

Research Article

The Impact of Wildlife Conservation on Food Security: A Comparative Case Study Between Chifunda and Chibale Chiefdoms - Chama District, Zambia

Bester Muzeya^{*} , Gear Mumena Kajoba 

Department of Geography and Environmental Studies, The University of Zambia, Lusaka, Zambia

Abstract

The study investigated the impact of wildlife conservation on food security in Chifunda and Chibale Chiefdoms of Chama District, Eastern Province of Zambia. Chifunda Chiefdom, formally designated as a GMA, actively engages in wildlife conservation, while Chibale Chiefdom lacks formal GMA status and has limited conservation efforts. The research aimed to compare local perceptions, the role of wildlife conservation on food security, and the effects of conservation efforts on food availability, accessibility, and affordability in both chiefdoms. Data was collected through a mixed-methods approach, including quantitative surveys and qualitative interviews with community members, key informants, and focus groups. The sample comprised 176 individual household heads, with 88 from each chiefdom. Key findings revealed significant differences in awareness and participation in conservation programs between the two chiefdoms. Chifunda exhibited higher awareness and more positive perceptions of conservation, recognizing its benefits such as employment opportunities and community development projects. In contrast, Chibale showed a pronounced awareness gap and predominantly negative perceptions, with concerns about crop losses and threats to human life. Statistical analysis indicated a significant difference in food security between areas with wildlife conservation efforts and areas without. The study highlights the complex relationship between wildlife conservation and food security, emphasizing that integrated strategies combining conservation with sustainable agricultural practices are crucial for enhancing food security and promoting positive conservation outcomes.

Keywords

Wildlife Conservation, Food Security, Chifunda Chiefdom, Chibale Chiefdom, Human-Wildlife Conflict, Sustainable Agriculture

1. Introduction

Chama District, located in the Eastern Province of Zambia, is home to seven chiefdoms, including Chifunda and Chibale. Chifunda Chiefdom is a designated Game Management Area (GMA), while Chibale is not formally designated as a GMA, although both chiefdoms are situated within the Musalangu

GMA. Wildlife conservation is a critical aspect of biodiversity conservation, aiming to protect and preserve natural ecosystems and the species that depend on them. However, conservation efforts can have both positive and negative impacts on local communities and their livelihoods, particularly

^{*}Corresponding author: bestermuzeya@gmail.com (Bester Muzeya)

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concerning food security and socio-economic well-being. This study examines the impacts of wildlife conservation on food security in the two chiefdoms and highlights the potential benefits of formally designating Chibale Chiefdom as a GMA.

The degradation of wildlife habitats and unsustainable hunting practices have led to declining wildlife populations globally, affecting biodiversity and potentially impacting food security for communities reliant on natural resources for sustenance [1]. Wildlife conservation can have negative consequences for local farmers and residents who depend on the land for subsistence farming and other livelihood activities. Wild animals such as buffalos, elephants, kudus, warthogs, baboons, and antelopes cause significant crop damage, property damage, human injury, and even death in severe cases without proper mitigation measures, thereby affecting food security [2]. Therefore, it was essential to investigate the comparative perceptions and impacts of wildlife conservation on food security and socio-economic livelihoods in Chifunda and Chibale Chiefdoms. Hence, the study aimed to investigate the impacts of wildlife conservation on food security through a comparative study between Chifunda and Chibale Chiefdoms. The specific objectives were:

- 1) To determine local perceptions of wildlife conservation and food security.
- 2) To assess the role of wildlife conservation in food security.
- 3) To evaluate how wildlife conservation efforts affect the availability, accessibility, and affordability of food in a GMA and a non-GMA.

Previous studies explored community perceptions of wildlife conservation in various contexts. Bennett et al [2] found that positive perceptions towards wildlife conservation were associated with increased participation in conservation activities, fostering a sense of ownership and enhancing food security [3]. However, negative perceptions can lead to conflicts and hinder conservation efforts. Mkumbo et al [4] identified a research gap due to a lack of comprehensive quantitative assessments of wildlife resource availability and utilization in GMAs, highlighting the need for empirical data on the actual availability and utilization of wildlife resources for food security purposes [4]. Hickey et al [5] analyzed the socio-economic and environmental activities in GMAs in Tanzania, finding that income diversification through wildlife-based tourism positively influenced household food security, although the equitable distribution of benefits was necessary to ensure social inclusion [5].

Nyhus et al [6] investigated the impacts of human-wildlife conflict on food security in GMAs of Nepal, suggesting effective mitigation measures to reduce conflicts and improve food security [6].

This research sought to fill the gap in understanding the comparative impacts of wildlife conservation on food security in areas with and without formal Game Management Area (GMA) status. While previous studies have explored com-

munity perceptions and the socio-economic benefits of wildlife conservation, there was a lack of comprehensive quantitative assessments specifically comparing GMAs and non-GMAs in terms of food security and socio-economic livelihoods [1, 2].

Given the existing literature, this research is necessary because it provides empirical data on how wildlife conservation efforts influence food availability, accessibility, and affordability in different contexts. It also addresses the need for integrated strategies that combine conservation with sustainable agricultural practices to enhance food security and promote positive conservation outcomes. By highlighting the differences between Chifunda and Chibale Chiefdoms, the study underscores the importance of formal GMA designation and effective human-wildlife conflict mitigation measures.

2. Materials and Methods

The study was conducted in Chifunda and Chibale Chiefdoms, located in Chama District, Eastern Province of Zambia. Chifunda is a designated Game Management Area (GMA), while Chibale is not. The study area encompasses diverse physical and socio-economic characteristics, including varying vegetation types, population demographics, and agricultural practices.

A mixed-methods approach was employed, combining quantitative and qualitative data collection methods. A case study design was used for an in-depth examination of specific contexts, such as the impact of particular wildlife conservation programs on local food security.

Purposive sampling, also known as non-probability sampling technique, was used to deliberately select participants or groups based on specific characteristics or knowledge with valuable insights or experiences related to the impacts of wildlife conservation and food security. The sample consisted of 176 individual household heads, with 88 from each chiefdom (44 males and 44 females). Additionally, 12 key informants were interviewed. The key informants were chosen based on knowledge and expertise, position within the community, willingness to share, and access to other informants. Specifically, individuals with extensive knowledge or experience related to wildlife conservation and food security were selected, including community leaders, local government officials, and representatives from conservation organizations. Key informants held influential positions within the community, such as traditional leaders, senior farmers, or members of local committees, which allowed them to provide valuable insights into community dynamics and conservation efforts. Additionally, selected informants were willing and able to share their experiences and perspectives openly and honestly. Key informants often had connections to other potential participants, facilitating broader data collection. In their roles, community leaders provided insights into community attitudes and practices regarding wildlife conservation and food security, local government officials offered perspectives on

policy implementation and its impacts on local livelihoods, conservation organization representatives shared information on conservation programs and their perceived effectiveness, and senior farmers provided firsthand accounts of the challenges and benefits of living in proximity to wildlife and participating in conservation efforts. These informants helped bridge the gap between researchers and the community, ensuring that the study captured a comprehensive and nuanced understanding of the impacts of wildlife conservation on food security.

Data was collected through in-depth interviews, focus group discussions, observations, questionnaires, and surveys. Primary data collection targeted individual household heads, key informants, and community members. Secondary data reviews from relevant sources such as government reports and academic literature were also conducted.

Thematic analysis was used to identify and code patterns and themes from the collected data. Narrative analysis focused on interpreting individual stories and narratives regarding the impacts of wildlife conservation on food security. Descriptive statistics were generated from the questionnaire, and two independent sample t-tests were used to determine the difference in food security between areas with and without wildlife conservation efforts.

Ethical considerations were paramount in this study and the study was approved by The University of Zambia Natural and Applied Sciences Research Ethics Committee (NASREC). Informed consent was obtained from all participants, ensuring they understood the research goals, procedures, and potential risks. Confidentiality and anonymity were maintained throughout the process, and participants were treated with respect, actively seeking their input and acknowledging their expertise as key stakeholders.

3. Results

3.1. Quantitative Results-Chifunda

The quantitative data from Chifunda Chiefdom provides a detailed overview of the local demographics, awareness, and participation in Community-Based Natural Resource Management (CBNRM) programs, as well as the reasons for non-participation.

3.2. Demographic Profile of Chifunda Participants

In this study, the Chifunda participants comprised 88 individuals who were randomly interviewed. The demographic characteristics of the 88 participants in the study were as follows: the gender distribution in Chifunda Chiefdom was evenly split, with 44 (50 %) males and 44 (50 %) females. The age range of respondents shows a majority in the 30-49 years category 52 making 59 %, followed by 18-29 years 22 making

25 %, and 50+ years 14 making 16 %. The demographic profile indicates a relatively mature population in the chiefdom.

In terms of occupation, the majority of respondents are farmers 81 (92 %), followed by business/entrepreneurs 4 (5%), and a small number of fishers 3 (3%). This highlights the predominance of agriculture as the main livelihood activity in Chifunda Chiefdom.

Educational levels among respondents show that most have primary education 65 (74 %), followed by secondary education 18 (21 %), tertiary education 2 (2 %), and a small number with no education 3 (3 %). This suggests that while basic education is common, higher levels of education are less prevalent.

3.3. Local Perceptions of Wildlife Conservation and Food Security

3.3.1. Awareness and Participation

A significant majority of 72 (82%) respondents are aware of wildlife conservation efforts, and 58 (66%) have heard about the Community-Based Natural Resource Management (CBNRM) Programme, with 46 (52 %) specifically mentioning wildlife conservation and 19 (22 %) not aware. Among those who are aware, the most commonly mentioned program is wildlife conservation, which accounts for 52 (59 %) of respondents. This is followed by forest management and fisheries management, each with 9 (10 %) of the respondents. Additionally, 18 (20 %) of the respondents mentioned none of the programs. Despite the high CBNRM awareness, participation of community members in wildlife programs is low, with 82 % showing less involvement/participation due to reasons such as lack of awareness, time constraints, and lack of understanding.

3.3.2. Perception of Wildlife Conservation in Chifunda

Of the 88 participants interviewed, 59 (67 %) of respondents perceive wildlife conservation as a good practice, and 76 (86%) would not kill wildlife for crop or property damage, primarily due to the source of income, and employment, promoting alternative livelihood through many stakeholders, and fear of the law.

3.3.3. Impact on Food Security

When examining the role of wildlife conservation on food security, the data shows mixed results. While 41 (47 %) of respondents believe that wildlife conservation contributes to food security, 34 (39 %) do not, and 19 (22 %) are unsure. Additionally, 58 (66 %) have observed changes in food livelihood enhancement since the implementation of wildlife conservation efforts. However, satisfaction with food availability is varied, with 44 (50 %) not satisfied, 36 (41 %) satisfied, and 8 (9 %) very satisfied. The availability and accessibility of nutritious food options are rated as easily accessible

by 46 (52 %) of respondents.

3.4. Role of Wildlife Conservation on Food Security

3.4.1. Food Availability and Satisfaction

The impact of wildlife conservation on food prices is another area of concern. A significant portion, 46 (52 %), believe that wildlife conservation has increased food prices, while 41 (47 %) see no change and only 1 (1 %) believe prices have decreased. This indicates a perception that conservation efforts may be contributing to higher food costs, which could affect overall food security.

3.4.2. Food Sources and Consumption

Regarding food sources and consumption, the majority of respondents, 88 (100 %), grow their food, primarily maize, groundnuts, and soya beans. Most of this food is used for home consumption, with 74 (84 %) using it solely for home use, and 14 (16 %) for home use and sale.

3.4.3. Protein Source

Protein sources are primarily chickens, with 52 (59 %) keeping them, and 36 (41 %) eating meat not often. Fish is a common part of the diet, with 75 (85 %) eating it once to thrice a week from local sources. The frequency of vegetable consumption, with 68 (77 %) eating once to thrice a week and 9 % eating vegetables every day. The main supplementary protein food eaten is Soya Pieces 87 (99 %).

3.4.4. Impact on Food Availability

The data also highlights the perceived impact of wildlife conservation on food availability. While 24 (27 %) believe it has positively affected food availability, 20 (23 %) see a negative impact, and 13 (15 %) see a very negative effect. This mixed perception underscores the complexity of balancing wildlife conservation with food security needs in the community. On another hand, 52 (59 %) perceive that nutritious food can easily be accessed while 36 (41 %) perceive that nutritious food cannot easily be accessed. The data from Chifunda Chiefdom presents a complex perspective on the impact of wildlife conservation on food security. While there is considerable awareness and some positive perceptions of conservation efforts, low participation in these programs raises concerns, particularly regarding increasing food prices. Additionally, the community faces challenges related to varying levels of satisfaction with food availability and accessibility.

3.5. Qualitative Data-Chifunda

3.5.1. Local Perceptions of Wildlife Conservation and Food Security

Respondents generally perceive a negative relationship

between wildlife conservation and food security, citing that a high population of animals leads to a decrease in food security. However, on another note communities accept the benefits of Wildlife conservation through safari hunting practice that provides revenues to communities through the Community Resource Boards (CRBs) which are used for community development: building schools, and hospitals, and used as sources for HWC mitigations against crop and property damages but continue to complain about crop damage. The community also acknowledged that NGOs such as the Frankfurt Zoological Society-North Luangwa Conservation Program (FZS-NLCP) create casual and permanent employment opportunities, provide livelihood alternatives, HWC Mitigation, and provide technical support for the local governance structures that shape the overall community welfare, and Conservation Markets for Communities (COMACO) also play a key role in creating market links for the local communities who may not be able to have accessibility to the market. Being adjusted to the North Luangwa National Park (NLNP), the community is privileged in eco-tourism benefits which create employment later on improving livelihoods.

Chifunda community, however, commented that the absence of wildlife conservation allows for adequate farming, leading to surplus food for sale and increased revenue.

3.5.2. Role of Wildlife Conservation on Food Security

The role of wildlife conservation in food security is complex. The lack of sufficient human-wildlife conflict (HWC) mitigation measures and higher animal populations are seen as significant factors negatively impacting food security. However, there is recognition that conservation could bring economic benefits through CRBs and other Integrated initiatives. Integrating conservation with agricultural practices could improve food security, but better strategies are needed to mitigate the negative impacts.

3.5.3. Impact of Wildlife Conservation Efforts on Food Availability, Accessibility, and Affordability

Wildlife conservation efforts have a notable impact on food availability, accessibility, and affordability. Chifunda was reported to have poor road infrastructure often leads to difficulties in accessing food products and higher prices. The presence of wildlife conservation is associated with lower chances of having adequate food in homes, while the absence of conservation allows for better farming conditions and increased revenue from surplus food. The community faces challenges such as crop damage, difficulties in transporting food and seeds, and losses during storage due to wildlife. Further engagement with the local FRA depot provided maize purchases from the year 2020: 2020 – 3500, 2021 – 3500, 2022 – 5000, 2023 – 4000, and in 2024 – 4000 50 kg bags of Maize. The community highlighted that despite the low maize

crop produce, the community is privileged to casual and permanent employment opportunities that complement this gap and allow community members access to income which they use to access other food items from the local and outside market.

3.5.4. Law Enforcement:

Chifunda has the presence of DNPW law enforcement, supported by community scouts (local wildlife officers) which are employed by the CRB. This ensures law and order in the chiefdom and has seen a rise in wildlife conservation efforts in the area. The higher number of scouts employed at the chiefdom level has provided the highest number of community members in employment and this encourages community members to continue with the practice of conservation.

3.5.5. Conservation Supporting Programs and Challenges

To support wildlife conservation in Chifunda, the Department of Wildlife and National Parks (DNPW) and, the Ministry of Agriculture (MOA) among other government units are working closely with cooperating partners such as FZS-NLCP, COMACO, Tralard, Bi-Carbon Partners (BCP), and Community-Based Organisation (CBOs) among other interested parties in conservation in ensuring that the conservation agenda is maintained in the GMA.

The main challenge is how to ensure that the benefits of conservation are received and acknowledged by every member of the community.

3.6. Chibale Research Results

3.6.1. Quantitative Data-Chibale

The quantitative data from Chibale Chiefdom also provides insights into the local demographics, awareness, and participation in Community-Based Natural Resource Management (CBNRM) programs, as well as the reasons for non-participation.

3.6.2. Demographic Profile of Participants

The Chibale participants also comprised 88 individuals who were randomly interviewed. The gender distribution in Chibale Chiefdom is evenly split, with 44 (50 %) males and 44 (50 %) females. The age range of respondents shows a majority in the 18-29 years at 42 (48 %) and 30-49 years at 40 (45 %) categories, with a smaller representation from those aged 50+ years at 6 (7 %). This indicates a relatively young population in the chiefdom.

In terms of occupation, the majority of respondents are farmers 65 (74 %), followed by business/entrepreneurs 22 (25 %), and a very small number of fishers 1 (1 %). This highlights the predominance of agriculture as the main livelihood activity in Chibale Chiefdom.

Educational levels among respondents show that most have primary education 62 (70 %), followed by secondary education 24 (27 %), tertiary education 1 (1 %), and no education 2 (2 %). This suggests that while basic education is common, higher levels of education are less prevalent.

3.6.3. Awareness and Participation in Wildlife Conservation Programs

97 (99 %) of Chibale respondents are not aware of or heard about wildlife conservation in the area. Awareness of the CBNRM Programme is relatively low too, with 70 (80 %) of respondents not having heard about it, and only 18 (20 %) being aware. Among those who are aware, the most commonly mentioned program is forest management, which accounts for 38 (43 %) of the respondents. This is followed by wildlife conservation and fisheries management, mentioned by 26 (30 %) and 7 (8 %) of the respondents respectively. Additionally, 17 (19 %) of the respondents were not sure which program they had heard of.

The data reveals a significant awareness gap regarding wildlife conservation efforts in Chibale Chiefdom. A vast majority of respondents 88 (100 %) are aware of the absence of wildlife conservation efforts, yet only 18 (20 %) have heard about the Community-Based Natural Resource Management (CBNRM) program, with 26 (30) specifically mentioning wildlife conservation. Participation in these programs is notably low, with all 88 (100 %) respondents not participating, primarily due to a lack of awareness as highlighted by 58 (66 %) respondents. This indicates a critical need for increased awareness and engagement initiatives to foster community involvement in conservation efforts.

3.6.4. Local Perceptions of Wildlife Conservation and Food Security

Local perceptions of wildlife conservation are predominantly negative. Of the 88 respondents, 75 (85 %) view wildlife conservation as a bad practice, citing reasons such as crop losses, threats to human life, and a lack of tangible benefits. Conversely, only 25 (28 %) respondents perceive it as a good practice, emphasizing the importance of conserving natural resources for future generations. This contrast highlights the challenges in aligning conservation efforts with community interests and the necessity for addressing the concerns of the local population.

3.6.5. Role of Wildlife Conservation on Food Security

(i). Food Production and Consumption

Food production in Chibale Chiefdom is primarily subsistence-based, all 88 (100 %) grow their food, mainly maize, along with groundnuts, soya beans, and sunflowers. The majority of the grown food 48 % is used for home consumption and selling, indicating a dual role in sustaining household

food security and generating income. Fresh vegetables are a regular part of the diet, with 47 (54 %) respondents consuming them once to thrice a week and 38 (43 %) eating them daily. This suggests a reliance on locally grown produce for nutritional needs.

(ii). Impact on Food Prices

The impact of wildlife conservation on food prices is perceived variably among the respondents. While 58 (65 %) respondents believe that wildlife conservation has not changed food prices, 20 (23 %) think it has decreased prices, and 11 (13 %) think it has increased them. These mixed perceptions underscore the complex relationship between conservation efforts and food security dynamics in the region.

(iii). Food Availability

The data indicates that 49 (56 %) of the 88 respondents feel wildlife conservation has negatively impacted food availability, while 32 (36 %) feel it has had no impact. Additionally, 33 (38 %) respondents have noticed decreased food biodiversity availability/security since the decline in conservation efforts. This suggests that the perceived impact of wildlife conservation on food availability is largely negative, with some respondents noticing a decline in food security.

3.6.6. Food Accessibility and Affordability

Accessibility to nutritious food remains a challenge in Chibale Chiefdom. A significant number of respondents 62 (71 %) of the 88 find nutritious food options not easily accessible. 53 (60 %) respondents access food from the local market, with 33 (38 %) relying on locally grown food. This indicates a dependency on local food systems, which may be vulnerable to disruptions in wildlife biodiversity. The data also shows that the majority of respondents 78 (89 %) primarily consume soya pieces as an alternative protein source, reflecting limited dietary diversity.

3.6.7. Satisfaction with Food Security

Satisfaction with food security varies among the respondents. While 44 (50 %) respondents are satisfied with their food security situation, 24 (27 %) are not satisfied, and 21 (24 %) are very satisfied. This variation in satisfaction levels points to differing experiences and possibly unequal access to food resources within the community. Additionally, the number of meals afforded per day varies, with 41 (47 %) respondents having lunch and supper, 34 (39 %) having breakfast, lunch, and supper, and 14 (16 %) having only supper. This indicates varying levels of food security and access to meals among the population.

Overall, the quantitative data from Chibale Chiefdom highlights significant challenges in wildlife conservation awareness, participation, and its perceived impact on food security. Negative perceptions of conservation efforts and low participation rates suggest a need for targeted awareness and

engagement programs. Food production is primarily subsistence-based, with a reliance on local markets for food access. The mixed perceptions of conservation's impact on food security and the challenges in accessing nutritious food underscore the need for integrated approaches that address both conservation and food security objectives.

3.7. Qualitative Data-Chibale

3.7.1. Local Perceptions of Wildlife Conservation and Food Security

The perceptions of conservation in Chibale are predominantly negative. Respondents especially women are not free to have open discussions around wildlife conservation for fear of the rest of the community pointing fingers at them for secretly supporting the conservation agenda and the community is believed to take any unlawful action against such any individual or group. Historically, the community has resisted conservation efforts, with traditional authorities and community members opposing the practice. This resistance stems from a belief that wildlife conservation negatively impacts food production and law enforcers wrongly manhandled community members and had most of the household male households imprisoned which led to the then chief to ask all law enforcers to evacuate the chiefdom and allow the community to run on its own accord. The community from this moment is believed to act against intentions of setting up law enforcement sections in the community.

The community associates the absence of wildlife with increased food security, as it allows for more maize production and reduces the need to guard fields against wildlife. Additionally, there is a strong cultural rejection of conservation, with community members fearing that reintroducing wildlife will lead to poverty and increased human-wildlife conflicts. This perception is reinforced by the lack of understanding of conservation and its potential benefits that come as a result of eco-tourism by creating jobs, promoting markets for local communities, and overall environmental sustainability.

3.7.2. Role of Wildlife Conservation on Food Security

The link between conservation and food security is evident in the study. The absence of effective conservation efforts has led to gaps in law enforcement, resulting in increased illegal timber harvesting and biodiversity loss. These activities primarily benefit elites and outsiders, leaving the local community with limited resources. The community recognizes that conservation could bring revenue and improve livelihoods, but there is a need for increased agricultural input to address the gaps left by conservation efforts. The study highlights the importance of integrating conservation with other community benefits, such as employment opportunities and sustainable resource management, to enhance food security.

3.7.3. Impact of Wildlife Conservation Efforts on Food Availability, Accessibility, and Affordability

Chibale community believes that the absence of wildlife conservation will lead to increased food availability, accessibility, and affordability. People's crops will not be damaged by wildlife and there will be more produce each year. The community cited reference to neighbouring chiefdoms such as Kambombo and Chifunda undergoing hardships in food security due to restrictions caused by wildlife and low crop produce each year. This claim was made based on how much each chiefdom produces and makes sales to the Food Reserve Agency (FRA) each year. The comparison was, however, made without understanding other benefits that come with conservation practice. Further engagement with the local FRA depot provided that maize purchase from the year 2020 being: 2020 – 5000, 2021 – 28000, 2022 – 45000, 2023 – 38000, 2024 – 41545 50 kg bags of Maize. Chibale community attributed the higher maize production to the absence of wildlife conservation efforts, which reduces crop damage from wildlife, leading to higher yields. While government efforts of providing affordable agricultural inputs to farmers and the agricultural mindset have led to improved agricultural practices, which have significantly enhanced maize production.

3.7.4. Law Enforcement

There is a notable lack of defined conservation policies, nor any form of law enforcement in the chiefdom. Community members fear legal repercussions if conservation efforts are reintroduced, leading to resistance against law enforcement and conservation initiatives. The uncertainty about the effectiveness of measures like fencing to prevent human-wildlife conflicts further complicates the situation. The community's fear of wildlife scouts acting as informers and the potential for imprisonment of household heads highlight the deep-seated mistrust and fear associated with conservation efforts.

3.7.5. Conservation Supporting Programs and Challenges

The study identifies a lack of organizations advocating for conservation in the area. COMACO, which provides market support, avoids conservation topics due to community resistance. This resistance extends to any organization or partnership that supports conservation, indicating a significant challenge in promoting conservation initiatives. Traditional communication norms and community power dynamics further hinder the introduction of new conservation perspectives. The community's resistance to conservation messaging underscores the need for tailored communication strategies that respect local traditions and social norms.

3.7.6. Sentiments

The local councilor's observations highlight a preference for personal development over community development,

respect for self-employment, and resistance to organizations that hinder household development. Political influence in forest management further complicates conservation efforts, making it challenging for communities to benefit from sustainable resource management.

Overall, the Chibale qualitative study reveals a complex interplay between wildlife conservation and food security in Chibale. Addressing the community's concerns and perceptions through strategic engagement, education, and tailored conservation initiatives is essential for promoting sustainable development and enhancing regional food security.

3.8. Comparative Research Results Analysis of Chifunda and Chibale Chiefdoms

3.8.1. Awareness and Participation in Wildlife Conservation Programs

The study reveals a significant difference in awareness and participation in wildlife conservation programs between Chifunda and Chibale Chiefdoms. In Chifunda, 72 (82 %) of respondents are aware of wildlife conservation efforts, with 58 (66 %) having heard about the Community-Based Natural Resource Management (CBNRM) program. Despite this awareness, participation is low, with 63 (72 %) not participating due to lack of awareness, time constraints, and lack of understanding. In contrast, Chibale shows a more pronounced awareness gap, with 87 (99 %) of respondents unaware of or having heard about wildlife conservation efforts. Only 17 (20 %) are aware of the CBNRM program, and participation is notably low, with all 88 (100 %) respondents not participating, primarily due to a lack of awareness. This indicates a critical need for increased awareness and engagement initiatives in both chiefdoms, but more so in Chibale.

3.8.2. Perception of Wildlife Conservation

Perceptions of wildlife conservation differ significantly between the two chiefdoms. In Chifunda, 58 (67 %) of respondents perceive wildlife conservation as a good practice, and 75 (86 %) would not kill wildlife for crop or property damage, primarily due to the source of income, employment opportunities, and fear of the law. Conversely, in Chibale, 75 (86 %) of respondents view wildlife conservation as a bad practice, citing reasons such as crop losses, threats to human life, and a lack of tangible benefits. Only 25 (29 %) of respondents perceive it as a good practice, emphasizing the importance of conserving natural resources for future generations. This contrast highlights the challenges in aligning conservation efforts with community interests and the necessity for addressing the concerns of the local population in Chibale.

3.8.3. Food Production and Consumption

Food production in both chiefdoms is primarily subsistence-based, but there are differences in the types of food

grown and their uses. In Chifunda, 88 (100 %) of respondents grow their food, primarily maize, groundnuts, and soya beans, with most of the food used for home consumption 73 (84 %) and some for selling 14 (16 %). In Chibale, 48 (55 %) of respondents grow their food, mainly maize, groundnuts, soya beans, and sunflowers, with the majority of the grown food used for home consumption and selling. Fresh vegetables are a regular part of the diet in both chiefdoms, with respondents consuming them once to thrice a week or daily. This suggests a reliance on locally grown produce for nutritional needs in both areas.

3.8.4. Impact on Food Prices

The impact of wildlife conservation on food prices is perceived variably in both chiefdoms. In Chifunda, 45 (52 %) of respondents believe that wildlife conservation has increased food prices, while 41 (47 %) see no change and only 1 (1 %) believe prices have decreased. In Chibale, 58 (66 %) respondents believe that wildlife conservation has not changed food prices, 20 (23 %) think it has decreased prices, and 11 (13 %) think it has increased them. These mixed perceptions underscore the complex relationship between conservation efforts and food security dynamics in both regions.

3.8.5. Food Availability, Accessibility, and Affordability

Food availability is perceived differently in the two chiefdoms. In Chifunda, 23 (27 %) of respondents believe wildlife conservation has positively affected food availability, while 20 (23 %) see a negative impact, and 13 (15 %) see a very negative effect. In Chibale, 49 (56 %) respondents feel wildlife conservation has negatively impacted food availability, while 32 feel it has had no impact. Additionally, 33 (38 %) respondents in Chibale have noticed decreased food availability/security since the decline in conservation efforts. Accessibility to nutritious food remains a challenge in both chiefdoms, with 62 (71 %) respondents in Chibale and 36 (41 %) in Chifunda finding nutritious food options not easily accessible. Most respondents in both areas access food from the local market, indicating a dependency on local food systems, which may be vulnerable to disruptions.

3.8.6. Satisfaction with Food Security

Satisfaction with food security varies among respondents in both chiefdoms. In Chifunda, 44 (50 %) of respondents are not satisfied with food availability, 36 (41 %) are satisfied, and 7 (9 %) are very satisfied. In Chibale, 44 (50 %) respondents are satisfied with their food security situation, 24 (27 %) are not satisfied, and 21 (24 %) are very satisfied. This variation in satisfaction levels points to differing experiences and possibly unequal access to food resources within the communities. Additionally, the number of meals afforded per day varies, with respondents in both chiefdoms having different meal patterns, indicating varying levels of food security and access

to meals.

The comparative analysis of Chifunda and Chibale Chiefdoms highlights significant differences in awareness, participation, and perceptions of wildlife conservation, as well as its impact on food security. Chifunda shows higher awareness and more positive perceptions of conservation efforts, while Chibale exhibits a pronounced awareness gap and predominantly negative perceptions. Both chiefdoms face challenges in food production, accessibility, and satisfaction with food security, underscoring the need for integrated approaches that address both conservation and food security objectives. Targeted awareness and engagement programs are essential to foster community involvement in conservation efforts and improve food security outcomes in both regions.

4. Discussion

This section systematically discusses the research results presented in chapter three, aligning them with the literature review and background information. The discussion is structured thematically to provide a comprehensive analysis of the findings, highlighting their implications for wildlife conservation and food security in Chifunda and Chibale Chiefdoms. Highlights objectives and whether they have been met.

4.1. Local Perceptions of Wildlife Conservation and Food Security

4.1.1. Awareness and Participation

The study revealed significant differences in awareness and participation in wildlife conservation programs between Chifunda and Chibale Chiefdoms. In Chifunda, 72 (82 %) of respondents were aware of wildlife conservation efforts, with 58 (66 %) having heard about the Community-Based Natural Resource Management (CBNRM) program. Despite this awareness, participation was low, with 63 (72 %) not participating due to lack of awareness, time constraints, and lack of understanding. In contrast, Chibale showed a more pronounced awareness gap, with 87 (99 %) of respondents unaware of or having heard about wildlife conservation efforts. Only 18 (20 %) were aware of the CBNRM program, and participation was notably low, with all 88 (100 %) respondents not participating, primarily due to a lack of awareness. This suggests that awareness alone is insufficient to drive participation; targeted engagement and education programs are essential to bridge this gap and foster community involvement.

These findings align with Bennett et al [2], who found that positive perceptions towards wildlife conservation were associated with increased participation in conservation activities, fostering a sense of ownership and enhancing food security. The low participation rates in both chiefdoms highlight the need for targeted awareness and engagement programs to foster community involvement in conservation efforts.

4.1.2. Perception of Wildlife Conservation

Perceptions of wildlife conservation differed significantly between the two chiefdoms. In Chifunda, the majority 59 (67 %) of respondents perceived wildlife conservation as a good practice, and 76 (86 %) would not kill wildlife for crop or property damage, primarily due to the source of income, employment opportunities, and fear of the law. Conversely, in Chibale, conservation is largely seen as negative with 75 (86 %) respondents viewing wildlife conservation as a bad practice, citing reasons such as crop losses, threats to human life, and a lack of tangible benefits. Only 25 (29 %) of the male respondents perceived it as a good practice, emphasizing the importance of conserving natural resources for future generations.

Respondents generally perceive a negative relationship between wildlife conservation and food security, citing that a high population of animals leads to a decrease in food security. However, Chifunda community acknowledged the benefits of Wildlife conservation through safari hunting practice that provides revenues to communities through the Community Resource Boards (CRBs) which are used for community development: building schools, and hospitals, and used as sources for HWC mitigations against crop and property damages but continue to complain about crop damage. The community also acknowledged that NGOs such as the Frankfurt Zoological Society-North Luangwa Conservation Program (FZS-NLCP) create casual and permanent employment opportunities, provide livelihood alternatives, HWC Mitigation, and provide technical support for the local governance structures that shape the overall community welfare, and Conservation Markets for Communities (COMACO) also play a key role in creating market links for the local communities who may not be able to have accessibility to the market. Being adjusted to the North Luangwa National Park (NLNP), the community is privileged in eco-tourism benefits which create employment later on improving livelihoods.

Chifunda community, however, commented that the absence of wildlife conservation allows for adequate farming, leading to surplus food for sale and increased revenue.

Conversely, in Chibale Chiefdom, perceptions of conservation are predominantly negative. Respondents, especially women, are not free to discuss wildlife conservation openly due to fear of community backlash. Historically, the community has resisted conservation efforts, believing that wildlife conservation negatively impacts food production. This resistance is reinforced by past experiences of law enforcers manhandling community members, leading to traditional authorities' demand for the evacuation of law enforcement arms from the chiefdom. The community associates the absence of wildlife with increased food security, as it allows for more maize production and reduces the need to guard fields against wildlife. There is also a strong cultural rejection of conservation, with fears that reintroducing wildlife will lead to poverty and increased human-wildlife conflicts [7].

These contrasting perceptions underscore the challenges in

aligning conservation efforts with community interests. As Mkhumbo et al [4] noted, there is a need for empirical data on the availability and utilization of wildlife resources for food security purposes. This study's findings suggest that addressing the concerns of the local population in Chibale is crucial for fostering positive perceptions towards wildlife conservation.

4.2. Impact of Wildlife Conservation on Food Security

4.2.1. Role of Wildlife Conservation on Food Security:

The role of wildlife conservation in food security is complex in both chiefdoms. In Chifunda, the lack of sufficient HWC mitigation measures and higher animal populations are seen as significant factors negatively impacting food security. However, there is recognition that conservation could bring economic benefits through CRBs and other integrated initiatives. Integrating conservation with agricultural practices could improve food security, but better strategies are needed to mitigate the negative impacts [8]. Additionally, the community's reliance on external support for HWC mitigation highlights the need for more sustainable, locally-driven solutions.

In Chibale, the absence of effective conservation efforts has led to gaps in law enforcement, resulting in increased illegal timber harvesting and biodiversity loss. These activities primarily benefit elites and outsiders, leaving the local community with limited resources. The community recognizes that conservation could bring revenue and improve livelihoods, but there is a need for increased agricultural input to address the gaps left by conservation efforts. The study highlights the importance of integrating conservation with other community benefits, such as employment opportunities and sustainable resource management, to enhance food security [6]. Moreover, addressing the underlying socio-economic disparities and ensuring equitable distribution of conservation benefits are crucial for long-term success.

4.2.2. Food Production and Consumption

Food production in both chiefdoms is primarily subsistence-based, but there are differences in the types of food grown and their uses. In Chifunda, 88 (100 %) of respondents grew their food, primarily maize, groundnuts, and soya beans, with most of the food used for home consumption 73 (84 %) and some for selling 14 (16 %). In Chibale, 88 (100 %) respondents also grew their food, mainly maize, groundnuts, soya beans, and sunflowers, with the majority of the grown food used for home consumption and selling. Fresh vegetables were a regular part of the diet in both chiefdoms, with respondents consuming them once to thrice a week or daily.

This research suggests that promoting wildlife conservation while ensuring food security requires addressing the specific

needs and challenges of local communities. Additionally, it is crucial to consider the potential trade-offs between conservation and agricultural productivity to develop balanced strategies. The findings align with Hickey et al [5], who found that income diversification through wildlife-based tourism and other ecosystem services positively influenced household food security. However, the study also highlighted the need for equitable distribution of benefits to ensure social inclusion. This research suggests that promoting wildlife conservation while ensuring food security requires addressing the specific needs and challenges of local communities.

The study suggests Integrated SMART agriculture farming practices to enhance food variety and the promotion of healthy soils for increased food security among communities

4.2.3. Impact on Food Prices

The impact of wildlife conservation on food prices was perceived variably in both chiefdoms. In Chifunda, 45 (52 %) of respondents believed that wildlife conservation had increased food prices, while 41 (47 %) saw no change, and only 1 (1 %) believed prices had decreased. In Chibale, 58 (66 %) of respondents believed that wildlife conservation had not changed food prices, 20 (23 %) thought it had decreased prices, and 11 (13 %) thought it had increased them.

These mixed perceptions underscore the complex relationship between conservation efforts and food security dynamics. Fernandez [9] indicated households living in prime GMAs enjoy higher income than those in non-GMA areas, but these benefits are often captured by wealthier segments of the community. This study's findings suggest that addressing the economic impacts of wildlife conservation on food prices is crucial for promoting food security. Furthermore, understanding the local market dynamics and how conservation efforts influence them can help in designing more effective interventions.

4.2.4. Food Availability, Accessibility, and Affordability

Wildlife conservation efforts have a notable impact on food availability, accessibility, and affordability and are perceived differently in the two chiefdoms. In Chifunda, 23 (27 %) of respondents believed wildlife conservation had positively affected food availability, while 20 (23 %) saw a negative impact, and 13 (15 %) saw a very negative effect. In Chibale, 49 (56 %) respondents felt wildlife conservation had negatively impacted food availability, while 32 (36 %) felt it had no impact. Additionally, 33 (38 %) of respondents in Chibale noticed decreased food availability/security since the decline in conservation efforts.

Chifunda was reported to have poor road infrastructure often leads to difficulties in accessing food products and higher prices. The presence of wildlife conservation is associated with lower chances of having adequate food in homes, while the absence of conservation allows for better farming conditions and increased revenue from surplus food. The

community faces challenges such as crop damage, difficulties in transporting food and seeds, and losses during storage due to wildlife. Further engagement with the local FRA depot provided maize purchase records for the following years: 2020 – 3500, 2021 – 3500, 2022 – 5000, 2023 – 4000, and 2024 – 4000 50 kg bags of Maize. Chifunda community however, highlighted that despite the low maize crop produce, the community is privileged to casual and permanent employment opportunities that complement this gap and allow community members access to income which they use to access other food items from the local and outside market [10].

On the other hand, the Chibale community believes that the absence of wildlife conservation will lead to increased food availability, accessibility, and affordability. People's crops will not be damaged by wildlife, and there will be more maize produced each year. Further engagement with the local FRA depot provided maize purchase records for the following years: 2020 – 5000, 2021 – 28000, 2022 – 45000, 2023 – 38000, and 2024 – 41545 50 kg bags of Maize indicating a higher maize production to that of Chifunda in the cited years. Chibale community cited neighbouring chiefdoms such as Kambombo and Chifunda undergoing hardships in food security due to restrictions caused by wildlife and low crop production each year. However, this comparison was made without understanding other benefits that come with conservation practice in the communities practicing active wildlife conservation.

Accessibility to nutritious food remained a challenge in both chiefdoms, with 62 (71 %) respondents in Chibale and 36 (41 %) in Chifunda finding nutritious food options not easily accessible. Most respondents in both areas accessed food from the local market, indicating a dependency on local food systems, which may be vulnerable to disruptions.

These findings align with Nyhus et al [6], who highlighted that human-wildlife conflicts, particularly with large predators, could lead to livestock loss and decreased food availability. Effective mitigation measures, such as predator-proof infrastructure and community engagement, are essential for reducing conflicts and improving food security. Moreover, addressing the infrastructural challenges and enhancing market linkages can significantly improve food accessibility and affordability.

4.3. Satisfaction with Food Security

Satisfaction with food security varied among respondents in both chiefdoms. In Chifunda, 44 (50 %) of respondents were not satisfied with food availability, 41 % were satisfied, and 9 % were very satisfied. In Chibale, 44 (50 %) respondents were satisfied with their food security situation, 24 (27 %) were not satisfied, and 21 (24 %) were very satisfied. This variation in satisfaction levels points to differing experiences and possibly unequal access to food resources within the communities.

These findings highlight the importance of understanding the long- and short-term social-economic impacts of wildlife conservation on food security. Muhumuza [11] noted that designing sustainable conservation strategies that also prioritize food security is crucial for achieving positive outcomes for local communities. Additionally, fostering community participation in decision-making processes can enhance the effectiveness and acceptance of conservation strategies.

4.4. Law Enforcement

In Chifunda, the presence of the Department of National Parks and Wildlife (DNPW) law enforcement, supported by community scouts (local wildlife officers) employed by the CRB, ensures law and order in the chiefdom. The higher number of scouts employed at the chiefdom level, complemented with community outreach programs in promoting livelihood alternatives, has provided the highest number of community members in employment, encouraging community members to continue with the practice of conservation. This aligns with a statement report; “*Effective enforcement of laws governing natural resources depends upon personnel properly trained in both legal and biological aspects of their profession* [12]”. However, the reliance on external support for law enforcement raises concerns about the sustainability of these efforts in the long term.

In Chibale, there is a notable lack of defined conservation policies or any form of law enforcement in the chiefdom. Community members fear legal repercussions if conservation efforts are reintroduced, leading to resistance against law enforcement and conservation initiatives. The uncertainty about the effectiveness of measures like fencing to prevent human-wildlife conflicts further complicates the situation. The community's fear of wildlife scouts acting as informers and the potential for imprisonment of household heads highlight the deep-seated mistrust and fear associated with conservation efforts. Wildlife law enforcers, however, could act as officers who also regulate other non-resource-related violations such as traffic, drug, and domestic violence crimes; and they often support search and rescue operations or other community policing situations where necessary in promoting law and order. Addressing these fears and building trust between the community and law enforcement is crucial for the success of conservation initiatives.

4.5. Gender Dimensions of Food Insecurity and Conservation

The study also highlighted the gender dimensions of food insecurity and conservation. Mkumbo et al [4] emphasized the need for gender-sensitive approaches to identify and address the specific needs, challenges, and contributions of women to food security and conservation. Similar to situational findings in Chifunda and Chibale, Women play a crucial role in agri-

cultural production, particularly in rural setups. According to Heifer International [13], women make up 41 % of the global agricultural workforce, with even higher %ages in regions like South Asia and sub-Saharan Africa, where 60 % of women work in agriculture.

4.5.1. Women Producing More Farm Produce

Despite facing significant challenges, women contribute substantially to food production. They are involved in various agricultural activities, from preparing fields and sowing seeds to cultivating and harvesting crops. This extensive involvement in farming activities underscores their critical role in ensuring food security and nutrition for their families and communities. Recognizing and supporting women's contributions to agriculture can enhance overall food security and community resilience.

4.5.2. Diversity of Work

Women in agriculture engage in a diverse range of activities beyond traditional farming. They are involved in food processing, marketing, and distribution, which are essential components of the agricultural value chain. Women also play a significant role in sustainable land and natural resource management, contributing to climate resilience and environmental conservation [13]. Their work extends to household duties, where they are responsible for most informal and unpaid labour, including caregiving, which further highlights their multifaceted contributions to both agriculture and family well-being. Addressing the workload and providing support for women's diverse roles can improve their productivity and well-being.

4.5.3. Challenges Women Face

Despite their significant contributions, women in agriculture face numerous challenges. These include limited access to resources such as land, credit, and agricultural inputs. According to the International Labour Organization, women-run farms produce 20-30 % less than those run by men due to these constraints [13].

Additionally, women often have less say in decision-making processes related to household spending and land use, which limits their ability to fully utilize their agricultural potential. Cultural norms and gender biases further exacerbate these challenges, restricting women's opportunities to engage in more profitable agricultural activities and access essential resources [14]. This was evident in the Chibale case where the women could not openly talk about issues that matter for the general benefit of the community without the approval of men. This dynamic hinders the voices of women from being heard and their contribution in decision-making is limited. Empowering women and promoting gender equality in decision-making processes are essential for addressing these challenges.

4.5.4. Role of Women in Food Security

Women are pivotal in ensuring food security and nutrition at the household and community levels. They are often the primary food producers, processors, and providers, playing a key role in maintaining the four pillars of food security: availability, access, utilization, and stability [15].

Women's involvement in agriculture and food systems is crucial for addressing food insecurity and malnutrition. Their contributions to food production, coupled with their roles in managing household food resources, make them essential actors in achieving food security and improving nutritional outcomes for their families. Supporting women's roles in food security can lead to more resilient and sustainable food systems.

4.5.5. Role of Women in Natural Resources Management

Women also play a vital role in the sustainable management of natural resources. They have unique knowledge and skills related to the use and conservation of resources such as water, forests, and land. This knowledge is critical for promoting sustainable development and effective conservation practices [16].

Women's involvement in natural resource management helps ensure that conservation initiatives are inclusive and address the specific needs and contributions of different community members. By integrating gender-sensitive approaches, conservation efforts can be more effective and sustainable, ultimately contributing to the overall well-being of communities and the environment [4]. Incorporating women's perspectives in conservation planning can enhance the effectiveness and sustainability of these efforts.

4.6. Conservation Supporting Programs and Challenges

To support wildlife conservation in Chifunda, the DNPW and the Ministry of Agriculture (MOA), among other government units, are working closely with cooperating partners such as FZS-NLCP, COMACO, Tralard, Bi-Carbon Partners (BCP), and Community-Based Organizations (CBOs) to ensure that the conservation agenda is maintained in the GMA. The main challenge is ensuring that the benefits of conservation are received and acknowledged by every member of the community [17]. Ensuring transparency and equitable distribution of conservation benefits can enhance community support for these initiatives.

In Chibale, the study identifies a lack of organizations advocating for conservation in the area. COMACO, which provides market support, avoids conservation topics due to community resistance. This resistance extends to any organization or partnership that supports conservation, indicating a significant challenge in promoting conservation initiatives. Traditional communication norms and community power dynamics further hinder the introduction of new conservation

perspectives. The community's resistance to conservation messaging underscores the need for tailored communication strategies that respect local traditions and social norms. Developing culturally sensitive communication strategies can help overcome resistance and foster community engagement in conservation efforts.

The comparative analysis of Chifunda and Chibale Chiefdoms highlights significant differences in awareness, participation, and perceptions of wildlife conservation, as well as its impact on food security. Chifunda showed higher awareness and more positive perceptions of conservation efforts, while Chibale exhibited a pronounced awareness gap and predominantly negative perceptions. Both chiefdoms faced challenges in food production, accessibility, and satisfaction with food security, underscoring the need for integrated approaches that address both conservation and food security objectives. Targeted awareness and engagement programs are essential to foster community involvement in conservation efforts and improve food security outcomes in both regions. Moreover, it is crucial to develop context-specific strategies that consider the unique socio-economic and cultural dynamics of each chiefdom. Additionally, addressing the community's concerns and perceptions through strategic engagement, education, and tailored conservation initiatives is essential for promoting sustainable development and enhancing regional food security. Ensuring that conservation benefits are equitably distributed and transparently communicated can build trust and support among community members.

5. Conclusions

The study reveals significant differences between Chifunda and Chibale Chiefdoms regarding perceptions, food security status, and wildlife conservation efforts. Chifunda shows higher awareness and more positive perceptions of conservation, while Chibale exhibits a pronounced awareness gap and predominantly negative perceptions. These differences impact food security, with Chifunda facing challenges from human-wildlife conflicts despite economic benefits, and Chibale experiencing increased illegal activities and biodiversity loss. The study underscores the need for integrated strategies combining conservation with sustainable agricultural practices to enhance food security and promote positive conservation outcomes.

Abbreviations

CBNRM	Community-Based Natural Resources Management
CBOs	Community Based Organisations
CRBs	Community Resources Boards
COMACO	Conservation Market for Communities
DNPW	Department of National Parks and Wildlife
FZS	Frankfurt Zoological Society
GMA	Game Management Area

GRZ	Government of the Republic of Zambia
HWC	Human-Wildlife Conflict
HWCoex	Human-Wildlife Co-existence
NGOs	Non-Governmental Organizations
NLCP	North Luangwa Conservation Program
TA	Traditional Authorities
VAG	Village Action Group

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Author Contributions

Bester Muzeya: Conceptualisation, Resources, methodology, writing – original draft, writing-review and editing, data curation, visualisation,

Gear Mumena Kajoba: Supervision, validation

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Data Availability Statement

The data supporting the outcomes of this research work has been reported in this manuscript and is available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare no conflicts of interest.

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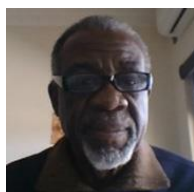
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Biography



Bester Muzeya is an environmental conservationist with a Bachelor of Education in Environmental Education from the University of Zambia. Currently, she is serving as a Senior Community Conservation Officer at the Frankfurt Zoological Society-North Luangwa Conservation Program, focusing on community natural resources management. Bester has extensive experience in community outreach, governance, and institutional development, having coordinated projects like the DREAMS Project and the New and Healthier Me – Adolescent Girls Mentoring Project. Skilled in proposal writing, report generation, and public speaking, she is fluent in English and six Zambian languages, contributing significantly to environmental conservation and community development.



Gear Mumena Kajoba part-time senior lecturer in Geography at the University of Zambia Institute of Distance Education since 1995, progressing from 1973 to 2023. He holds an MPhil in Geography from the University of Sussex (1989), MA in Geography from Arizona State University (1973), and a BA in Geography and History from the University of Zambia (1972). Served as Liaison Officer for the Zambia Chapter of the Organization of Social Science Research in East and Southern Africa (1992-2002) and was a visiting scholar at RIHN, Kyoto, Japan (2007). He published a book and several scholarly articles.

Research Field

Bester Muzeya: Wildlife Conservation, Community-Based Natural Resource Management, Environmental Education, Sustainable Agriculture, Human-Wildlife Conflict Mitigation, Institutional and Organizational Capacity Building, Environmental Health and Safety, Disaster Management and Mitigation.

Gear Mumena Kajoba: Land Tenure Dynamics, Gender Studies-Women and Land, Agrarian Studies in Africa, Food Security in Africa, Food Systems Resilience, Sustainable Development.