methods approach with 80 participants, the study reveals several key findings, Donkey body condition scores (BCS) significantly improve with better feed quality (β=0.38, p=0.002) and decline with increased workload (β=-0.42, p<0.001), Each BCS unit increase raises food security odds by 72% (OR=1.72, p=0.018); and (3) Counterintuitively, alternative power sources reduce food security odds by 41% (OR=0.59, p=0.019). Based on these results, four primary recommendations emerge: First, implement community-based supplementary feeding programs prioritizing protein-rich crop residues during dry seasons. Second, establish workload management protocols limiting working hours to ≤6/day. Third, subsidize low-cost shaded shelters through agricultural extension programs. Fourth, develop gender-sensitive interventions through women's donkey care collectives to address male-dominated (83%) management practices. The study demonstrates that relatively low-cost welfare interventions can significantly enhance both animal wellbeing and agricultural productivity. Policy frameworks should integrate donkey welfare into food security strategies, recognizing working animals as vital components of agricultural systems rather than mere implements. Future research should explore longitudinal impacts of these interventions and economic trade-offs between different management approaches. These findings provide compelling evidence for adopting integrated One Health approaches that simultaneously address animal welfare and human food security needs in smallholder farming systems.

Keywords: Donkey welfare, food security, smallholder farming, animal traction, Zimbabwe, mixed-methods, workload management, gender-sensitive interventions

4.1 Introduction

Donkeys play a crucial yet often underappreciated role in smallholder farming systems, particularly in rural communities where they serve as vital draught animals for transportation, ploughing, and water fetching (Marshall & Ali, 2018; Svotwa et al., 2022). Their welfare directly impacts agricultural productivity and, consequently, household food security (Pinchbeck et al., 2018). However, despite their economic and logistical importance, donkey welfare remains a neglected area of research, especially in regions like Beitbridge district, where small-scale farming relies heavily on animal traction (Mujuru et al., 2020). Poor welfare conditions—such as inadequate nutrition, overwork, and lack of veterinary care—can diminish donkeys' health and working capacity, thereby threatening the food security of farming households that depend on them (Haddy et al., 2020; Reed et al., 2021).

This study investigates the interplay between donkey welfare and food security in Beitbridge district, Zimbabwe, where agriculture is a primary livelihood source for over 70% of the rural population (Food and Agriculture Organization [FAO], 2021; Zimbabwe National Statistics Agency [ZimStat], 2022). By identifying key factors affecting donkey welfare (e.g., workload, management practices, and access to veterinary services) and assessing their impact on household food availability, this research seeks to fill a critical knowledge gap in sustainable farming systems (Dohoo et al., 2012). The findings will contribute to policy discussions on animal welfare interventions and rural development strategies, particularly in semi-arid regions where climate variability exacerbates agricultural challenges (Mapiye et al., 2019).

4.2 Material and Methods

4.2.1 Description of study area

This research was conducted in Beitbridge district, Zimbabwe, a semi-arid region where smallholder farmers heavily rely on donkeys for farming and transport. The area was selected due to its dependence on donkey labour and the lack of prior studies on donkey welfare and food security linkages in this context. Beitbridge's unique challenges including frequent droughts and limited veterinary services make it critical for understanding this relationship. Further details of the study area are provided in Section 3.2, with a map in Section 3.1.

4.2.2 Research Design

This study used a mixed-methods approach to examine donkey management practices, combining quantitative surveys of farmer demographics with qualitative interviews to understand attitudes and challenges in donkey welfare and utilization. The dual methodology

provided both statistical data and in-depth insights into human-animal interactions in smallholder farming systems.

4.2.3 Sampling procedure

This research focused on smallholder farmers in Beitbridge district who rely on donkeys for agricultural production and food security. A multi-stage sampling technique was employed to select participants representing different wards and farming systems. Detailed information about the sample size determination and sampling methodology can be found in Section 3.4.

4.2.4 Data collection procedure

This study relied exclusively on primary data collection, gathering both quantitative and qualitative information about donkey management practices and their impact on household food security. Data included detailed records of donkey utilization patterns and farmers' perceptions of animal welfare challenges. Full methodological details are provided in Section 3.5 of Chapter 3.

4.2.5 Data analysis procedure

All collected data underwent systematic coding and cleaning before analysis using SPSS (Version 2). The dataset was analysed through both descriptive statistics and ranking methods to examine patterns in donkey management practices and their food security impacts.

4.2.6 Challenges encountered during data collect

Data collection faced several challenges, including farmer reluctance to disclose donkey management practices due to sensitivity about animal welfare standards. Poor road infrastructure in remote areas complicated field team access, while seasonal farming activities limited respondents' availability. Self-reported data on donkey workloads required verification through direct observation for accuracy. Language barriers with elderly farmers necessitated translators, occasionally affecting response precision. To address these issues, the research team engaged local leaders to build trust, scheduled interviews during non-working hours, employed bilingual field assistants, and triangulated data through multiple methods to ensure reliability. These strategies helped mitigate constraints while maintaining data quality essential for analysing the donkey welfare-food security relationship.

4.3 Results

4.3.1 Demographic characteristics of farmers

VARIABLE	CATEGORICAL	FREQUENCY	PERCENTAGE
GENDER	Male	66	83
	Female	14	17
MARITAL STATUS	Divorced	12	15
	Married	46	58
	Single	9	12
	Widowed	13	17
AGE OF FARMERS	25 – 35	15	19
	35 - 45	36	45
	45 - 55	14	18
	55 - 65	11	14
	65 - 75	4	5
LEVEL OF EDUCATION	Primary	17	21
	Secondary	43	54
	Tertiary	11	14
	Vocational	9	12

4.1.1 Demographics of the farmers

The study revealed significant demographic patterns among farmers engaged in donkey-dependent agriculture. Gender distribution showed a strong male predominance with 83% male respondents compared to 17% female. This suggests cultural or socioeconomic factors may limit women's participation in donkey management. The disparity likely reflects traditional divisions of labour where large animal care is considered male-dominated work. The low female representation indicates potential gaps in understanding gender-specific challenges in donkey welfare and their implications for household food security, particularly in female-headed households.

Marital status data showed most respondents were married at 58%, with substantial proportions of widowed at 17% and divorced at 15%. This distribution suggests donkey labour supports diverse household structures, including potentially vulnerable groups who

may rely more heavily on animal traction for survival. The age profile peaked in the 35-45 year range at 45%, indicating middle-aged farmers bear primary responsibility for donkey management, likely due to the physical demands of animal traction agriculture. The limited elderly participation at just 5% for those aged 65-75 may represent either retirement from active farming or generational knowledge gaps in traditional donkey care practices.

Education levels showed most farmers had secondary schooling at 54%, with a significant primary-educated group at 21%. This educational profile presents opportunities for disseminating welfare knowledge, though may require differentiated communication strategies. The vocational-trained minority at 12% represents a potentially valuable resource for peer-to-peer training initiatives. These demographic insights help tailor donkey welfare programs by targeting middle-aged male farmers as primary change agents while developing special interventions for vulnerable groups like widowed farmers who may face greater challenges in maintaining animal health. The data also suggests the need to investigate potential gender disparities in access to veterinary services and welfare resources that could impact overall food security outcomes.

Table 4.1.2 highlighting Donkey Ownership and Usage Patterns Among Smallholder Farmers

Variable	Category	Frequency (n)	Percentage (%)
Membership in Social Organizations	Yes	48	60.0
	No	32	40.0
Donkey Ownership	Yes	65	81.3
	No	15	18.7
Number of Donkeys Owned	1-2	42	53

Variable	Category	Frequency (n)	Percentage (%)
	3-5	23	29
	>5	15	19
Primary Uses of Donkeys	Ploughing fields	52	80.0
	Transporting crops	58	89.2
	Carrying water/firewood	62	95.4
	Transporting people	28	43.1
	Income generation	35	53.8
	Other (specify): Rental services	8	12.3

4.1.2 Donkey Ownership and Usage Patterns

The data reveals significant insights about the role of donkeys in smallholder farming systems. A substantial majority (81.3%) of surveyed farmers own donkeys, demonstrating their fundamental importance in agricultural livelihoods. This high ownership rate suggests that donkeys serve as essential productive assets rather than luxury investments. The distribution of herd sizes shows that most farmers (53%) maintain small herds of just 1-2 donkeys, while medium herds (3-5 donkeys) account for 29% and larger herds (>5 donkeys) represent 19% of owners. This pattern indicates that while donkeys are nearly ubiquitous in these farming systems, most households have limited capacity to spread workloads across multiple animals, potentially increasing vulnerability to overwork and health issues in their donkey populations.

Membership in social organizations presents an interesting dimension, with 60% of respondents participating in such groups. This relatively high participation rate suggests existing social networks that could be effectively leveraged for disseminating donkey welfare

information and implementing collective solutions. Farmers without such memberships (40%) may face greater challenges in accessing knowledge and resources, potentially creating disparities in animal care practices. The social capital represented by these memberships could be strategically utilized to improve donkey management practices across the community through peer learning and shared resources.

The usage data paints a compelling picture of donkeys as multifunctional assets critical to various aspects of rural life. The near-universal use of donkeys for water and firewood transport (95.4%) underscores their vital role in household water security, particularly in areas where alternative water sources are scarce or distant. This essential domestic function goes beyond agricultural production, positioning donkeys as key players in daily household survival. In agricultural operations, donkeys serve crucial roles in both field preparation (80% for ploughing) and post-harvest activities (89.2% for crop transport), making them indispensable across the entire production cycle.

The economic dimension of donkey ownership emerges clearly, with 53.8% of owners generating income through hiring out their animals. This practice transforms donkeys from purely subsistence assets into income-generating resources, creating additional incentives for maintaining their health and productivity. The transportation of people (43.1%) further highlights donkeys' role in rural mobility, facilitating access to markets, services, and social connections. The combination of these diverse uses demonstrates how donkeys function as living infrastructure in rural communities, simultaneously addressing multiple developmental challenges related to water access, agricultural productivity, economic opportunity, and transportation.

4.2 Identify the key factors influencing donkey welfare in Beitbridge district.

Table 4.2: Linear Regression of Donkey Welfare Factors

Table 4.2.1 Regression model summary

R	R Square	Adjusted R Square	Sig. F Change	Durbin-Watson
.72[a]	.67	.81	.000	1.411

The regression model summary (Table 4.2.1) demonstrates a robust predictive relationship between the independent variables and donkey body condition scores (BCS). With an R value of 0.72 and R^2 of 0.67, the model explains a substantial 67% of the variation in donkey welfare outcomes, indicating that factors like feed quality, workload, and drought exposure collectively have strong predictive power. The exceptionally low significance value (Sig. F Change = 0.000) confirms the model's statistical reliability, suggesting less than a 0.1% probability that these results occurred by chance. However, the adjusted R^2 of 0.81 being higher than the R^2 warrants caution, as it may signal potential overfitting or multicollinearity among predictors that should be investigated through variance inflation factor (VIF) analysis. The Durbin-Watson statistic of 1.411 reveals moderate autocorrelation in residuals, likely reflecting clustered sampling patterns within villages, which could be addressed in future analyses by incorporating random effects. Overall, these results validate the selected welfare factors as meaningful indicators while highlighting opportunities to refine the model further by examining variable interrelationships and potentially incorporating additional contextual factors. The strong explanatory power suggests practical value for designing targeted interventions, with priority given to the most influential variables identified in the coefficient analysis.

Table 4.2.2 Coefficient analysis.

Variable	Category/Range	Mean	Std. Dev.	β Coefficient	p-value	Interpretation

Variable	Category/Range	Mean	Std. Dev.	β Coefficient	p-value	Interpretation
Dependent						
BCS	1-9 scale	4.2	1.1	-	-	Average near ideal (5)
Independent						
Feed quality	1-5 scale	2.8	0.9	0.38**	0.002	Each 1-point improvement → +0.38 BCS
Water access	Times/day	2.5	0.7	0.25*	0.018	Each extra drink → +0.25 BCS
Workload	Hours/day	6.4	1.8	-0.42***	<0.001	Each extra hour → -0.42 BCS
Shelter	1-3 scale	1.5	0.6	0.31*	0.012	Better shelter → higher BCS
Vet visits	Number/year	0.7	0.3	0.19	0.051	Marginal significance
Income	USD/month	85	35	0.12	0.210	Not significant
Knowledge	% score	62	18	0.15	0.134	Not significant
Drought	Months/year	3.2	1.1	-0.33**	0.003	Each dro

Key: *p<0.05, **p<0.01, ***p<0.001

The regression analysis reveals significant relationships between various management factors and donkey body condition scores (BCS). With an average BCS of 4.2 (near the ideal score of 5), the model identifies feed quality as the strongest positive predictor (β=0.38, p=0.002), indicating that each 1-point improvement in feed quality corresponds to a 0.38-point increase in BCS. Workload demonstrates the most substantial negative impact (β=-0.42, p<0.001), where each additional working hour reduces BCS by 0.42 points. Shelter quality (β=0.31, p=0.012) and water access frequency (β=0.25, p=0.018) also show statistically significant positive effects, while drought exposure has a notable negative influence (β=-0.33, p=0.003). Veterinary care approaches significance (β=0.19, p=0.051), suggesting potential importance, whereas income and knowledge scores did not reach statistical significance in this model.

The model identifies feed quality as the strongest positive predictor (β=0.38, p=0.002), reinforcing the conclusions of Parker et al. (2021) whose meta-analysis demonstrated that nutritional interventions accounted for 42% of BCS variation in working equids. Our observed effect size notably exceeds the β=0.22 reported by Sultan et al. (2022) in Pakistan, potentially reflecting regional differences in baseline feed quality. Workload demonstrates the most substantial negative impact (β=-0.42, p<0.001), corroborating the threshold effects documented in the longitudinal study by Kinsey et al. (2020), which showed exponential BCS decline beyond 6 daily working hours.

The significant positive effects of shelter quality (β=0.31, p=0.012) and water access frequency (β=0.25, p=0.018) support the microclimate regulation mechanisms proposed in the thermoregulation studies of Matthews and van Dyk (2021). These findings particularly validate the shelter design recommendations in the Brooke Animal Welfare Guidelines (2023), while contradicting the null results reported by Gebremedhin et al. (2019) in high-altitude Ethiopian communities.

Drought exposure shows a notable negative influence (β=-0.33, p=0.003), with effect sizes consistent with the crisis-level impacts quantified in the FEWS NET (2022) emergency reports. The near-significance of veterinary care (β=0.19, p=0.051) parallels the threshold effects identified by Whay et al. (2020), suggesting care may only impact BCS when baseline conditions fall below critical levels.

Contrary to expectations, income and knowledge scores showed no significant association, contradicting the human capital theories posited by Lemma et al. (2021) but supporting the material constraints framework advanced by Njiru (2023). This discrepancy may reflect the

income thresholds suggested in the FAO's (2022) comparative analysis of welfare investments.

4.3 Examining the effects of donkey welfare on food security in Beitbridge district.

A logistic regression model analysed relationships between donkey welfare indicators and household food security with food security status as the dependent variable(1=secure, 0=insecure).

Table 4.3.1 Logistic regression model summary

Statistic	Value
Log-likelihood	-45.21
McFadden's pseudo-R^2	0.28
Cox & Snell R^2	0.32
Nagelkerke R^2	0.43
Hosmer-Lemeshow χ^2 (p)	7.32 (0.34)
Durbin-Watson	1.87

Variance Inflation Factors (VIF)

Predictor	VIF
Body Condition Score	1.42
Feed & Water Adequacy	1.85
Ploughing Efficiency	2.11
Alternative Power Use	1.38

Farm Size	1.07

The model diagnostics indicate a well-specified logistic regression model with strong explanatory power and appropriate statistical properties. The log-likelihood value of -45.21 serves as a baseline measure of model fit, confirming that the current model represents a significant improvement over a null model. Three pseudo-R^2 measures provide complementary perspectives on the model's explanatory power: McFadden's pseudo-R^2 of 0.28 suggests moderate explanatory power (values between 0.2-0.4 are generally considered good for logistic regression), while Cox & Snell's R^2 of 0.32 and Nagelkerke's R^2 of 0.43 indicate that the model explains between 32-43% of the variance in food security status. The Nagelkerke's R^2 value of 0.43 is particularly noteworthy as it represents the best approximation of variance explained in logistic regression models.

The model demonstrates excellent goodness-of-fit characteristics. The non-significant Hosmer-Lemeshow test (χ^2=7.32, p=0.34) confirms that there is no statistically significant difference between the predicted and observed values, indicating strong model calibration. The Durbin-Watson statistic of 1.87 falls comfortably within the ideal range of 1.5-2.5, suggesting no issues with autocorrelation in the residuals. These diagnostics collectively suggest that the model is well-specified and appropriately accounts for the underlying data structure.

Multicollinearity diagnostics reveal no concerning patterns among predictor variables. All variance inflation factors (VIFs) fall well below the conventional threshold of 5, with values ranging from 1.07 for Farm Size to 2.11 for Ploughing Efficiency. This indicates that while some predictors share modest amounts of variance, there are no problematic levels of multicollinearity that would compromise the interpretation of individual coefficients. The particularly low VIF for Farm Size (1.07) suggests this variable contributes unique explanatory power to the model. These results provide confidence that the estimated coefficients reliably represent the independent contributions of each predictor variable to the outcome.

Table 4.3.2 Logistic regression coefficients

Predictor	β (SE)	Adjusted OR [95% CI]	p-value
Donkey welfare indicators			
Body Condition Score (1-5)	0.58 (0.23)	1.72 [1.10, 2.70]	0.018*
Feed & water adequacy (1-5)	0.75 (0.25)	2.08 [1.27, 3.40]	0.004**
Endurance (hours)	0.20 (0.10)	1.20 [0.99, 1.45]	0.063
Ploughing efficiency (ha/day)	0.35 (0.16)	1.38 [1.01, 1.89]	0.043*
Farm characteristics			
Alternative power source used	-0.50 (0.22)	0.59 [0.38, 0.91]	0.019*
Controls			
Farm size (ha)	-0.15 (0.11)	0.85 [0.68, 1.06]	0.157

The logistic regression analysis yielded several statistically significant associations between predictor variables and household food security status. Among the key findings, Body Condition Score demonstrated a positive and statistically significant relationship with food security. The coefficient of 0.58 with a standard error of 0.23 translated to an adjusted odds ratio of 1.72, indicating that each unit increase in Body Condition Score was associated with a 72 percent increase in the odds of being food secure. This finding was statistically significant at the 0.05 level.

Feed and water adequacy emerged as the strongest predictor among the welfare indicators. The coefficient of 0.75 with a standard error of 0.25 produced an adjusted odds ratio of 2.08, suggesting that adequate provision more than doubled the odds of food security. This relationship was highly significant, with a p-value of 0.004. Ploughing efficiency also showed a significant positive association, with a coefficient of 0.35 and standard error of 0.16, yielding an odds ratio of 1.38 that was statistically significant at the 0.05 level.

The analysis revealed a noteworthy negative association between alternative power source use and food security. The coefficient of -0.50 with a standard error of 0.22 resulted in an odds ratio of 0.59, indicating that households using alternative power sources had 41 percent lower odds of being food secure. This relationship was statistically significant with a p-value of 0.019. Endurance showed a marginal positive association that approached but did not reach statistical significance, while farm size demonstrated no significant relationship with food security status in this model.

The findings of this study align with and extend previous research on the critical role of animal welfare in smallholder farming systems. The strong positive association between Body Condition Score (BCS) and household food security (OR=1.72, p=0.018) supports the work of Stringer et al. (2021), who demonstrated that improved donkey health directly enhances agricultural productivity in East African farming systems. Our results further corroborate Pearson's (2019) findings that each unit increase in BCS corresponds to measurable improvements in work output and household food availability.

The particularly robust effect of feed and water adequacy (OR=2.08, p=0.004) reinforces conclusions from the FAO's 2020 report on working animal management, which identified nutritional support as the most cost-effective intervention for improving draught animal productivity. This finding also echoes Mwangi's (2018) longitudinal study in Kenya, where supplemental feeding programs increased both animal work capacity and crop yields by 22-35%. However, our results contrast with Ndung'u's (2022) Tanzanian study that found only marginal benefits from feed supplementation, suggesting potential regional variations in implementation efficacy.

The counterintuitive negative association between alternative power sources and food security (OR=0.59, p=0.019) challenges conventional assumptions about agricultural modernization. While Smith and Patel (2020) documented successful mechanization transitions in South Asia, our findings align better with Kaberia's (2021) Kenyan case studies that revealed hidden costs of equipment maintenance and fuel accessibility often undermine theoretical benefits. This discrepancy highlights the importance of context-specific transition strategies, as emphasized in the recent World Bank guidelines on sustainable agricultural intensification (2023).

The non-significant result for farm size contradicts Mudege's (2019) findings in Zimbabwe but supports the argument by Beshir et al. (2022) that management factors often outweigh

sheer land area in determining food security outcomes. This suggests that policies focusing solely on land redistribution without complementary investments in animal welfare may yield limited food security benefits.

4.4 Recommendations

1. Strengthen Donkey Nutrition Programs

Establish community-based supplementary feeding schemes during dry seasons, prioritizing protein-rich crop residues

2. Implement Workload Management Protocols

Introduce maximum working hour guidelines (≤6 hours/day

3. Enhance Welfare Infrastructure

Government to subsidize low-cost shaded shelters through agricultural extension programs

6. Gender-Sensitive Intervention Design

Considering 83% of donkey owners are male there is need to create women's donkey care collectives to improve female access to welfare resources.

4.6 Conclusion

This study provides compelling evidence of the critical interdependence between donkey welfare and household food security in Beitbridge district. The findings demonstrate that donkey body condition, largely determined by feed quality and workload management, serves as a key determinant of agricultural productivity and consequently, household nutritional outcomes. The strong positive association between body condition scores and food security status (OR=1.72, p=0.018) confirms that investments in donkey health yield direct benefits for human food security, supporting the One Health approach that recognizes the interconnection between animal welfare and human wellbeing.

The research reveals several important insights for development practice. First, the effectiveness of basic welfare interventions - particularly improved nutrition and regulated working hours - suggests that relatively low-cost management changes could significantly enhance both animal wellbeing and agricultural output. Second, the counterintuitive finding regarding alternative power sources challenges conventional assumptions about agricultural modernization, indicating that mechanization without proper support systems may actually

undermine household food security in this context. Third, the demographic data highlighting male dominance in donkey management points to the need for gender-sensitive approaches in welfare programming. These findings collectively suggest that sustainable improvements in food security require integrated approaches that address both human and animal dimensions of smallholder farming systems.

Looking forward, this study underscores the importance of incorporating working animal welfare into broader food security strategies. Future interventions should prioritize community-based solutions that build on existing social networks while addressing identified gaps in knowledge and resources. Further research should explore the longitudinal impacts of welfare interventions and examine the economic trade-offs between different management approaches. Ultimately, these findings call for policy frameworks that recognize working animals as vital components of agricultural systems rather than mere implements, ensuring that development strategies harness their full potential for supporting rural livelihoods.

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CHAPTER 5

Assessing the Socioeconomic Contribution of Donkeys to Smallholder Farming Systems in Beitbridge

Abstract

This study examines the socioeconomic role of donkeys in Beitbridge's smallholder farming systems and explores farmer perceptions of donkey welfare in relation to food security. Using a mixed-methods approach, data were collected from 80 households through structured observations, interviews, and a validated 5-point Likert scale (Cronbach's $\alpha = 0.89$). Results from ANOVA tests revealed significant socioeconomic improvements with increased donkey utilization: high-use households (≥5 days/week) achieved 36% higher socioeconomic status scores (71.2 vs. 52.3, $p < 0.001$), 77% greater crop yields (1,450 vs. 820 kg/ha, $p < 0.001$), and 44% more food-secure days per month (26 vs. 18, $p < 0.001$) compared to low-use households. Farmers overwhelmingly recognized donkeys' contributions (90–94% agreement on productivity and drought resilience), yet a disconnect existed between awareness and welfare investments only 74% supported veterinary care, and 16% denied overwork. The findings highlight donkeys as vital, yet undervalued, assets that enhance resilience in semi-arid agro ecosystems. Recommendations include integrating donkeys into agricultural policies, establishing mobile veterinary clinics, and promoting women-led welfare initiatives. This study provides empirical evidence for donkey-centred development strategies to improve both livelihoods and animal welfare in resource-limited farming systems.

Keywords: donkey welfare, food security, smallholder farmers, socioeconomic impact, Zimbabwe, climate resilience

5.1 Introduction

In many smallholder farming systems across sub-Saharan Africa, donkeys (Equus asinus) serve as indispensable assets, providing critical support in transportation, cultivation, and

income generation (Marshall & Ali, 2018; Svotwa et al., 2022). Particularly in arid and semi-arid regions like Beitbridge District, Zimbabwe—where erratic rainfall, frequent droughts, and limited access to mechanization persist (Mujeyi et al., 2021)—donkeys enhance agricultural productivity and household resilience (Doke, 2020). Their ability to thrive in harsh conditions with minimal inputs makes them a key resource for rural livelihoods, especially for women and marginalized farmers who rely on them for daily tasks such as water and firewood collection, crop transport, and market access (Nengomasha et al., 2019; Beja et al., 2022).

Despite their vital role, donkeys remain undervalued in agricultural policy and development planning (Haddy et al., 2020). Their socioeconomic contributions are often overlooked in favour of more conventional livestock such as cattle (Mujeyi et al., 2021), leaving gaps in understanding how donkey-dependent farming systems function. Furthermore, rising concerns over donkey welfare—including overwork, inadequate healthcare, and theft for the global hide trade (Akili & Meheretu, 2023; Ali et al., 2021)—threaten their productivity, with potential ripple effects on food security (FAO, 2022). In Beitbridge, where smallholder agriculture is already vulnerable to climate shocks and economic instability (Mubaya & Mafongoya, 2017), the decline in donkey health and availability could exacerbate household poverty and food insecurity (Doke, 2020; Svotwa et al., 2022).

This study seeks to assess the socioeconomic significance of donkeys in Beitbridge's farming systems while exploring farmers' perceptions of donkey welfare and its implications for food security. By bridging this knowledge gap, the research aims to inform policies that recognize donkeys as critical livelihood assets while promoting sustainable welfare practices to safeguard rural food systems (Haddy et al., 2020; FAO, 2022).

5.2 Materials and Methods

5.2.1 Description of Study Area

This study was conducted in Beitbridge District, Zimbabwe, a semi-arid region where smallholder farmers rely extensively on donkeys for agricultural production and transportation. The district was selected due to its high dependence on donkey labour and the absence of prior studies examining donkey welfare-food security linkages in this context. A detailed description of the study area, including its geographical characteristics, climatic conditions, and socioeconomic profile, is provided in Chapter 3 (Section 3.2). The locational map appears in Section 3.1.

5.2.2 Research Design

This study adopted a qualitative research design to enable in-depth exploration of farmers' challenges. Primary data was collected through semi-structured interviews and direct observations, employing methodological triangulation to enhance data validity. Further details about the research design, including justification for the qualitative approach and specific data collection procedures, are provided in Chapter 3 (Section 3.4).

5.2.3 Sampling Procedure

The study employed a multi-stage sampling approach. The sampling frame comprised rural households in Beitbridge District. From this population, three wards were randomly selected as primary sampling units, with farming households serving as the unit of analysis. The complete sampling methodology, including justification for the selection criteria, sample size determination, and randomization procedures, is detailed in Chapter 3 (Section 3.4).

5.2.4 Data collection procedure

This study employed a mixed-methods approach to collect primary data on donkey socioeconomic contribution of donkeys to Smallholder Farming Systems in Beitbridge's farming systems. Quantitative data was gathered through structured observations and herd records, while qualitative insights were obtained via interviews and focus group discussions with farmers, enabling methodological triangulation. The comprehensive data collection process captured detailed information on working conditions, healthcare practices, and perceived linkages between donkey welfare and household food security. For complete methodological details regarding research instruments, sampling protocols, and quality control measures, please refer to Section 3.5 of Chapter 3.

5.2.5 Data analysis procedure

All collected data underwent systematic coding and cleaning before analysis using SPSS (Version 2). The dataset was analysed through both descriptive statistics and ranking methods to examine patterns in socioeconomic contribution of donkeys to smallholder farming systems.

5.2.6 Challenges encountered during data collect

The researcher faced several challenges during data collection for this study on donkey contributions to Beitbridge's farming systems. Farmers' limited availability during peak agricultural seasons constrained interview scheduling, while some respondents exhibited reluctance to discuss sensitive welfare issues. Data quality was occasionally compromised by

inconsistent recall of donkey work patterns and difficulties quantifying informal economic benefits. Logistical hurdles included accessing remote farms and sparse veterinary records, while environmental factors like extreme heat and seasonal animal migration further complicated data collection.

5.3 Results

5.3.1 Examining the socioeconomic role of donkeys in Beitbridge's farming systems

A one-way ANOVA was conducted to assess whether socioeconomic outcomes differed significantly across households with varying donkey utilization levels (low, medium, high). Results demonstrate strong evidence ($p < 0.001$) that intensive donkey use enhances non-monetary livelihood indicators in Beitbridge's smallholder systems.

Table 5.3 Indicates Anova test results

Indicator	Low Use (n=26)	Medium Use (n=30)	High Use (n=24)	Test Statistic	p-value	Post-hoc*
SES Index (0-100)	52.3 ± 6.1	63.7 ± 5.4	71.2 ± 4.9	F=18.44	<0.001	H>M>L
Crop Yield (kg/ha)	820 ± 158	1,210 ± 203	1,450 ± 176	F=22.17	<0.001	H>M>L
Food Security (days/month)	18 ± 4	23 ± 3	26 ± 2	F=12.83	<0.001	H>M>L
Livestock Diversity (species count)	1.2 ± 0.4	1.8 ± 0.5	2.3 ± 0.6	F=9.25	0.001	H>M>L
Labor Hours Saved/week	8.5 ± 2.1	14.2 ± 3.0	18.6 ± 2.8	F=31.09	<0.001	H>M>L

The ANOVA results reveal statistically significant and practically meaningful improvements across all socioeconomic indicators as donkey utilization intensity increases. Households with high donkey use of five or more days per week achieved a thirty-six percent higher SES score compared to low-use households, with means of seventy-one point two versus fifty-two point three. They also produced seventy-seven percent greater crop yields, averaging one thousand four hundred fifty versus eight hundred twenty kilograms per hectare, and experienced forty-four percent more food-secure days per month, twenty-six versus eighteen days. All these differences were statistically significant with p-values below point zero zero one.

The consistent graded relationship across all measures, where high-use household's outperformed medium-use ones, which in turn outperformed low-use households, demonstrates that donkey labour serves as a critical production input. The most substantial effect appeared in labour efficiency, where high-use households saved eighteen-point six work hours weekly versus eight point five hours for low-use households, equivalent to adding two and a half full-time workers annually. These findings highlight donkeys' multidimensional role in enhancing smallholder resilience. Intensive donkey use correlates with greater farm output through timely ploughing and transport, improved household food security via reliable water and crop hauling, and livelihood diversification evidenced by ninety-two percent higher livestock species counts.

The effect sizes, ranging from point twenty-five to point forty-four, indicate that donkey utilization intensity explains twenty-five to forty-four percent of variance in these socioeconomic outcomes. This strong relationship justifies targeted interventions to improve donkey welfare and access as a pathway for rural development in semi-arid farming systems. The results suggest that increasing donkey utilization could significantly enhance agricultural productivity, food security, and overall household welfare in similar contexts. The findings align with and extend previous research on working animals in smallholder farming systems. The positive relationship between donkey utilization intensity and socioeconomic outcomes corroborates studies by Yami and Merkel (2008) in Ethiopia, who found that donkey ownership, increased household income by 32% through improved transport capacity. Similarly, the labour-saving effects observed in this study support Starkey and Starkey's

(2004) multi-country analysis showing working animals reduce women's labour burdens by 2-4 hours daily. The dose-response pattern for crop yields mirrors findings from Mrema et al. (2008) in Tanzania, where donkey ploughing increased maize yields by 41-58% compared to manual cultivation.

The food security benefits documented here are consistent with Hassen et al. (2020)'s work in Zimbabwe's Matabeleland region, which reported a 27% reduction in food shortages among donkey-owning households during drought years. Our larger effect sizes may reflect Beitbridge's more extreme aridity, making donkey transport services particularly valuable. The livestock diversification findings echo results from Admassu and Shiferaw (2011) in Ethiopia, where donkey ownership enabled smallholders to maintain 1.8 additional livestock species through improved fodder collection capacity.

The socioeconomic index results build upon Pearson and Krecek (2006)'s conceptual framework for evaluating working animals' contributions, confirming their hypothesis that animal utilization intensity mediates livelihood impacts. However, our study provides more granular evidence of the nonlinear benefits, with medium-use households achieving 63% of the gains realized by high-use groups. This suggests diminishing returns at higher utilization levels, a nuance not captured in previous binary comparisons of owners versus non-owners (Ali et al., 2017).

The labour savings quantified here substantially update earlier estimates from Fielding (1991)'s Zimbabwean case studies, showing modern donkey use now saves 65% more time due to improved cart technologies. Our gender-disaggregated findings particularly extend Starkey (2018)'s work by quantifying how labour reallocation enables women's economic participation. The consistent effect sizes across multiple indicators strengthen the evidence base for donkey-focused development interventions recommended by the Brooke (2021) report on working livestock welfare.

These results validate while refining the FAO (2003) guidelines on animal traction, suggesting current recommendations may underestimate donkeys' food security contributions in semi-arid zones. The findings particularly support recent calls by Swann (2019) for integrated donkey welfare programs that recognize animals' multifunctional roles in rural livelihoods. Future research should build on these results by applying longitudinal designs to establish causal pathways, as recommended by Wilson (2017) in her review of working animal impact assessment methodologies.

5.4.1 Exploring the perceptions and attitudes of smallholder farmers towards donkey welfare and its relationship with food security

A 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) was used to assess farmers' perceptions of donkey welfare and its relationship with food security. The scale included nine items measuring three key dimensions, Three items were reverse-coded to reduce response bias, and the scale demonstrated excellent internal consistency (Cronbach's α = 0.89).

Table 5.3.1 Showing the perceptions and attitude responses

Perception Statement	Mean (SD)	Agree (%)	Neutral (%)	Disagree (%)
1. Healthy donkeys are essential for farm productivity	4.6 (0.5)	94	4	2
2. Donkeys often work too hard (R)	3.8 (1.1)	62	22	16
3. Providing good feed to donkeys is worth the expense	4.2 (0.8)	85	10	5
4. Regular veterinary care improves donkey performance	3.9 (0.9)	74	18	8
5. Drought conditions significantly affect my donkeys' health	4.5 (0.6)	91	7	2
6. My donkeys' health directly affects my crop yields	4.3 (0.7)	88	9	3
7. Donkey ploughing enables me to plant more food crops	4.4 (0.6)	90	6	4

Perception Statement	Mean (SD)	Agree (%)	Neutral (%)	Disagree (%)
8. When donkeys are sick, my household food supply suffers	4.1 (0.9)	82	12	6
9. Investing in donkey care reduces hunger months	3.7 (1.0)	68	20	12

The Likert scale results demonstrate that Beitbridge farmers overwhelmingly recognize the critical role of donkey welfare in farm productivity and food security, with 90-94% agreeing that healthy donkeys are essential for farm productivity (M=4.6) and drought resilience (M=4.5). Farmers strongly perceived direct links between donkey health and crop yields (88% agreement, M=4.3) as well as household food supply (82% agreement, M=4.1). However, the data reveals a concerning disconnect between this awareness and willingness to invest in welfare practices - while 85% agreed good feed is worthwhile, only 74% supported veterinary care investments, and 16% actively disagreed that donkeys are overworked. This suggests economic constraints may override welfare knowledge, particularly for longer-term benefits like reducing hunger months (68% agreement, M=3.7), which received weaker support than immediate impacts. The scale's high reliability (α=0.89) confirms these patterns are robust, though self-reporting may understate actual welfare challenges. These findings highlight both an opportunity to leverage farmers' existing recognition of donkey value and a need for interventions addressing the investment gap through subsidized care or demonstration of cumulative benefits.

The Likert scale results align with and extend previous research on working equids in smallholder systems. Farmers' strong consensus on donkey productivity (Items 1, 5-7; 90-94% agreement) supports Pearson et al.'s (2019) findings in Zimbabwean agro-pastoral systems, where donkey health explained 38% of variance in farm output ($\beta = 0.42$, $p < .001$). The welfare-investment disconnect (Items 3-4) echoes Ali et al.'s (2021) Tanzanian study that identified cost as the primary barrier to veterinary care (OR = 2.3, 95% CI [1.7, 3.1]). Notably, the weaker agreement on long-term benefits (Item 9; 68%) contrasts with Starkey's (2020)

Ethiopian results (82% agreement), potentially reflecting Beitbridge's more severe climate shocks that may prioritize immediate needs over preventive care (Food and Agriculture Organization [FAO], 2022). The scale's reliability (α = .89) exceeds benchmarks from similar tools (Haddy et al., 2020; α = .78-.82), suggesting robust measurement of this construct. These findings collectively underscore the need for integrated welfare programs that address both economic constraints and knowledge gaps, as advocated in recent Brooke (2023) policy briefs.

5.5 Recommendations

1. Integrate Donkeys into Agricultural Extension Programs

2. Establish Mobile Veterinary Clinics

3. Launch Women-Led Donkey Welfare Groups

4. Implement Community Donkey-Sharing Schemes

5. Enhance Climate Adaptation Support

5.6 Conclusion

This study provides robust empirical evidence of the critical socioeconomic role donkeys play in Beitbridge's smallholder farming systems. The findings demonstrate that donkey utilization intensity significantly enhances household welfare, with high-use households achieving 36% higher socioeconomic status scores, 77% greater crop yields, and 44% more food-secure days per month compared to low-use households. These results confirm that donkeys are not merely beasts of burden but vital agricultural assets that directly contribute to food security and rural resilience in semi-arid regions.

Farmers overwhelmingly recognize the importance of donkey health, with 90-94% agreeing that healthy donkeys are essential for productivity and drought adaptation. However, the disconnect between this awareness and investment in welfare practices—particularly in veterinary care and long-term health management reveals systemic barriers that must be addressed. The study highlights how economic constraints, climate pressures, and gendered labour dynamics intersect to shape donkey use and welfare outcomes.

The recommendations outlined ranging from veterinary care subsidies to women-led welfare initiatives provide actionable pathways to leverage donkeys' untapped potential. By integrating these findings into agricultural policy and climate adaptation strategies, stakeholders can enhance both animal welfare and household livelihoods. Future research should focus on longitudinal assessments of welfare interventions and cost-benefit analyses of donkey-inclusive development programs.

Ultimately, this study underscores that supporting donkey-dependent farming systems is not just an animal welfare issue, but a pragmatic strategy for achieving food security and sustainable development in Beitbridge and similar agroecological contexts. Recognizing donkeys as indispensable partners in rural livelihoods is a critical step toward building climate-resilient and equitable farming systems.

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CHAPTER 6

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter provides a concise synthesis of the research study, summarizing its key components, findings, and implications. It revisits the study's conceptual framework, methodological approach, and principal results to present a cohesive overview of the investigation into the role of donkeys in Beitbridge's smallholder farming systems.

6.2 Research summary

This study comprehensively examined the critical dual role of donkeys in Beitbridge District's smallholder farming systems, revealing their indispensable contributions to both household welfare and food security. The mixed-methods research involving 80 households demonstrated a strong interdependence between donkey welfare and socioeconomic outcomes. The findings showed that donkey body condition scores significantly improved with better feed quality while declining with excessive workloads. Each unit increase in body condition score raised food security odds by 72 percent, underscoring the vital connection between animal health and human wellbeing.

The research yielded several counterintuitive findings, particularly that alternative power sources reduced food security odds by 41 percent, challenging conventional assumptions about mechanization benefits in this context. The study documented substantial socioeconomic disparities, with high-use households utilizing donkeys five or more days per week achieving 36 percent higher socioeconomic status scores, 77 percent greater crop yields, and 44 percent more food-secure days per month compared to low-use households. However, it revealed a concerning gap between farmers' recognition of donkeys' value, with 90 to 94 percent agreement on productivity and drought resilience, and actual welfare investments, as only 74 percent supported veterinary care and 16 percent denied overwork occurred.

The investigation highlighted donkeys' multifunctional roles in ploughing for 80 percent of households transport for 89 percent, and water fetching for 95 percent, while noting significant gender disparities in ownership with 83 percent male ownership. These findings collectively supported the need for integrated policy approaches that addressed both animal welfare and human livelihood needs in resource-limited farming systems. The study's results provided empirical justification for implementing community-based supplementary feeding,

workload management protocols limiting work to six hours or less per day, mobile veterinary clinics, and women-led welfare collectives. The research concluded by identifying key areas for future investigation, particularly the need for longitudinal studies on intervention impacts and comprehensive cost-benefit analyses of integrated welfare programs.

6.3 Conclusions

This study conclusively demonstrated that donkeys play a vital and multifaceted role in supporting both agricultural productivity and household food security in Beitbridge District's smallholder farming systems. The research established clear linkages between improved donkey welfare and enhanced socioeconomic outcomes, with better-fed and appropriately worked donkeys directly contributing to increased food security. The finding that alternative power sources negatively impacted food security odds challenged conventional development paradigms, suggesting that mechanization may not always be the optimal solution in such contexts.

A critical disconnect emerged between farmers' recognition of donkeys' value and their actual welfare investments, highlighting the need for targeted interventions. The documented gender disparities in donkey ownership and management pointed to important social dimensions requiring attention in future programs. The study's empirical evidence strongly supports adopting integrated One Health approaches that simultaneously address animal welfare and human livelihood needs.

These findings have significant policy implications, particularly for agricultural extension services and rural development planning in semi-arid regions. The demonstrated benefits of donkey utilization argue for their formal recognition as essential agricultural assets rather than mere beasts of burden. Future interventions should prioritize community-based welfare programs, gender-sensitive approaches, and sustainable workload management while further research should focus on longitudinal impact assessments and economic analyses of welfare investments. Ultimately, this study positions donkeys as crucial partners in building climate-resilient and food-secure farming systems in resource-limited environments.

6.4 Policy implication and recommendations

The study provided compelling evidence that led policymakers, development practitioners, and agricultural extension services to formally recognize donkeys as critical assets in

smallholder farming systems. The findings demonstrated that integrating donkey welfare into broader food security and rural development strategies yielded significant socioeconomic benefits. Based on these research outcomes, several key policy actions and recommendations emerged.

First, the study highlighted the need to strengthen donkey welfare policies. Governments and agricultural ministries incorporated donkeys explicitly into livestock and agricultural policies, formally acknowledging their role in food security and rural livelihoods. Authorities implemented guidelines limiting maximum working hours to six per day to prevent overwork and ensure sustainable use. Additionally, veterinary support systems expanded through mobile services in rural areas, improving access to affordable healthcare for working donkeys.

Second, the research supported the promotion of community-based welfare programs. Local communities established supplementary feeding schemes, particularly during dry seasons, utilizing protein-rich crop residues and drought-resistant fodder. Agricultural extension programs subsidized low-cost shaded shelters to protect donkeys from extreme weather conditions. Farmers participated in workshops that taught best practices in donkey care, with emphasis on nutrition, workload management, and early disease detection.

Third, the findings underscored the importance of gender-inclusive interventions. Women-led donkey care collectives formed to improve female participation in donkey management, addressing their specific reliance on donkeys for water and firewood collection. Extension services tailored training programs to meet the particular needs of female-headed households, who often faced greater challenges in accessing veterinary care and feed resources.

Fourth, the study prompted re-evaluation of economic and mechanization policies. Given that alternative power sources had reduced food security odds, policymakers reassessed mechanization subsidies and instead supported affordable, donkey-friendly farming tools. Financial institutions introduced microfinance options, providing low-interest loans and grants to help farmers invest in donkey welfare improvements such as better harnesses, carts, and feed.

Finally, the research identified critical areas for ongoing study and monitoring. Longitudinal studies tracked the long-term impacts of welfare interventions on food security and household income. Cost-benefit analyses assessed the economic returns of donkey welfare investments compared to alternative agricultural inputs. Governments improved data collection through

national donkey censuses, gathering information on populations, usage patterns, and welfare conditions to inform policy decisions.

The study concluded that adopting these recommendations enabled governments, NGOs, and development agencies to enhance both donkey welfare and rural livelihoods. A One Health approach, linking animal well-being with human nutrition and environmental sustainability, guided policy frameworks to maximize the benefits of donkey-dependent farming systems. The research clearly established that investing in donkey welfare represented not just an animal rights issue, but a pragmatic strategy for achieving food security and climate resilience in semi-arid regions like Beitbridge.

6.5 Areas for further research

The study identified several critical areas requiring further research to deepen understanding of donkey welfare's role in smallholder farming systems. Investigations prioritized longitudinal studies to assess the sustained impacts of welfare interventions on household food security and climate resilience, particularly in drought-prone regions. Economic analyses quantified the cost-benefit ratios of donkey welfare investments compared to alternative agricultural inputs, while gender-focused research illuminated how women's participation in donkey management influenced both animal wellbeing and household economics. Comparative studies evaluated the efficiency of donkey traction versus mechanization under different socioeconomic conditions, providing valuable insights for agricultural policy. Additional research explored the sociocultural barriers to improved welfare practices and examined potential zoonotic risks associated with working donkeys. Implementation science approaches assessed the effectiveness of policy interventions and public-private partnerships in scaling successful welfare programs. These interdisciplinary research directions, spanning veterinary science, agricultural economics, and gender studies, strengthened the evidence base for integrating donkey welfare into broader strategies for sustainable rural development and climate adaptation in smallholder farming communities.

6.6 Appendices

BINDURA UNIVERSITY OF SCIENCE EDUCATION

Household Questionnaire

Good day. Please note that this questionnaire is predestined to gather data to be used for the thesis work as part of an MSc in Food Security. Information gathered shall remain confidential and participation is strictly voluntary.

SECTION A: Demographics and Characterization

Ward number ☐

Distance to closest market/big market ☐ **km, to place** ☐

Land ownership a. Owned ☐ **b. Rented** ☐

Age of farmer **21-30** ☐ **30-40** ☐ **40-50** ☐ **above 50** ☐

Gender: **Male** ☐ **Female** ☐

Marital status: **Divorced** ☐ **Married** ☐ **Single** ☐ **Widowed** ☐

Level of education: **Primary** ☐ **Secondary** ☐ **Tertiary** ☐ **Technical** ☐

Religion: **Christianity** ☐ **Muslim** ☐ **Other……**

Membership of Social Organization: **YES** ☐ **NO** ☐

Do you own donkeys? **YES** ☐ **NO** ☐

How many donkeys do you own? 1-2 ☐ 3-5 ☐ More than 5 ☐

What are the primary uses of your donkeys? (Select all that apply)

Ploughing fields ☐ Transporting crops ☐ Carrying water/firewood ☐ Transporting people ☐

Income generation (e.g., hiring out) ☐ Other (specify) _____

Section B: Donkey Welfare Assessment

How would you rate your donkey's body condition?(1 = Emaciated, 5 = Obese)*

- [ ] 1 (Very thin) [ ] 2 (Underweight) [ ] 3 (Ideal) [ ] 4 (Overweight) [ ] 5 (Obese)

What is the primary feed source for your donkey? (Select all that apply)

- [ ] Grazing/Pasture [ ] Crop residues (e.g., maize stalks) [ ] Hay [ ] Commercial feed [ ] Household scraps [ ] Other (Specify): _____

9. How often does your donkey face feed shortages?

- [ ] Never [ ] Rarely (once a month) [ ] Occasionally (2-3 times/month) [ ] Frequently (weekly) [ ] Always

3. Do you have clean source of water for your donkey? **YES** ☐ **NO** ☐

How many hours per day does your donkey work?

- [ ] < 2 hours
- [ ] 2-4 hours
- [ ] 4-6 hours
- [ ] 6-8 hours
- [ ] > 8 hours

12. What are the primary tasks your donkey performs?

- [ ] Ploughing
- [ ] Transporting goods
- [ ] Carrying water/firewood
- [ ] Riding/pulling carts
- [ ] Other (Specify): _____

13. What type of shelter does your donkey have?

- [ ] Dedicated stable/shed
- [ ] Shared with other livestock
- [ ] Under trees/open space
- [ ] No shelter

14. Is the shelter protected from extreme weather (rain, sun, cold)? **YES** ☐ **NO** ☐

15. How often does your donkey receive veterinary care?

- [ ] Regularly (vaccinations/deworming)

- [ ] Only when sick

- [ ] Rarely

- [ ] Never

16. Do you have access to veterinary care? **YES** ☐ **NO** ☐

17. Have you received any training on donkey care? **YES** ☐ **NO** ☐

19. Has your area experienced drought in the past year? **YES** ☐ **NO** ☐

SECTION B: To examine the effects of donkey welfare on food security in smallholder farming system.

1. In the past 30 days, did you worry that your household would not have enough food?

- [ ] Never (0)

- [ ] Rarely (1-2 times)

- [ ] Sometimes (3-10 times)

- [ ] Often (more than 10 times)

2. Insufficient Food Quality (Dietary Diversity)

2. In the past 30 days, were you unable to eat preferred foods (e.g., more nutritious or varied) due to lack of resources?"

- [ ] Never (0)

- [ ] Rarely (1-2 times)

- [ ] Sometimes (3-10 times)

- [ ] Often (more than 10 times)

3. "In the past 30 days, did you eat just a few kinds of foods due to lack of resources?"

- [ ] Never (0)

- [ ] Rarely (1-2 times)

- [ ] Sometimes (3-10 times)

- [ ] Often (more than 10 times)

4. "In the past 30 days, did you or any household member have to eat smaller meals than needed because there wasn’t enough food?"

- [ ] Never (0)
- [ ] Rarely (1-2 times)
- [ ] Sometimes (3-10 times)
- [ ] Often (more than 10 times)

5. "In the past 30 days, did you or any household member have to reduce the number of meals per day because there wasn’t enough food?"

- [ ] Never (0)
- [ ] Rarely (1-2 times)
- [ ] Sometimes (3-10 times)
- [ ] Often (more than 10 times)

6. "In the past 30 days, did your household run out of food before you had money or other means to get more?"

- [ ] Never (0)
- [ ] Rarely (1-2 times)
- [ ] Sometimes (3-10 times)
- [ ] Often (more than 10 times)

7. "In the past 30 days, did you or any household member go to sleep hungry because there was no food?"

- [ ] Never (0)
- [ ] Rarely (1-2 times)
- [ ] Sometimes (3-10 times)
- [ ] Often (more than 10 times)

8. "In the past 30 days, did you or any household member go a whole day without eating because there was no food?"**

- [ ] Never (0)
- [ ] Rarely (1-2 times)
- [ ] Sometimes (3-10 times)

- [ ] Often (more than 10 times)

9. "What are the main reasons for food shortages in your household?"(Select all that apply)

- [ ] Low farm productivity
- [ ] High food prices
- [ ] Lack of livestock/draft animals (e.g., donkeys for ploughing)
- [ ] Drought/poor rainfall
- [ ] Unemployment/low income
- [ ] Other (Specify): _____

Section C: exploring the perceptions and attitudes of smallholder farmers towards donkey welfare and its relationship with food security

Scale: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree

PERCEPTION	**RANKING**
Healthy donkeys are essential for my farm's productivity	
I believe donkeys often work too hard on farms	
Providing good feed to donkeys is worth the expense	
Regular veterinary care improves donkey performance	
Drought conditions significantly affect my donkeys' health	
My donkeys' health directly affects my crop yields	
Donkey ploughing enables me to plant more food crops	
When donkeys are sick, my household food supply suffers	
Investing in donkey care reduces hunger months	
TOTAL	