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Original Article

Understanding the Impact of Crop Raiding by Wild Animals on People's Livelihoods in Sub-Saharan Africa

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Crop Raiding, Human-Wildlife Conflict, Peoples' Livelihoods, Food Security, SDGs.

ABSTRACT

Crop raiding and human-wildlife conflicts are major challenges facing communities adjacent to protected areas in Sub-Saharan Africa (SSA). This has affected the food and income security of inhabitants in such regions. The extent of crop raiding on peoples' livelihoods is not well documented. The aim of the study is to understand the impact of crop raids on people's livelihoods in the SSA region. It was guided by specific objectives, namely; the history of crop raiding, the common animals involved in crop raiding, the causes of crop raiding by wild animals, the effects of crop raiding on people's livelihoods, and lastly, crop protection techniques to reduce the impact of wild animal crop raiding to come up with the implication of the future research and policy implementation. A literature search from 2000 to 2024 was made from Google Scholar, Science Direct and Research Gate search engines using key phrases to get appropriate articles for this review. 120 relevant publications were identified from which 71 closely related publications were scrutinized and used for this article. Results show that crop raiding is the major cause of human-wildlife conflicts that have resulted in severe damage to crops, food insecurity and income insecurity, thus curtailing the development of affected areas. The study concludes that the participation of all relevant stakeholders and enacting and enforcing appropriate policies can reduce the frequency and severity of crop raiding and promote sustainable development. This study addresses SDG 1 (No Poverty) by undermining income generation and increasing vulnerability among rural communities. It also relates to SDG 2 (Zero Hunger) as it disrupts agricultural production, leading to food shortages. SDG 15 (Life on Land) is directly pertinent, aiming to protect ecosystems and biodiversity while mitigating human-wildlife conflicts.

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INTRODUCTION

The aim of the study is to understand the impact of crop raids on people's livelihoods in the Sub-Saharan Africa (SSA) region. It was guided by specific objectives, namely; the history of crop raiding, the common animals involved in crop raiding, the causes of crop raiding by wild animals, the effects of crop raiding on people's livelihoods, and lastly, crop protection techniques to reduce the impact of wild animal crop raiding to come up with the implication of the future research and policy implementation. It addresses several Sustainable Development Goals (SDGs). Firstly, it aligns with SDG 1 (No Poverty) by addressing the economic impact of crop damage on rural communities, which often rely on agriculture for their livelihoods. Crop raiding can exacerbate poverty by reducing income and food availability. Secondly, the study connects with SDG 2 (Zero Hunger) as it highlights how wildlife interference with crops contributes to food insecurity and undermines efforts to achieve food sustainability. Thirdly, SDG 15 (Life on Land) is directly relevant because crop raiding underscores the complex interactions between humans and wildlife, emphasizing the need for conservation efforts that mitigate human-wildlife conflicts. Addressing these challenges through sustainable agricultural practices and wildlife management strategies is essential for achieving these interconnected SDGs in Sub-Saharan Africa (Mperejekumana et al., 2024).

Little efforts have been made to document and understand the effect of crop raiding by wild animals and this has caused famine and low productivity among local farmers. In Africa, more than 80% of the elephant range lies outside protected areas, and farmers and elephants increasingly come into contact (Yaw & Lonneke, 2008). Elephants can completely destroy a small farm in a single night, severely limiting farmers' ability to feed their families and earn income, as well as posing a risk of injury or death (Terada et al., 2021). Rural populations incur the costs of living with elephants and other animals but reap few benefits from activities such as eco-tourism (Milićević et al., 2020). Local farmers in SSA have few options for protecting themselves and their farmland against these animals as the killing of these animals is illegal by international and national laws (Amusan & Ajibola, 2019).

Crop raiding has been identified as a major cause of human-wildlife conflicts and a significant disadvantage to farming near protected areas, uprooting and trampling agricultural cultivars, putting farmers' economic and food security at risk (Natukunda, 2019), (Weinmann, 2018). Some of the most dramatic occurrences, such as locust swarms that ruin significant areas of crops in many regions of Africa, attract widespread media coverage (Joseline, 2010). Crop raiding by vertebrates such as birds and mammals, on the other hand, has been and continues to be a serious problem (Hill, 1997). Human-wildlife conflict is becoming more prevalent, and it has become the focus of current conservation efforts, particularly in protected areas (Redpath et al., 2015; Treves & Santiago-Ávila, 2020). With rising human populations, particularly in SSA, more human and wildlife populations are competing for resources (Almond et al., 2020). This calls for interventions that include local people in close proximity to conservation areas on smart agriculture to reduce crop losses by wild animals.

The impact on natural resources as a result of the rising African population is putting a strain on modern development and conservation goals (Wassie, 2020). Challenges are increasingly arising at the intersection of human and natural systems, complicating the development of a long-

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term solution (Raphela & Pillay, 2021). Prioritizing 'fortress' conservation can deny local populations access to resources critical to their livelihoods, limiting development, alleviating poverty, and fueling resentment of conservation efforts (Pemunta, 2019).

According to Ango (Ango et al., 2017), during the cropping season in Ethiopia, mammals like baboons and bush pigs, by consuming and trampling crops such as maize, sorghum, finger millet *Eleusine coracana*, tubers, vegetables, field beans, and peas, vervet monkeys wreaked havoc on the environment (79 percent). This review agrees with Ango et al. (2017) findings that warthogs trampled crops in home gardens and open fields; olive baboons raided granaries for maize and chicken; large forest pigs trampled crops in home gardens and open fields; vegetables, and tubers; and olive baboons and blue monkeys ate coffee berries and trees.

In Uganda, for example, agriculture is anticipated to remain the economy's backbone for the foreseeable future, with agricultural operations employing a large majority of Uganda's workforce (72 percent), and around 25.9% of growth domestic products (Mpiima et al., 2019, p. 190). It accounts for 1/2 of Uganda's export profits, primarily through coffee (Turyahikayo & Kamagara, 2016, p. 27). However, due to animal crop raiding and the emergence of commercial farming for lucrative export markets, commercial farming's share of overall production remains low (Nakano et al., 2018), with rain-fed agriculture accounting for more than 95 percent of the country's agricultural production (Wossen et al., 2017).

Despite the fact that communities in SSA use National Parks and other conservation areas for domestic and agricultural purposes, much remains unknown about the impact of crop raiding by wild animals on people's livelihoods in the pursuit of diverse domestic and agricultural uses (Ampumuza & Driessen, 2020). Animals attacking and damaging crops and property of people living in close proximity to National Parks, particularly mountain gorillas, baboons and elephants, have been the subject of multiple farmer complaints leading to conflict of interest between people and animals (Hill, 2000). According to Simpson and Geenen (2021), farmers are losing crops to vermin animals at an increasing rate, resulting in more human-wildlife conflicts and park encroachment in Sub-Saharan Africa.

RESEARCH METHODOLOGY

This review work used a literature search and synthesis of pertinent peer-reviewed papers and associated material as its methodological technique. A literature search from 2000 to 2024 was made from Google Scholar, Web of Science, Research Gate, Science Direct, and a variety of other scientific journal publishing websites as search engines and platforms. This review did not cover every area of the literature on crop raiding by wild animals, but it did focus on the most significant ones. Peer-reviewed papers, institutional publications, and a small number of unpublished materials. On the other hand, were given higher emphasis in developing the paper's conclusion, whereas unpublished sources were used as background material. As a result, over 1190 publications, government reports, wildlife organization reports, and conference proceedings were examined. E-books from the World Bank, policy papers from the World Bank, and published student essays were all retrieved, with 65 of them being evaluated and used in this work.

HISTORY OF CROP RAIDING IN SUB-SAHARAN AFRICA

Crop raiding by wildlife is a problem of most rural SSA which has led to incidences of loss of human life, injury to humans, destruction of crops and farm infrastructure (Mukeka et al., 2019), thereby escalating human-wildlife conflicts. The problem of crop raiding is thus a national and an international problem for which no perfect long-term solutions have been found and this calls for mass education among smallholder farmers adjacent protected areas to reduce animal movements to agricultural lands like platting of tea which is not eaten by animals to deter them

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back to the forest hence, conservation (Titile et al., 2019).

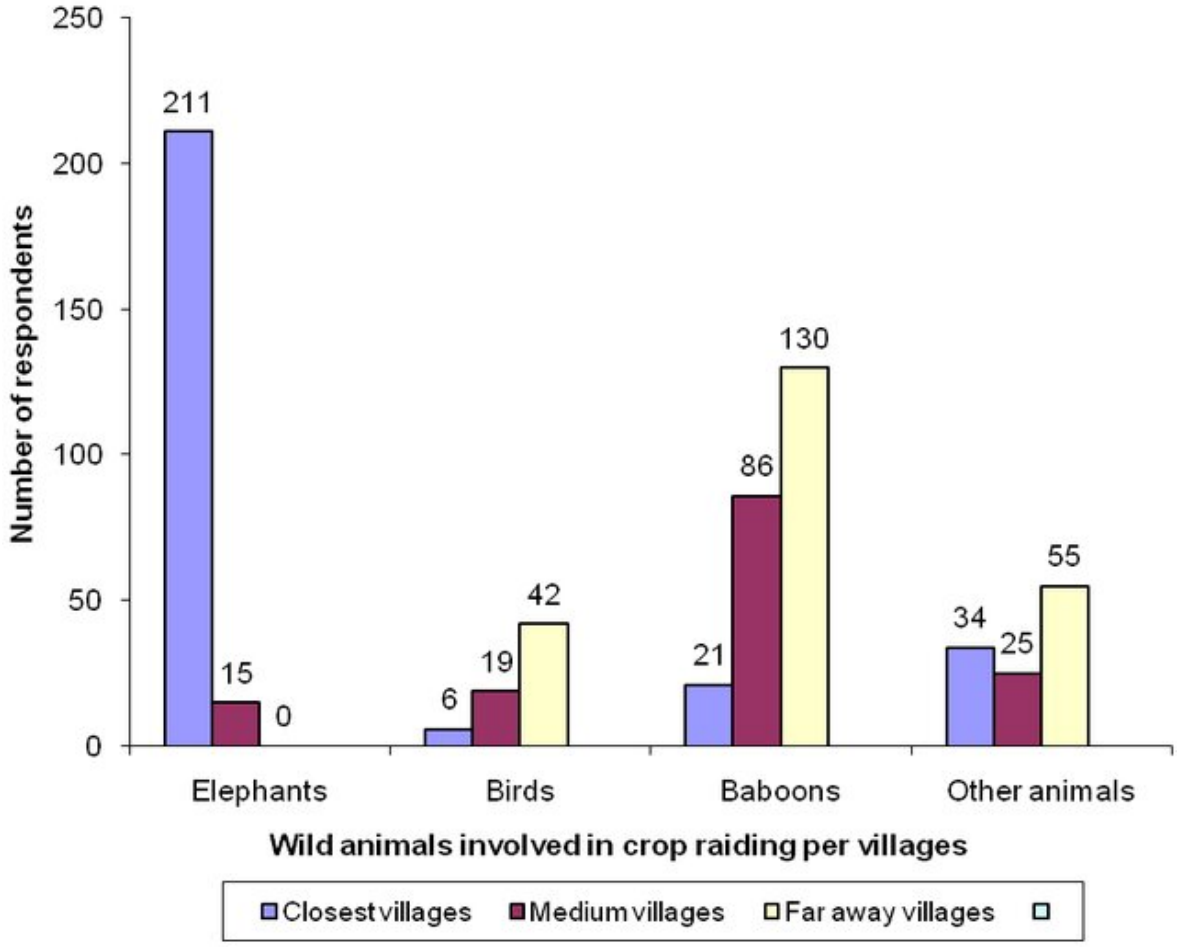
In other national parks and forest reserves, quite a number of measures to minimize crop raiding and human-wildlife conflicts have been implemented (Matseketsa et al., 2019), for example, the establishment of Mauritius thorns in Bwindi Impenetrable National Park in Uganda, (Anand & Radhakrishna, 2017).

The contemporary conflict between farmers and wildlife at the edge of Sub-Saharan Africa's National parks, wildlife reserves and forests echoes the traditional pattern of conflict on agricultural frontiers (Krätli & Toulmin, 2020). At some sites, shifts in animal distribution force farmers to abandon cultivation due to heavy crop losses (Hill, 2018). More recently, as the human population continues to increase, human-wildlife conflicts also demand careful management practices through a climate-smart village approach where local crop farmers are taught better farming methods to reduce crop damage by world animals (Abegunde et al., 2019).

COMMON ANIMALS INVOLVED IN CROP RAIDING

Outside of protected areas, animals like mountain gorillas, bush pigs, monkeys, elephants, and buffalos inflict severe agricultural damage, compromising community relations (Bitariho et al., 2019). Recompense for damage caused by wild animals is routinely sought, however in many African countries, compensation is not permitted, resulting in long-term poverty and low living standards. Monkeys assault agricultural fields because there isn't enough new foliage in the jungle for them to eat, therefore they end up in farms (Mwakatobe et al., 2014) especially in Kenya (**Fig 1**).

Figure 1: Common Animals Involved in Crop Raiding in Kenya by Mwakatobe et al. (2014).



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Though in different ways, elephants, birds, and baboons all have a major impact on people's lives in Kenya. Elephants are magnificent animals, but they may destroy crops and water sources, causing significant losses in agriculture and increasing tensions between people and wildlife. Large animals frequently pose a threat to farmers' crops, which strains their finances and increases food poverty. On the other hand, birds have two roles. Although some species play a beneficial role by managing pests and pollinating crops, others, like quelea birds, have the ability to completely destroy grain fields, endangering both the supply of food and revenue. The difficulties experienced by farmers are increased by baboons, who are renowned for their cunning and adaptability. They can destroy infrastructure and plunder crops. The intricate dynamics of coexistence in Sub-Saharan Africa, where biodiversity is abundant yet poses real threats to livelihoods, are highlighted by this interplay between humans and wildlife. Innovative approaches including agricultural diversification, community-based conservation, and the promotion of sustainable practices that strike a balance between human needs and wildlife conservation in this biologically complex region are frequently used in attempts to lessen these effects.

In addition to the foregoing, several primates are known for their crop-raiding activity, which puts them in confrontation with humans. Farmers lack information on climate-smart agriculture, such as tree planting, to reduce the number of animals entering their agricultural lands (Uddin et al., 2024), and it is from this review paper that farmers should practice sustainable land management practices. Omnivorous species like baboons eat a wide variety of foods, including many crop species, and often use several different parts of these plants, rendering the plants vulnerable throughout their life cycle (Sillero-Zubiri & Switzer, 2001).

Weaver birds are common in gardens, yet people do not consider them a threat (Maurice et al., 2020), and this necessitates a better understanding of how birds interact with agro-ecosystems, how they are affected by associated management practices, and what conservation strategies might mitigate negative impacts. Baboons in Kenya, Tanzania, and Cameroon, as well as mountain gorillas in Uganda's Bwindi Impenetrable National Park, are seen to be unpredictable and cause more harm because people can't predict when or if they'll visit a given farm, and present security efforts are believed ineffectual (Seiler & Robbins, 2016). Even when they do, they are protected by law and harm to them could have serious consequences for those involved.

When it comes to crop-raiding animals that cause the most damage, huge animals such as elephants and buffaloes get a disproportionately high share of the blame. Smaller animals, such as wild pigs, baboons, rodents, and birds, on the other hand, do the most cumulative harm to crops over time, but receive fewer complaints (Scheijen et al., 2019). Similarly, domestic animals may cause significant agricultural damage, yet the damage does not evoke widespread anger in the communities.

In Uganda, there are different common animals involved in crop raiding as indicated in (**Fig 2**) below;

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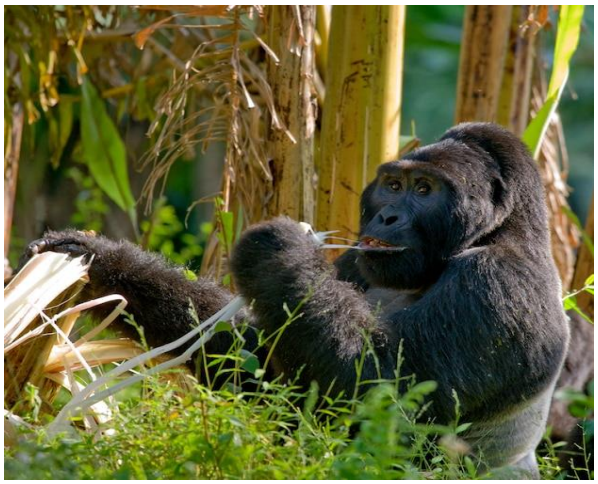
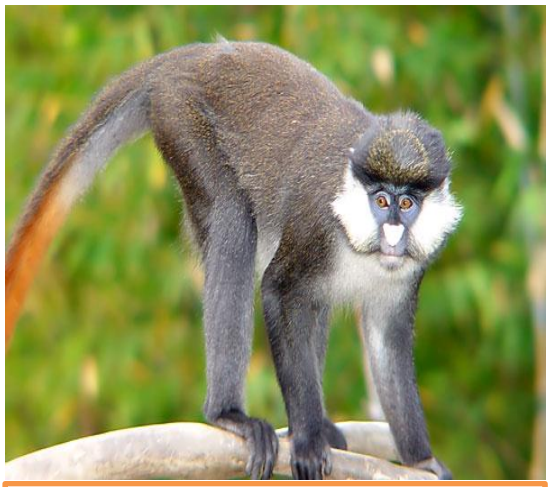
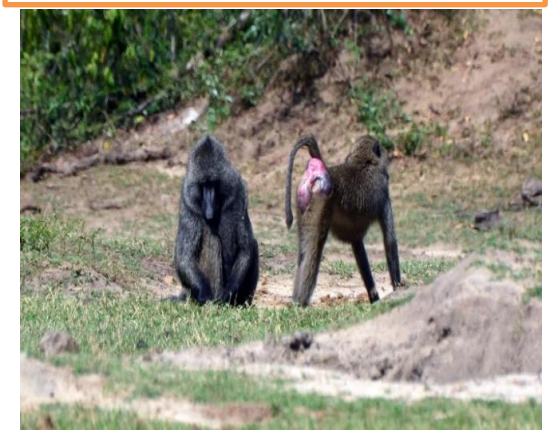
Figure 2: Showing the different common animals involved in crop raiding.



Mountain Gorilla



Red-tailed Monkey



Baboons

Elephants

CAUSES OF CROP RAIDING BY WILD ANIMALS

Increase in agriculture and encroachment: According to Gloriose (2019), rising population pressures have resulted in a significant decline in suitable arable land for agriculture. As a result, more marginal ground is tilled, and farming extends right up to the edge of wilderness and

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protected areas (Laso, 2021). Pest species thrive on the edges of natural habitats and agricultural fields, where they can devour both the food available in undisturbed areas and the crops growing nearby (Boetzl et al., 2020).

Crop exploitation is common in locations where agricultural activities are conducted near protected areas, or where former elephant routes have been disrupted by human settlements, agricultural fields, and plantations, thereby reducing crop resilience (Satori et al., 2021).

Changes in agricultural methods and techniques: There has been a significant trend toward agricultural intensification in recent decades, and the large monocultures that emerge can be particularly appealing to animals, so people now grow crops near protected areas without using climate-smart agricultural practices (Sandhu, 2021). Some animals are naturally pre-adapted to take advantage of these chances, such as cereal crops, which are a prime target for birds that mostly consume seeds (Ndava & Nyika, 2019).

Increasing wildlife population: The substantial opposition of international stakeholders to wild population reduction through culling and hunting bans suggests that wild animal populations are rising (Jori et al., 2020). This, paired with increased protection, has resulted in a tremendous increase in wildlife populations as well as changes in animal behaviour. Elephants in high-density parks have been known to often invade surrounding farms. Increases in abundance, as well as circumstances such as war and other disturbances, might cause animals to be displaced, causing them to occupy buffer zones and have increased contact with humans (Mallya, 2017). Hence, animals may turn to crop raiding to survive in resource-poor locations (Alfred, 2014).

EFFECTS OF CROP RAIDING ON PEOPLE'S LIVELIHOODS

Wildlife crop raiding has a major financial impact on households, especially in regions close to national parks, forests, and wildlife reserves. When wild creatures like elephants, baboons, or monkeys infiltrate their crops, subsistence farmers—who depend on agriculture for both food and income—frequently suffer catastrophic losses (Asaye et al., 2024). Crop destruction from these assaults results in lower yields and, in extreme situations, complete crop collapse. Smallholder farmers are particularly affected financially because they don't have insurance or other sources of income to help cover the losses (McCarten & Milich, 2024). Affected families are frequently forced to borrow money, sell assets or cattle, or even give up farming completely as a result. Furthermore, the loss of cash crops like maize, coffee, or bananas lowers household income and makes it more difficult to acquire healthcare, education, and other necessities (Swalehe & Yanda, 2023). These economic strains perpetuate poverty cycles, making recovery difficult and unsustainable in the long term (Efio, 2023). Crop raiding not only results in monetary losses but also compromises food security and heightens social unrest. Because plundered crops are insufficient to meet dietary needs, households often experience food shortages. Families may respond by cutting back on meal portions or consuming fewer nutrient-dense substitutes. Farmers are forced to devote a great deal of time and money to crop protection due to the ongoing threat of wildlife encroachment, frequently at the expense of other sources of income (Galley & Anthony, 2024). Communities arguing over resources or seeking compensation from authorities for losses can also lead to social strife. Furthermore, wildlife-caused injuries or deaths intensify the conflict between humans and wildlife, thus, upsetting livelihoods (Paudel et al., 2024). This ongoing danger weakens rural communities' ability to bounce back, inciting hostility toward conservation initiatives and making it more difficult for people and wildlife to live in harmony.

Crop raiding is a major issue in Africa right now, as it contributes to a negative attitude toward protected areas and their managers. As a result, there is a pressing need to create measures to reduce friction by either lowering crop loss or raising local people's tolerance to a particular level of loss. Crop raiding is a sensitive topic, and

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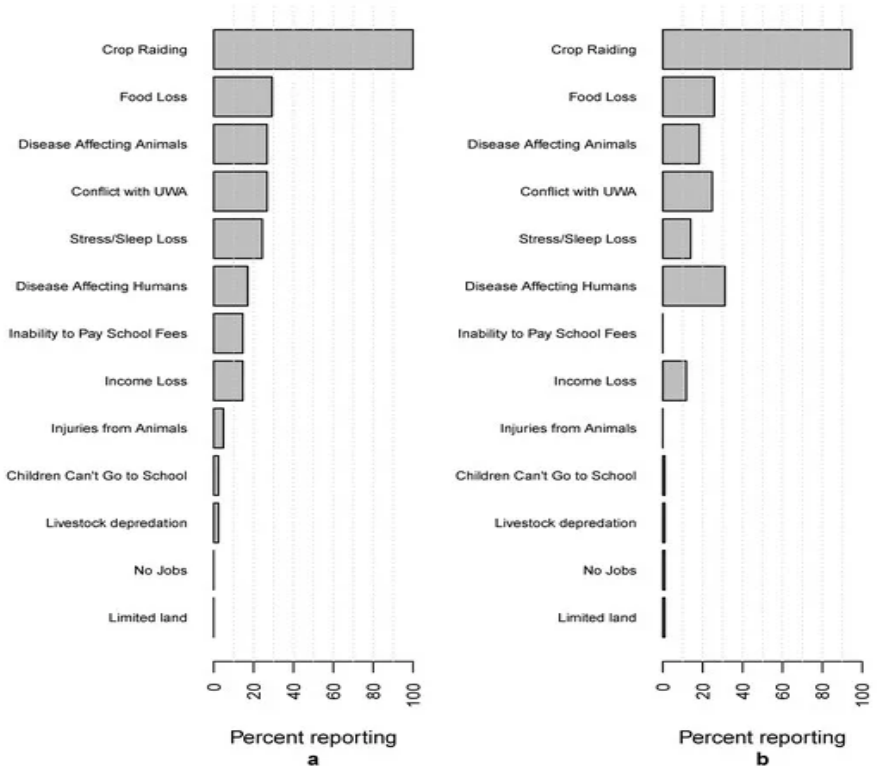
finding effective solutions is difficult. Governments, conservation organizations, and the private sector must invest billions of dollars to combat this trend and improve food security (Chen et al., 2019). Depending on the region and crop variety, problem animals can cause anywhere from 10% to 90% of agricultural damage (Linkie et al., 2007) hence, a problem for local people who have no source of income to earn a living. Crop loss caused by park animals along the Kibale National Park boundary is estimated to be between 4 and 7%, amounting to almost $6 per farmer or US$100 per kilometre of boundary each year, according to (Rode et al., 2006). Other Ugandan parks, such as Bwindi National Park and other parks in Africa, experience similar crop losses (Hartter, 2009).

Park managers are increasingly seeing crop-raiding as a key barrier to expansion and conservation. Park authorities address crop-raiding and its repercussions for local residents by constructing additional buffers and barriers to affect primate behaviour and deter them from coming into contact with people crops, changing the terrain around primate habitats could dramatically improve the human-primate conflict scenario (Kate, 2012). Despite local development projects and revenue sharing, tensions between locals and park managers over crop raiding have persisted (Archabald & Naughton-Treves, 2001).

Sadly, the direct effects of crop-raiding have not been extensively researched and measured, farming communities also bear considerable opportunity costs in order to safeguard their crops and limit crop losses (Barua et al., 2013). Crop guarding, which consists of one or more household members safeguarding their crops, is the most prevalent kind of raid mitigation (Ango et al., 2017). Women and children are frequently mobilized for such chores, resulting in lost income and limited educational possibilities, respectively (Mills, 1997).

Crop raiding also jeopardizes food security in subsistence farmers' households, as crop losses restrict dietary diversity, leading to malnutrition (Alfred, 2014). Additionally, crop-raiding around protected areas has been linked to increased food poverty in poor countries (Fungo, 2011) like Uganda (**Fig 3**).

Figure 3: Effects of Crop Raiding on People's Livelihoods (Kolinski & Milich, 2021).



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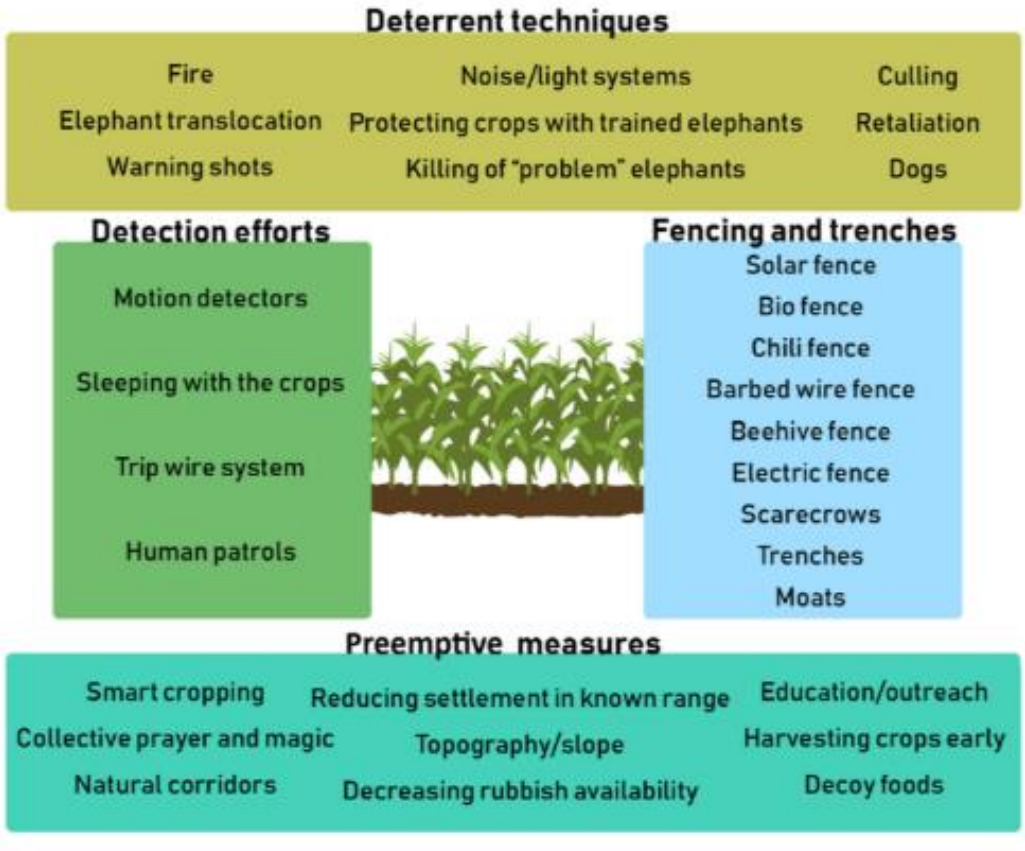
CROP PROTECTION TECHNIQUES TO REDUCE THE IMPACT OF WILD ANIMAL CROP RAIDING

Indigenous knowledge has been used extensively in the protection of crops from wildlife damage. These include farmers and communal groups (Osei-Owusu, 2018) to guard fields on a rotational basis from a network of watchtowers that are built. When wild animals are spotted, locals can be outfitted with powerful lights and tin drums to scare them away (Virtanen et al., 2021). Along the front lines of farms, they can even ignite fires and keep them going late into the night (Horgan & Kudavidanage, 2020). These techniques have been frequently used in SSA along the agriculture-wildlife interface (Kate, 2012), but quantitative data on great apes is limited (Muthee et al., 2019) (**Figure 4**).

Figure 4: Protection techniques (Montgomery et al., 2022).



On the other hand, most of the local communities use electrical fences, use of trenches, and cameras to monitor animals in their gardens (**Fig 5**) below.

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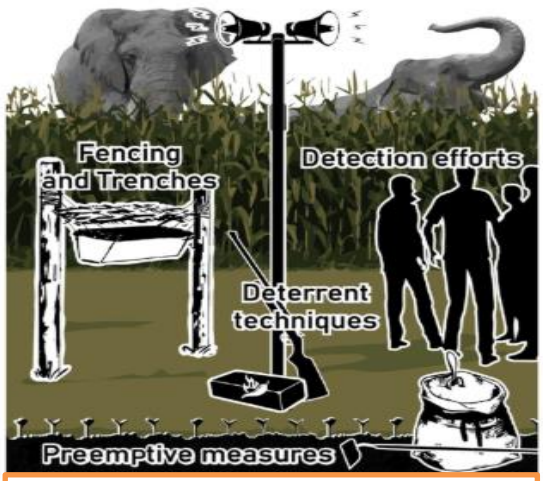
Figure 5: Showing the Crop Protection Techniques to Reduce the Impact of Wild Animal Crop Raiding, (Montgomery et al., 2022)**.**



Fences

Trenches

Electrical Fences

Use of camera in monitoring

Non-electric fencing: In many parts of Sub-Saharan Africa, local agricultural farmers are currently utilizing non-electrified fences to restrict wild animal movements in order to decrease crop raiding by animals (Amara et al., 2020). Wooden or steel poles pushed vertically

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into the ground are commonly used to construct these barriers (Mukeka et al., 2018) and between the poles, heavy gauge wire is strung and drawn tight. As a result, this should be done as part of a climate-smart agriculture strategy, coupled with tree planting near protected areas to aid conservation.

Elephants, mountain gorillas, and other wild animals have been deterred by chemical compounds with possible deterrent properties, either as an unpleasant or painful odour or as a targeted substance, such as a hormone, that induces fear (Osborn & Anstey, 2002). The chilli bricks only use simple, locally available materials and work on the same grounds that *Capsicum* repels elephants (Osei-Owusu, 2018). Farmers in the area dry chilli and combine it with elephant or animal dung before compressing it into bricks (Mallya, 2017). The bricks are then sun-dried and burned near the fields' edge. The bricks burn slowly and produce a spicy cloud of smoke, which has been widely used in Zimbabwe (Palminteri, 2016).

Plate 1: Chili brick adapted from (Palminteri, 2016).

IMPLICATION FOR THE FUTURE RESEARCH

This study suggests developing a strategic plan for the use of indigenous knowledge approaches such as guarding the fields, visual deterrents, pipe bombs and making noise to be considered as part of a broader set of adaptation measures and policies for protected areas and farming activities at a range of scales because they are the ones with the most local knowledge of conservation.

In Sub-Saharan Africa, specific mechanisms for empowering and monitoring capabilities at the grassroots level should be built. These include encouraging and increasing local community participation by all stakeholders in the adoption of suitable crop protection policies and monitoring for enhanced agriculture throughout all African areas. A regulatory framework that combines proper crop protection technologies with community participation in conservation is required. Furthermore, increased government policy attention, as well as rigorous research and development efforts, are required to provide an enabling environment for sustainable natural resource conservation and management in order to prevent agricultural raiding by wild animals.

CONCLUSION AND RECOMMENDATIONS

Based on the background data, not much has been done to study the effects of wild animals raiding crops, and some crop protection strategies have

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been put in place to lessen the effects of agricultural raiding by wild animals found in SSA.

Crop raids have persisted due to a lack of adequate and effective interventions by smallholder farmers, the government, and non-governmental organizations, resulting in a human-wildlife conflict. If not addressed properly, this will have negative consequences for socioeconomic progress as well as biodiversity conservation and preservation efforts in West Africa and Southern Africa where there are more National Parks.

Therefore, indigenous knowledge approaches such as guarding the fields, visual deterrents, pipe bombs and making noise need to be considered as part of a broader set of adaptation measures and policies for protected areas and farming activities at a range of scales through fencing.

Government and other stakeholders should encourage the use of indigenous knowledge practices among the local farmers such as the use of tin drums to scare wild animals away, ignite fires, Non-electric fencing and burning of chilli bricks to emit a pungent cloud of chilli smoke to deter animals from agricultural crops.

With varying degrees of success, international donors have spent more than USD 3.4 billion since the early 1990s to support endangered species and stop deforestation in Africa. Rather than local communities, wildlife has received a lot of attention from this effort. Strategies for effective conservation should consider the economic demands of the local population as well as their attitudes, knowledge, and actions. Wildlife and humans are related and have similar requirements. Effective conservation efforts require close collaboration with impacted communities and a focus on local views to ensure the protection of the ecosystem.

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