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Assessing the Effects of Human-Wildlife Conflict on Crop Yield and Household Food Security: A Case Study of Mambolomoka Ward, Shangombo District

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Abstract

This study, Assessed the Effects of Human-Wildlife Conflict on Crop Yield and Household Food Security in Mambolomoka Ward, Shangombo District," explored the extent to which human-wildlife conflict (HWC) affects smallholder farmers and their livelihoods in rural Zambia. HWC has become a growing global concern, and in Zambia it is particularly severe in areas adjacent to protected zones where agriculture remains the primary livelihood activity. Despite the existence of the Zambia Wildlife Act No. 14 of 2015, local farming households continue to face repeated destruction of crops by elephants, hippos, and primates, undermining both food security and income stability. While policies and frameworks exist, rural households still experience persistent crop losses without meaningful compensation or adequate support systems, leaving them highly vulnerable. The study aimed to identify the types and frequency of HWC incidents, assess their impacts on crop yield and food security, and evaluate coping mechanisms and policy interventions. Employing a descriptive survey design, data were collected using structured questionnaires, semi-structured interviews, and focus group discussions with farmers, community leaders, agricultural officers, and officials from the Department of National Parks and Wildlife. Purposive sampling targeted individuals directly affected by HWC. The findings revealed that 78% of respondents reported elephants as the major source of crop destruction, followed by hippos at 56% and primates at 42%. Maize and vegetable fields were the most affected, with 84% of households indicating they had reduced or abandoned cultivation due to repeated damage. Overall, 72% of households experienced severe food insecurity, with 65% reporting a decline in annual income as a direct result of wildlife incursions. Coping strategies included selling livestock (47%), buying food from markets (62%), borrowing from neighbors (39%), and relying on relief food (28%), although these measures were unsustainable and often increased long-term vulnerability. The study concludes that policy enforcement and compensation mechanisms remain weak, contributing to the persistence of the problem. Recommendations include strengthening community-based wildlife committees, enhancing compensation and insurance schemes, training farmers on sustainable land-use practices and wildlife management, and promoting alternative livelihoods such as poultry rearing, bee-keeping, and small-scale irrigation. Addressing human-wildlife conflict in Mambolomoka requires integrated and participatory approaches that balance biodiversity conservation with improved household resilience and food security.

Keywords: Human-Wildlife Conflict, Crop Yield, Food Security, Livelihoods, Effects, Wildlife Management

1. Introduction

Human-wildlife conflict (HWC) has become one of the most pressing challenges in rural development, conservation, and food security discourses across the globe. HWC referred to negative interactions between humans and wildlife, often resulting in loss of crops, livestock, property, and sometimes human life (Nyhus, 2016) [37]. According to Gandiwa *et al*. (2019), human-wildlife conflict typically arose when growing human populations expanded into wildlife habitats, increasing competition over land, water, and food resources. Wildlife species, in turn, raided crops, destroyed property, or attacked humans as they sought to meet their survival needs in increasingly fragmented ecosystems.

Globally, HWC it has been recognized as a critical threat to biodiversity conservation and sustainable rural development. The United Nations Environment Programme (UNEP, 2021) stated that "conflict between humans and wildlife had become more frequent and severe" due to rapid land-use changes, climate change, and human encroachment into wild habitats. In Asia and Africa, particularly, elephants, hippos, lions, and primates had been identified as major conflict species affecting agricultural

communities (Hirsch *et al*., 2021). Crop raiding by elephants in India, Zimbabwe, and Zambia had resulted in significant household food insecurity, driving affected farmers into poverty (Shaffer *et al*., 2019).

In Africa, the situation mirrored global trends but with distinct localized intensities. Southern Africa, where countries like Zambia are located, had recorded increasing incidents of human-wildlife conflicts, particularly around protected areas and game management zones (GMAs) (Chansa and Milanzi, 2021). Wildlife movements, driven by seasonal migrations or search for food, often brought them into direct contact with farming communities, leading to frequent crop destruction and household food insecurity. Mambolomoka Ward in Shangombo District, being adjacent to protected ecosystems, experienced such conflicts regularly, with elephants, hippos, and monkeys causing devastating losses to subsistence farmers.

Policy frameworks addressing human-wildlife conflict at both global and local levels had evolved significantly. The Convention on Biological Diversity (CBD) urged signatories to integrate human-wildlife conflict management into national biodiversity strategies (CBD, 2018). Locally, Zambia's Wildlife Act No. 14 of 2015 mandated the Zambia Department of National Parks and Wildlife (DNPW) to implement conflict mitigation measures, including community sensitization, problem animal control, and benefit-sharing mechanisms with affected communities (Republic of Zambia, 2015). However, practical implementation had often been constrained by inadequate resources, lack of coordinated land-use planning, and limited community participation (Ngoma *et al*., 2022).

The nexus between conservation and development had been a central debate within human-wildlife conflict literature. Conservationists argued for the protection of endangered species and ecosystems, while rural development practitioners emphasized the need to safeguard the livelihoods of communities dependent on agriculture (Groom and Harris, 2019). Critics such as Pooley *et al*. (2021) pointed out that "without integrating local livelihood concerns into conservation planning, human-wildlife conflict interventions would remain ineffective and unsustainable." Hence, achieving coexistence between people and wildlife required innovative approaches balancing ecological needs with socio-economic realities.

Various perspectives had emerged regarding the drivers and solutions to human-wildlife conflict. Some scholars highlighted the role of climate change, noting that erratic weather patterns, droughts, and resource scarcity had intensified wildlife incursions into human settlements (Kiffner *et al*., 2020). Others emphasized governance issues, including land tenure insecurity, poor coordination among agencies, and insufficient compensation schemes for affected households (Mkanda and Chansa, 2017). It had been increasingly argued that empowering local communities through participatory conservation, benefit-sharing from tourism revenues, and community-based natural resource management (CBNRM) offered a more sustainable pathway to reducing conflicts (Western *et al*., 2020).

In the Zambian context, human-wildlife conflict not only reduced crop yields but also directly threatened household food security and income stability. According to Mwitwa *et al*. (2020), many rural households near protected areas experienced annual crop losses ranging from 30% to 70%, particularly during peak harvest seasons. This undermined the four pillars of food security: availability, access, utilization, and stability, as defined by the Food and Agriculture Organization (FAO, 2015). Households facing recurrent crop damage often adopted negative coping strategies, such as selling livestock, withdrawing children from school, or migrating, thereby perpetuating cycles of vulnerability.

Given this complex background, it is evident that addressing human-wildlife conflict requires multifaceted strategies informed by local realities. There is need to better understand the specific effects of human-wildlife conflict on crop yields and household food security within affected wards such as Mambolomoka in Shangombo District. Such an understanding would provide critical insights for policymakers, conservationists, and development practitioners in designing interventions that protected both human well-being and wildlife conservation objectives.

1.1 General Objective

To assess the effects of human-wildlife conflict on crop yield and household food security in Zambia.

1.1.1 Specific Objectives

1. To identify the types and frequency of human-wildlife conflicts affecting crop production in Mambolomoka Ward.
2. To assess the effects of human-wildlife conflict on household food security and livelihoods in affected communities.
3. To evaluate community coping strategies and the effectiveness of existing policy interventions in managing human-wildlife conflict.

1.2 Theoretical Framework

This study will adopt the Human-Wildlife Conflict (HWC) Theory as the guiding framework to examine the interactions between human populations and wildlife in Mambolomoka Ward. The HWC Theory explains that conflicts arise when expanding human activities such as agriculture, settlement, and resource extraction overlap with wildlife habitats and migratory routes. These overlaps often lead to negative outcomes including crop damage, livestock predation, property destruction, and occasional injury or death to humans (Nyhus, 2016) [37]. In retaliation, affected communities may harm or kill wildlife, which poses significant challenges to conservation efforts (Pooley *et al*., 2021). The theory also identifies key drivers of conflict such as rapid population growth, deforestation, habitat fragmentation, climate change, and inadequate policy enforcement, particularly in rural and protected areas (Chansa & Milanzi, 2021). By framing human-wildlife conflict as both an ecological and socio-economic problem, the theory acknowledges the complex and multi-dimensional nature of these interactions.

The relevance of the Human-Wildlife Conflict Theory to this study is that, it provides a comprehensive lens to analyze the specific challenges faced by smallholder farmers in Mambolomoka Ward, Shangombo District. The first research objective, which seeks to identify the types and frequency of conflicts affecting crop production, is supported by the theory's emphasis on ecological drivers such as habitat overlap and seasonal wildlife behavior. For the second objective, which examines the effects of conflict on household food security and livelihoods, the theory's

focus on socio-economic vulnerabilities including poverty, land tenure insecurity, and lack of adequate support systems helps explain why rural communities are particularly susceptible to food insecurity following wildlife incursions. The third objective, evaluating coping strategies and policy interventions, aligns with the theory's call for integrated solutions that address both conservation and community needs through participatory governance and sustainable resource management.

By adopting the Human-Wildlife Conflict Theory, this study not only contextualizes the immediate impacts of wildlife on rural livelihoods but also highlights the importance of addressing underlying systemic factors to achieve sustainable coexistence. The theory advocates for approaches that combine land-use planning, community engagement, and adaptive management to mitigate conflict while promoting biodiversity conservation. In the context of Mambolomoka Ward, this means recognizing the interdependence of wildlife conservation and rural development, and ensuring that policies and coping mechanisms are inclusive, context-specific, and equitable. Thus, the theory provides a robust foundation for analyzing the complex dynamics of human-wildlife interactions and developing informed interventions that support both ecological sustainability and the socio-economic well-being of affected households.

2. Literature Review

2.1 Types and Frequency of Human-Wildlife Conflicts Affecting Crop Production

Human-wildlife conflict has emerged as a significant global challenge, posing serious risks not only to human populations but also to the survival of various endangered species including lions, elephants, leopards, crocodiles, and bears (Bhattacharjee & Parthasarathy, 2013). These conflicts are primarily triggered when wildlife and humans compete for the same natural resources, particularly in regions bordering protected areas where interactions are more frequent. According to Jhamvar-Shingote and Schuett (2013), the consequences of such interactions can be severe, ranging from emotional distress and fear to actual physical harm and fatalities. Young *et al*. (2010) emphasize that human-wildlife conflicts often stem from socio-economic inequalities and power dynamics between stakeholders, with wealthier individuals often displaying more tolerance, while poorer communities may express greater hostility (Dickman, 2012). Skogen *et al*. (2008) expand this view by explaining that unequal power relations can deepen resentment toward wildlife among rural populations, which may also reflect broader societal tensions.

The impact of HWCs on human beings includes direct negative impacts and indirect behavioural impacts and has always been a key issue of academic concern. The direct negative effects of HWCs on human life include the destruction of crops, including commercial crops (reducing the productivity of cultivated land), the killing of livestock, the destruction of houses, and attacks on humans (Gross *et al*., 2021). However, from the perspective of impact heterogeneity, HWC has a greater direct impact on low-income groups (Gross *et al*., 2021). There are many indirect effects of HWCs on human life. For example, (Gross *et al*., 2021) increased damage to ecosystems, especially the hunting of wildlife, occurs because for farmers who experience HWCs, protection is more passive. The increase in the labor intensity and risks of agricultural operations makes farmers more psychologically and physically vulnerable (Khumalo, K, *et al*., 2015).

Across the African continent, human-wildlife conflict (HWC) has become a significant challenge, particularly in and around protected areas. It refers to interactions between people and wild animals that result in harm to either party, often leading to socio-economic and ecological consequences (Singh & Singh, 2023). The root cause of this rising conflict is closely linked to growing human populations, which have led to the rapid expansion of settlements, agriculture, and other land uses into wildlife habitats (Singh & Singh, 2023). In Ethiopia, where over 80% of the population resides in rural areas and relies heavily on small-scale, subsistence farming, access to natural resources is crucial for survival and daily livelihoods (CSA, 2015; Temesgen, 2017; Zerihun *et al*., 2018). Within Bale Mountains National Park, human encroachment through activities such as illegal grazing, deforestation, poaching, and cultivation has led to significant habitat degradation, intensifying human-wildlife interactions and resulting in escalating conflict (Temesgen, 2015).

In Zambia Habitat fragmentation, settlements and fast growing human population are reducing wildlife habitats (Amaja *et al*., 2016). The habitat fragmentation experienced in most developing countries is increasing the interactions between humans and animals (Milupi *et al* 2022). For example, communities surrounding the South Luangwa National Park often face huge losses due to elephant conflicts caused by farming activities such as prevalent in the area. In 2017, Zambia recorded a total of 6,085 reports of HWC across the country (MTA, 2018). The major types of wildlife damage on the human being in Zambia comprise livestock predation by lions, crop raiding, property damage, crop damage and sometimes killing of humans (Umar and Kapambwe 2020). According to the study by Angela Phiri, (2024) on Causes and Effects of Human-Wildlife Conflict in Zambia, found that the type of human wildlife conflict common in Kakumbi chiefdom include human injuries and loss of life, crop damage and destruction of property by wild animals. The study further showed that the wild animal species which are frequently in conflict with human beings were elephants (Loxodonta Africana's), lions (Panthera Leo), hippos (Hippopotamus amphibious). Monkeys (Cercopithecoidea) and crocodiles (Crocodylidae).

In districts like Shangombo, crop raiding and trampling are reported as the most prevalent forms of human-wildlife conflict affecting agriculture. Mubanga (2020) in his study, noted that farmers in Mambolomoka Ward experience significant losses during the dry season when wildlife moves closer to human settlements in search of food and water. Local reports indicate that some households lose up to 60% of their expected harvest annually due to these wildlife incursions (Chomba, 2012). According to Chansa and Milanzi (2021), wildlife raids on farms occur predominantly during the dry season when natural forage is scarce, compelling animals to seek food in cultivated fields. The magnitude of the problem is reflected in economic terms as well. Estimates suggest that crop losses to wildlife in affected wards can reduce household incomes by 30–50%, further entrenching poverty and food insecurity (Mubanga, 2020). A particularly troubling trend is the lack of adequate compensation mechanisms for affected farmers. As Mubanga (2020) observes, "the compensation framework in

Zambia is largely ineffective, leaving rural farmers to absorb the full brunt of economic losses from wildlife conflict." At the same time, frustration over unmitigated losses has led some farmers to resort to illegal hunting, poisoning, and snaring of problem animals (Mubanga, 2020).

2.2 Effects of Human-Wildlife Conflict on Household Food Security and Livelihoods

Worldwide, subsistence farmers have expressed their concerns about food shortages because of raiding by wildlife (Barua. M *et al*. 2013). Since subsistence homesteads depend mainly on crops they grow for their daily nutrition, a reduction in the food supply could threaten the food sufficiency of homesteads such as the ability to meet consumption needs from their own production (Quirin, C. and Dixon, 2012).

In India's Assam region, incidents of elephants raiding rice fields have caused repeated harvest failures, reducing food availability for thousands of households (Wilson *et al*., 2017). Similarly, in Sri Lanka's dry zones, wild elephants destroy paddy fields, leading to seasonal hunger and pushing many families into chronic food insecurity (Fernando *et al*., 2019). In Southeast Asia, Campos-Arcis and Blake (2017) argue that the Sumatran elephant's habitat has been reduced by over 70% in the past 25 years, leading to an increase in crop raiding that directly undermines local food production. In Latin America, wildlife species such as jaguars, capybaras, and peccaries often invade farms. In Peru, Naughton-Treves *et al*. (2016) found that crop losses from peccary raids can account for up to 30% of annual yields, placing significant stress on local food resources.

In Kenya, for example, the proximity of farmlands to national parks such as Amboseli and Laikipia has made them hotspots for HWC. Okello *et al*. (2021) found that elephants were responsible for substantial crop damage in these areas, with reported losses ranging from 30% to as much as 70% of farmers' yearly harvests. In many rural communities across Ethiopia and other developing countries such as Zambia, livelihoods are primarily sustained through mixed farming systems that integrate crop cultivation with livestock rearing (Ladan, 2014). Given this dependence, any form of destruction caused by wildlife whether to crops or livestock poses serious threats to the economic stability and food security of these households (Lewa *et al*., 2017). Farmers living near protected areas are often forced to stay up through the night or miss out on school, work, and community events in an effort to protect their fields and animals from ntruding wildlife (Mojo *et al*., 2014).

Mekuriaw Zewdie Ayalew (2024) carried out a study titled Effects of human–wildlife conflict on local people's livelihoods and wildlife conservation in and around Alitash National Park, northwest Ethiopia. The research revealed that communities living near Alitash National Park face multiple costs due to ongoing human-wildlife conflict. Based on household estimates, approximately 18.7% of respondents reported losing between 10% and 25% of their crop production to wild herbivores in the twelve months leading up to the study. A smaller fraction, about 2% of surveyed households, indicated even more significant damage, with losses ranging from 51% to 75% of their crop yields during the same period. Human-wildlife conflict around Queen Elizabeth and Murchison Falls National Parks in Uganda, has contributed significantly to food insecurity. Naughton-Treves *et al*. (2020) found that households living within five kilometers of protected areas had 25–30% lower food stocks compared to those living farther away, demonstrating the spatial impact of proximity to wildlife habitats.

Human-wildlife conflict (HWC) significantly undermines food availability in rural Zambia by causing extensive crop destruction and reducing arable land available for cultivation. Nyirenda *et al*. (2020) [36] conducted a study in Shangombo and Sinazongwe Districts, which revealed that over 60% of smallholder farmers reported losing between 25% and 50% of their seasonal crops to wildlife incursions. A local farmer in Mambolomoka Ward poignantly captured this reality by stating, "We plant, but it is the elephants who harvest first" (Nyirenda *et al*., 2020, p. 114) [36]. A major concern raised by Mwape *et al*. (2019) is that wildlife incursions frequently occur during the late stages of crop development, particularly just before harvest, when crops are at their most nutritionally dense and economically valuable. In a study conducted in Sesheke District by Mwape *et al*. (2019) found that approximately 45% of the maize fields surveyed exhibited signs of partial or complete destruction caused by animal incursions.

In Western Province, the frequency and severity of wildlife raids have escalated. Simasiku *et al*. (2020) highlighted that in Kalabo and Shangombo Districts, repeated crop destruction by elephants and hippos has contributed to chronic food shortages. According to their interviews with local agricultural officers, some households lost entire fields overnight, forcing them to rely on humanitarian food relief or expensive imports from distant towns. One agricultural officer noted, "Year after year, farmers lose everything; they no longer have enough food to last the dry season" (Simasiku *et al*., 2020, p. 98). Chansa and Mwima (2016) similarly found that in the Luangwa Valley, crop losses were often catastrophic. They recorded that 70% of farmers in the Mfuwe area experienced total maize loss at least once every three years. Chansa and Mwima (2016, p. 213) explained, "For many villagers, farming is a gamble the outcome depends less on skill and more on whether the wildlife will come that year."

A study by Muyoma Philip James (2016) on the Hidden Costs of Human-Wildlife Conflict in Mukungule, Mpika District, Zambia revealed that wildlife-induced crop losses have far-reaching socioeconomic consequences for rural farming households. Muyoma's study documented that, on average, each maize field in the study area lost approximately 15 bags of maize per crop season, with each bag weighing 50 kilograms. Given the government-fixed maize price of ZMW 65.00 per 50 kg during the 2013 and 2014 seasons, this translated to a financial loss of ZMW 975.00 per field per season. The study also found that, Household food insecurity is also a major problem in Mukungule GMA and crop raiding by wildlife often leads to large reductions in harvests (Muyoma Philip James, 2016). Most of the respondents (84%) reported food shortages, and during the wet season, people mostly rely on wild vegetables which are low in nutrition to supplement their diet. This household food insecurity may also prompt early harvesting of maize before it dries fully so it can be ground into mealie meal. Food shortages may have resulted in hidden costs such as malnutrition and poor health, especially among smaller children who may then have stunted growth (Muyoma Philip James, 2016).

Like many other communities coexisting with wildlife,

residents of Mukungule GMA guard their crops in an effort to protect them from wildlife. These practices increase the exposure of many people to mosquitoes that carry malaria (Osborn and Hill, 2005), not only increasing the risk of contracting malaria but also increasing the number of cases of malaria locally. Another hidden cost flowing from guarding crop fields is absenteeism from school because children are required to participate in guarding duties (Muyoma Philip James, 2016). From his study (Muyoma Philip James, 2016), he noted that a total of 77.5 per cent of all the respondents in the household surveyed and all participants in all the three FGD conducted, were of this view. Teachers Chishala Cluster who were part of the FGD confirmed that school attendance by pupils reduces during the guarding period, which leads to poor performance and the eventual drop out from school.

2.3 Community Coping Strategies and Effectiveness of Existing Policy Interventions in managing human-wildlife conflict

Compensation payments in India originated to preserve large charismatic species like the tiger and elephant, which became flagships for conservation efforts in the 1970s and 1990s respectively (Johnson *et al*., 2018). The Indian government considers compensation as an important policy tool that can mitigate economic losses while potentially reducing retaliation and promoting tolerance for wildlife (MOEF, 2015). In reality, the joint federal and state management of wildlife, reserves, and resources is contentious, with states often ignoring federal authority in decision-making. Individual state forest and wildlife departments manage compensation payments on a case-by-case assessment, situated within a broader framework of state-specific and national guidelines (Karanth *et al*., 2013).

Non-lethal methods of conflict management are diverse and include acoustic, visual, biological, and chemical deterrents designed to discourage wildlife from entering areas of human activity. Anecdotal evidence from villages bordering the Indian Sundarbans suggest that solar-powered lighting systems deterred tigers from entering their grounds and similar LED lighting systems were successful in the short term at reducing predation by lions in Amboseli, reducing livestock losses by over four times (Okemwa *et al*., 2018). However, as stated by Hoare (2015), deterrents are often touted as the 'new single solution' and are therefore much hyped by NGOs and the media, despite insufficient empirical evidence. Several scholars agree that, while the use of deterrents like Chilli and bee-hive fences are effective to a point, alone they are not sufficient as a conflict management tool and are therefore most successful when used in conjunction with other measures, such as guarding (Okemwa *et al*., 2018). The cost of maintenance is often difficult for some communities to absorb, which can reduce compliance and therefore overall effectiveness (Hoare, 2015; Holland, Larson and Powell, 2018; Guerra, 2019). Wildlife may become habituated, and, especially in the case of AHDs, deterrents may affect non-target species (Shaffer *et al*., 2019).

Methods that rely on land-use or land management changes are developed on the assumption that most negative human–wildlife impacts occur where the two geographically overlap (Sitati *et al*., 2003; Margulies and Karanth, 2018). These include zonation, where land is designated for specific uses (e.g. protected area or heavy resource use) or seasonal closures according to species ecology, wildlife corridors, or habitat modification where features considered to be attractive to wildlife are removed, such as watering holes or vegetation (Lewis *et al*., 2015). Evaluations of such approaches are hard to come by, as many exist as theoretical models (Schuette *et al*., 2013). Effectiveness is sometimes linked to the gains or losses afforded to local people from protected areas. Evidence suggests communities will be more supportive and tolerant if additional economic benefits are received, yet if severe losses are incurred, then implementation becomes politically difficult (Holland, *et al*., 2018).

Research into animal movements, behaviors and ecologies can be used as tools to prevent negative human–wildlife impacts and have been utilized in Zimbabwe to better manage conflict over lions and other predators (Loveridge *et al*., 2017). Similarly, technological detection methods, such as radio collars, drones and acoustic analysis, have enabled predators to be mapped, and early warning systems to be put in place (Weise *et al*., 2019). However, most of these methods rely on advanced technology that can be mistrusted or misunderstood by non-scientists and introduce feelings of resentment or disempowerment. A possible way to overcome this challenge is to use citizen science as a means of surveillance, such as the Shark Spotters programme in False Bay, South Africa, which has been highly effective at reducing shark attacks on beachgoers (Engelbrecht *et al*., 2017). Weise *et al*. (2019) also supported the use of social science to check in with local communities when implementing early warning or alert systems that require compliance and adapt technology and training according to local needs.

The African Union's "African Strategy on Combating Illegal Exploitation and Illegal Trade in Wild Fauna and Flora" (2015) acknowledges that HWC can fuel resentment towards wildlife and undermine conservation efforts, thus calling for integrated strategies that address community welfare alongside anti-poaching measures. Similarly, the Southern African Development Community (SADC) has articulated frameworks through the SADC Protocol on Wildlife Conservation and Law Enforcement (revised 2015), which urges member states to develop cross-border management plans for transboundary species, especially elephants, that often trigger conflict as they migrate between countries. Chomba *et al*. (2017) highlight how in regions like the Kavango-Zambezi Transfrontier Conservation Area (KAZA TFCA), collaborative approaches to HWC are being promoted, although differences in national capacities and policy priorities sometimes weaken their effectiveness. In Botswana, the Community-Based Natural Resource Management policy has been relatively successful, with programs like the Okavango Community Trust allowing communities to benefit directly from tourism revenues, thereby increasing tolerance for wildlife even amid conflict (Mbaiwa, 2018). However, in countries like Mozambique and Angola, weak governance structures have impeded similar initiatives from achieving their intended goals, as observed by Lindsey *et al*. (2017). These regional dynamics illustrate that while policy frameworks have advanced, effective implementation requires strong institutions, community engagement, and sustained financial support.

In Zambia, traditional coping strategies against human-wildlife conflict (HWC) remain essential, particularly in rural communities like Mambolomoka Ward in Shangombo

District, where livelihoods are heavily dependent on subsistence farming. One of the most widely practiced strategies is field guarding. According to Simasiku *et al*. (2017), in areas bordering Sioma Ngwezi National Park, including Mambolomoka, villagers consider night guarding indispensable despite the numerous risks involved, such as dangerous encounters with elephants and the physical toll of extended vigilance without rest. Scare tactics form another cornerstone of traditional defenses in Zambian rural communities. Research by Chomba *et al*. (2016) around Lower Zambezi National Park found that such methods had mixed success; while smaller animals like warthogs and baboons could be temporarily frightened, larger mammals like elephants quickly habituated to these deterrents. Building physical barriers using locally available materials is another traditional practice. However, as Musamba and Chansa (2015) argued that, communities around Kafue National Park, these traditional fences are largely ineffective against determined elephants, who easily push through or trample such barriers. Use of dogs as early warning systems remains a widespread coping mechanism in Shangombo District and similar regions in Zambia. According to a survey by Lupupa *et al*. (2016) conducted near Lukusuzi National Park, communities that used dogs reported slightly fewer crop losses compared to those without canine guards. In terms of agricultural strategies, crop diversification and the planting of unpalatable buffer crops like chili peppers have become increasingly common in Zambia.

2.4 Literature Gap

Despite the expansion of national and international frameworks aimed at mitigating human-wildlife conflict (HWC), significant implementation gaps remain in Zambia. Mwape *et al*. (2021) highlight that rural farmers who are most affected by wildlife incursions often lack awareness of legal protections and available mitigation strategies, relying instead on under-resourced NGOs and local authorities. The absence of technical support and structured intervention programs exacerbates the disconnect between policy intentions and practical realities. One of the most pressing gaps is the lack of a formal national compensation mechanism for wildlife-induced damages. Although Zambia's Wildlife Act allows for compensation claims, implementation is minimal. In contrast, Kenya's structured compensation model introduced in 2016 offers affected communities timely and consistent financial redress (Western *et al*., 2020). Zambia's failure to institutionalize similar systems leaves farmers vulnerable, leading to retaliatory actions and unsustainable livelihood shifts.

Another gap is that existing policy frameworks largely ignore indigenous knowledge systems that could strengthen conservation efforts. As Nyirenda and Zulu (2020) argue, traditional early-warning signals, land-use adjustments, and natural deterrents remain excluded from official strategies, weakening the relevance and effectiveness of imposed solutions. At the regional level, legal systems shaped by colonial conservation ideologies continue to prioritize wildlife over local livelihoods, creating conflict between authorities and communities (Mandisodza, 2018). Furthermore, most HWC research in Zambia has concentrated on high-conflict areas such as South Luangwa and Kafue, with limited attention given to under-researched regions like Mambolomoka Ward in Shangombo District. These areas, with their distinct socio-economic and ecological dynamics, lack empirical studies that address the interconnectedness of crop damage, food insecurity, coping strategies, and policy responses. This study seeks to fill these gaps by investigating the impact of HWC on agricultural livelihoods and food security in Mambolomoka Ward, while critically assessing the effectiveness of current mitigation measures and their alignment with community needs.

3. Research Methods

3.1 Research Design

This study adopted a descriptive survey design to investigate the effects of human-wildlife conflict on crop yield and household food security in Mambolomoka Ward, Shangombo District. The descriptive approach was selected because it allows for an in-depth examination of the existing situation without manipulating variables. As Kothari (2017) noted, descriptive surveys are useful for gathering information about people's perceptions, attitudes, and practices in a natural setting.

3.2 Target Population

The target population refers to all individuals or groups relevant to the study who possess the characteristics necessary for providing information on the research problem (Creswell & Creswell, 2018) [15]. For this study, the target population was smallholder farmers in Mambolomoka Ward, Shangombo District, who had experienced human-wildlife conflict, particularly through crop raiding, trampling, and other wildlife-induced damages.

This study targeted local leaders, ward agricultural officers, and officials from the Department of National Parks and Wildlife (DNPW). These groups were selected because of their firsthand knowledge of the frequency, impacts, and management of human-wildlife conflict within the community. Their diverse perspectives are crucial for providing a comprehensive understanding of the problem.

3.3 Sampling Techniques

The study utilized a purposive sampling technique to select respondents who have direct and recent experience with human-wildlife conflict. This non-probability sampling method allows the researcher to deliberately choose individuals who are most knowledgeable about the research topic and can provide rich, detailed information relevant to the study objectives (Etkin *et al*., 2016) [18].

3.4 Sample Size

A total of 50 households was selected proportionally across the villages in Mambolomoka Ward to ensure broad representation. Additionally, 5 to 8 key informant interviews were conducted with local leaders, agricultural extension officers, and officials from the Department of National Parks and Wildlife (DNPW). This approach ensured that both household-level experiences and institutional perspectives are captured in the study.

3.5 Data Collection Methods

Data for the study was collected through a combination of structured questionnaires, semi-structured interviews, and focus group discussions (FGDs). The structured questionnaires were administered to selected households to collect quantitative data on the types and extent of human-wildlife conflict, crop losses, and household food security

levels. Semi-structured interviews were conducted with key informants to gather qualitative insights into policy interventions, traditional coping strategies, and wildlife management practices. Focus group discussions was further enrich the data by allowing community members to share collective experiences and perspectives. This multi-method approach ensured that both numerical trends and deeper community narratives are captured, providing a comprehensive understanding of the human-wildlife conflict situation in Mambolomoka Ward.

3.6 Data Analysis Methods

Data collected from questionnaires was analyzed using descriptive statistics such as frequencies, percentages, and mean scores to summarize household experiences of human-wildlife conflict and its impacts on food security. The quantitative data were coded and processed using STATA software to generate clear tables, graphs, and charts for easy interpretation. Qualitative data from interviews and focus group discussions was analyzed using thematic analysis. This involved transcribing the discussions, organizing data into key themes and patterns, and interpreting them in relation to the research objectives. This mixed analysis approach provided both statistical trends and deeper contextual understanding of the situation in Mambolomoka Ward.

3.7 Triangulation

Triangulation is a research strategy that involves the use of multiple methods, data sources, investigators, or theoretical perspectives to cross-check and validate findings (Carter *et al*., 2017) [11]. It strengthens the credibility, accuracy, and depth of a study by ensuring that the research conclusions are not solely dependent on a single method or source of information. Triangulation is particularly important in field-based studies where complex social and environmental interactions are being examined. In this study, triangulation was achieved by combining structured questionnaires, semi-structured interviews, and focus group discussions. Information gathered from households, local leaders, agricultural officers, and wildlife officials will be compared to identify consistencies and differences. By verifying data from different sources and methods, the research produced a more reliable and well-rounded understanding of how human-wildlife conflict affects crop production and household food security in Mambolomoka Ward.

4. Findings and Results

4.1 Characteristics of Respondents (Bio Data)

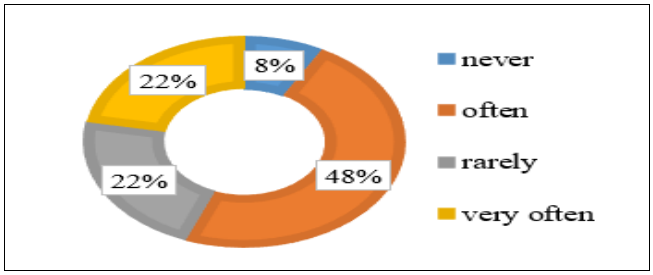
For the study, 54% of the respondents were male, while 46% were female. This distribution indicates that the study captured views from both genders in almost equal proportions, with a slight male dominance. Age wise for the study largest proportion of respondents (42%) were aged between 31–40 years, followed closely by those aged 21–30 years at 40%. Respondents aged 41–50 years accounted for 18% of the sample. This distribution shows that the majority of participants were in their productive and economically active age groups, suggesting that the impact of human–wildlife conflict is mostly felt by households that rely heavily on farming for their livelihoods.

Majority of respondents (24) had attained primary education, followed by 11 with secondary education and 9 with tertiary education. A smaller number, 7 respondents, reported having no formal education. This indicates that most participants had at least basic literacy, which is important in understanding and adopting wildlife conflict mitigation strategies. Majority of respondents (64%) were subsistence farmers, highlighting the community's heavy reliance on agriculture for livelihood. Civil servants accounted for 18% of respondents, while 10% combined both subsistence farming and civil service work. A smaller proportion (8%) were engaged in commercial farming.

Also 42% of the respondents had between 6–10 years of farming experience, while 34% had more than 10 years of experience. Only 24% had 1–5 years of experience. This indicates that most respondents were experienced farmers, which strengthens the reliability of their responses regarding the impacts of human–wildlife conflict on crop yield and food security.

Most respondents (26) owned farms ranging from 1–3 hectares, while 17 respondents had farm sizes between 4–6 hectares. A small proportion reported having farms above 6 hectares (4) and less than 1 hectare (3). This distribution indicates that the majority of farmers in the study area operate on small to medium-sized landholdings, which may heighten their vulnerability to human–wildlife conflict, as crop losses on limited land directly threaten household food security and income.

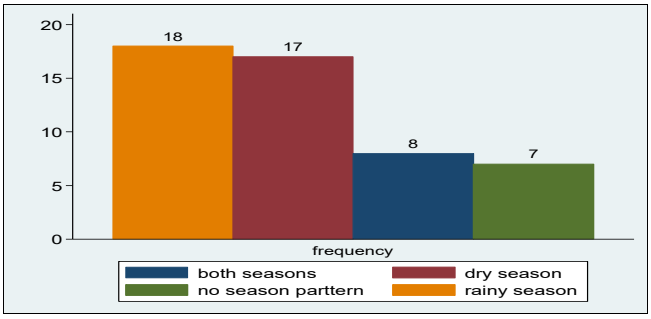
4.2 Presentation of Results on Types and Frequency of Human-Wildlife Conflicts Affecting Crop Production in Mambolomoka Ward



Source: Primary Data

Fig 1.1: How Often the Wild Animals Visited the Field or Farm in Past 12 Months

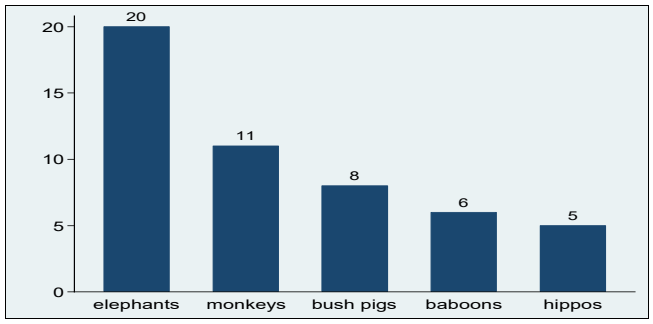
The results from Fig 1.1 above indicated that the majority of respondents (48%) reported that wild animals often visited their fields in the past 12 months, while 22% indicated very often. This means that about 70% of the households experienced frequent wildlife incursions within a year. Only 22% reported rare visits, and a small proportion (8%) said they had never experienced such incidents.



Source: Primary Data

Fig 1.2: The Season During Which Wild Animal Mostly Invade the Field or Farm

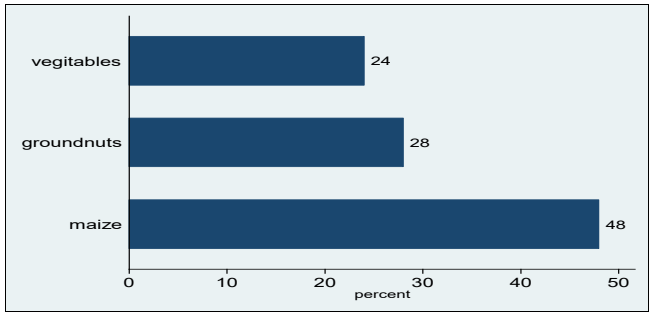
According to our findings on The Season During Which Wild Animal Mostly Invade the Field or Farm, it indicate that wild animals in Mambolomoka Ward invaded fields during both the rainy and dry seasons, but with slight differences in frequency. Specifically, 18% of respondents reported the rainy season as the period of most frequent wildlife activity, 17% indicated the dry season, 8% experienced invasions in both seasons, and 7% reported no clear seasonal pattern.



Source: Primary Data

Fig 1.3: Types of Wild Animals Commonly Invade the Field or Farm

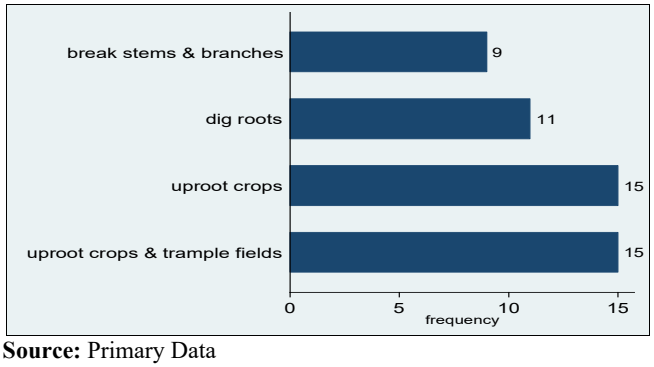
The findings on the types of wild animals most frequently reported to invade fields or farms in Mambolomoka Ward is displayed on Fig 1.3. According to respondents, frequencies of different wildlife incursions were as follows: frequency (likely elephants) – 20 respondents, monkeys – 11, bush pigs – 11, baboons – 6, and hippos – 5.



Source: Primary Data

Fig 1.4: Specific Crops Mostly Destroyed by the Wild Animals

According to our findings on Specific Crops Mostly Destroyed by the Wild Animals, maize was the most affected crop, with 48% reporting damage, followed by groundnuts at 28%, and vegetables at 24%.

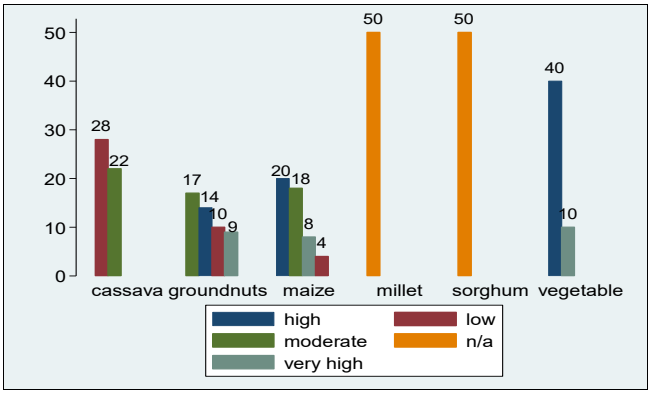


Source: Primary Data

Fig 1.5: Ways in Which the Crops are Being Damaged by Wild Animals

The results from Fig 1.6 reveal the different ways crops are destroyed by wild animals in Mambolomoka Ward. According to respondents, the most common forms of damage were uprooting crops and trampling fields (15), uprooting crops alone (15), digging up roots (11), and breaking stems and branches (9).

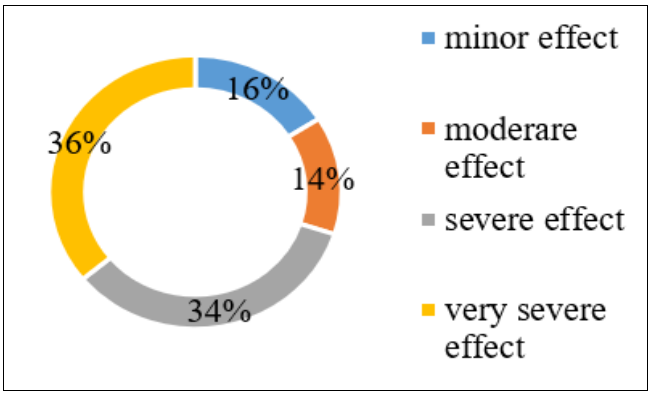
4.3 Presentation of Information on Effects of Wildlife Conflict on Household Food Security and Livelihood in Affected Communities



Source: Primary Data

Fig 1.6: Severity Rating of Crop Loss Due to Wild Animals Invasion of Field or Farm

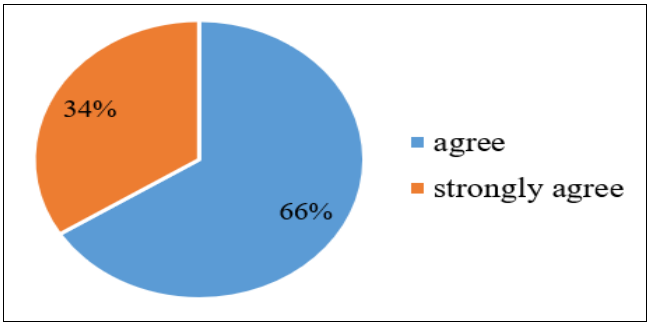
The results from Fig 1.6 illustrate how respondents rated the severity of crop losses caused by wild animal invasions across different crop types. For cassava, 28 respondents rated losses as low and 22 rated them as moderate. For groundnuts, 17 rated them moderate, 14 low, 10 high, and 9 very high. For maize, 20 respondents indicated high losses, 18 moderate, 8 low, and 4 very high. Millet and sorghum were marked as not applicable by 50 respondents each, showing that either these crops are not widely cultivated in Mambolomoka Ward or are rarely targeted by wildlife. For vegetables, 40 respondents rated the damage as very high and 10 as moderate.



Source: Primary Data

Fig 1.7: Extent to Which Crop Loss by Wild Animals Affects Household Food Security

The majority of respondents reported that the effect was very severe (36%) or severe (34%), meaning that 70% of households experienced major disruption to their food supply as a result of these losses. A smaller proportion reported moderate effects (14%), while only 16% indicated minor effects.

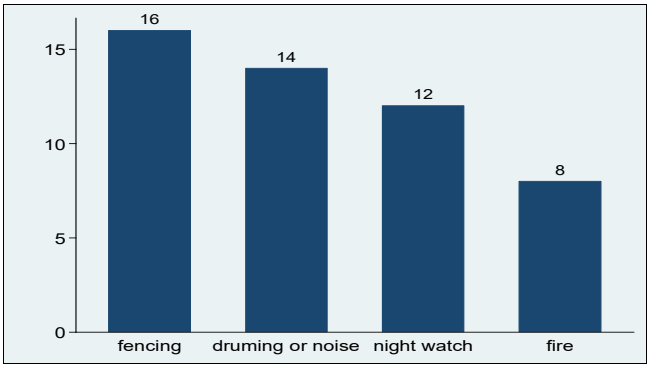


Source: Primary Data

Fig 1.8: How the Respondent Agree with the Notion "Human-Wildlife Conflict Undermines Local Economic Development"

The results reveal a strong consensus among respondents regarding the broader economic implications of human-wildlife conflict. A total of 66% strongly agreed and 34% agreed with the statement that wildlife conflict undermines local economic development.

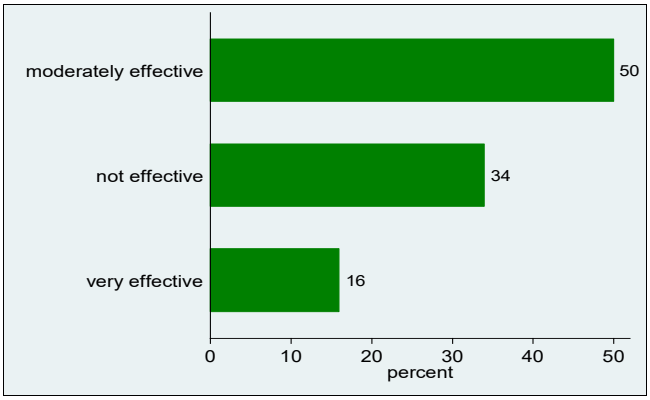
4.4 Presentation of Results on Community Coping Strategies and the Effectiveness Existing Policy Intervention in Managing Human-Wildlife Conflict



Source: Primary Data

Fig 1.9: Figure 4.22: Methods Used to Protect Crop from Wild Animals

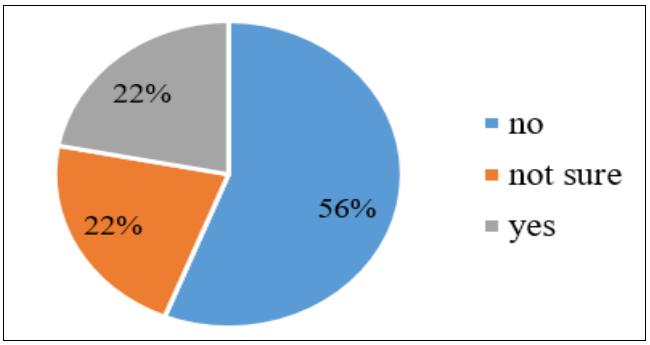
The most common strategy was fencing, adopted by 16 households. This was followed by drumming or creating noise, reported by 14 households, while 12 respondents indicated using night watch as a protective measure. The least used method was setting fire, which was mentioned by 8 households.



Source: Primary Data

Fig 1.10: Effectiveness of the Methods Used to Reduce Wild animal Invasion into the Farm or Field

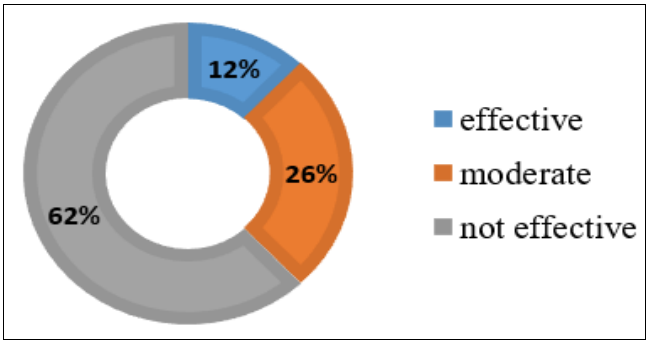
The findings indicated that 50% of respondents rated the methods as moderately effective, while 34% reported that these methods were not effective. Only 16% of the respondents considered the measures to be very effective in mitigating wildlife intrusion.



Source: Primary Data

Fig 1.11: Are There any Community-Level Measure to Address Human-Wildlife Conflict in the Area

The majority, 56% of respondents, indicated that no such measures exist, while 22% reported that measures are in place, and another 22% were not sure about their existence.



Source: Primary Data

Fig 1.12: Rating on the Effectiveness of the Programs to Address the Human-Wildlife Conflict in the Area

As shown the pie chart above, regarding the effectiveness of programs implemented by government or NGOs to address human-wildlife conflict in the area. The findings reveal that 62% of respondents considered the programs as not effective, 26% rated them as moderately effective, and only 12% perceived them as effective.

4.5 Discussion of Results

The study assessed the effects of human-wildlife conflict (HWC) on crop yield and household food security in Mambolomoka Ward, Shangombo District. The findings reveal that human-wildlife conflict remains a major challenge for agricultural productivity and food security in the area. The discussion integrates these findings with existing literature and theoretical perspectives to provide a comprehensive understanding of the observed trends.

The results indicated that crop raiding was the most common form of human-wildlife conflict experienced by farmers. Elephants and hippos were identified as the primary culprits responsible for destroying crops, consistent with studies by Longhurst *et al*. (2016) that highlighted elephants as major contributors to crop damage in African rural communities. The frequency of wildlife visits was reported

as “often” or “very often” by a significant proportion of respondents, suggesting persistent threats during the farming season. This aligns with Parker *et al*. (2019), who found that repeated wildlife incursions create cumulative losses, significantly reducing household resilience.

The majority of respondents reported that wildlife damage resulted in substantial reductions in crop yield, leading to food shortages and economic strain. This aligns with the work of Nyirenda *et al*. (2018), who observed that crop damage from wildlife directly undermines household food security and income, pushing communities into cycles of poverty and vulnerability. In Mambolomoka Ward, maize a staple crop was the most affected, which resonates with studies in other Zambian rural settings where cereal crops are targeted due to their availability and nutritional value.

The study also found that most farmers used traditional methods such as guarding fields, making noise, and using fire to deter wildlife. While these measures provided temporary relief, their effectiveness was limited, as noted by Hoare (2015), who argued that traditional deterrents often fail against persistent species such as elephants. Few respondents reported using modern techniques like chili fences or beehive fences, mainly due to lack of resources and knowledge. This reflects findings from Mutanga *et al*. (2020), who identified high costs and lack of extension support as barriers to adopting innovative conflict mitigation strategies in rural areas.

Community-level measures to address HWC were reported by only a minority of respondents, and most of these measures were perceived as inactive or ineffective. This result mirrors observations by Chomba *et al*. (2017), who noted that community-based interventions often fail due to weak coordination and lack of resources. Additionally, although some respondents were aware of government and NGO programs targeting human-wildlife conflict, the majority rated these initiatives as ineffective. This finding is consistent with Lindsey *et al*. (2017), who argue that insufficient funding and lack of community involvement often hinder the success of conservation programs.

The findings correspond with global and regional studies that highlight the multifaceted nature of human-wildlife conflict and its severe implications for rural livelihoods (Distefano, 2018). In Zambia, despite policies under the National Parks and Wildlife Act aimed at mitigating such conflicts, implementation remains weak at the grassroots level. The study demonstrates that in the absence of strong institutional support, rural communities continue to bear the burden of wildlife conservation efforts without adequate compensation or protection.

The persistent nature of wildlife incursions and the inadequacy of existing mitigation strategies pose significant threats to food security and rural livelihoods in Mambolomoka Ward. These findings highlight that human-wildlife conflict is not merely an environmental issue but a complex socio-economic challenge that undermines agricultural productivity and household resilience. Farmers in the area experience recurrent crop losses, which directly reduce their income and exacerbate poverty, creating a cycle of vulnerability that is difficult to break. The situation is worsened by the absence of structured compensation schemes and limited government interventions, leaving communities to bear the economic burden of wildlife damage. This often forces farmers to adopt negative coping mechanisms, such as reducing the size of cultivated land, switching to less profitable crops, or engaging in charcoal production, which further contributes to environmental degradation.

The findings further suggest that the current top-down approach to conflict mitigation, which relies heavily on wildlife authorities and NGOs, fails to leverage the potential of community-driven strategies. Local knowledge systems such as traditional deterrents, communal vigilance, and land-use adjustments remain underutilized despite their proven role in reducing crop damage. Incorporating these methods into formal management plans could increase acceptance, cost-effectiveness, and sustainability of interventions. Furthermore, the study reveals that weak institutional frameworks and insufficient technical support create a policy-practice gap that perpetuates HWC. Unlike countries such as Kenya, where compensation schemes and early-warning systems have been institutionalized, Zambia lacks a comprehensive mechanism to cushion affected households against losses.

5. Conclusion

HWC is a significant challenge in the area, primarily caused by elephants, hippos, and monkeys, which frequently invade crop fields. These invasions occur mostly during the crop-growing season, leading to severe yield losses. Approximately 62% of respondents experienced moderate to severe crop damage, resulting in reduced household food stocks and increased vulnerability to food insecurity.

The findings indicated that while farmers employed methods such as fencing, drumming, night watches, and fires, these were only moderately effective (50%) or not effective (34%). Limited access to financial resources and technology further constrained the ability of farmers to adopt advanced protective measures. Additionally, community-level initiatives were minimal and largely inactive, with 56% of respondents reporting no organized interventions. Although some government and NGO programs exist, their effectiveness was rated as low (62% ineffective), highlighting weak institutional support.

Hence the study has argued that HWC remains a critical barrier to sustainable agriculture and rural livelihoods in Mambolomoka Ward. Without comprehensive strategies that integrate traditional practices, modern technology, and strong institutional backing, the problem will persist, exacerbating poverty and food insecurity.

6. Acknowledgement

I acknowledge that the successful completion of this thesis on assessing the effects of human–wildlife conflict on crop yield and household food security would not have been possible without the support and contribution of many individuals and institutions. I acknowledge the guidance and academic supervision provided by my supervisor, whose insights and constructive feedback were critical to shaping this work. I also acknowledge the cooperation of the community members in Shangombo District who generously shared their experiences and information during the data collection process, making this research possible. Furthermore, I acknowledge the encouragement and support of my family, friends, and colleagues, whose patience and motivation gave me strength throughout this academic journey.

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