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ECONOMIC IMPLICATION OF HUMAN - WILDLIFE CONFLICT IN LUPANDE GAME MANAGEMENT AREA – MAMBWE DISTRICT, EASTERN PROVINCE

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Economic Implication of Human - wildlife conflict in Lupande Game Management Area – Mambwe District, Eastern Province

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Abstract

Purpose: The study aimed at establishing the economic loss caused by Human - wildlife conflict amongst small scale farmers and government. To achieving the purpose, the research was mainly guided by three objectives. To estimate the economic value of damage in agriculture, to estimate the economic value related with control by killing of problematic animals and effectiveness of response strategies in addressing Human - wildlife conflict.

Methodology: The study utilised descriptive research design where primary data was collected from key informants by applying semi-structured interview guide using convenient sampling. Purposive sampling during focus group discussion meetings using focus group discussion guides was administered in Human - wildlife conflict hot spot areas. The researcher further used secondary data to gain more understanding and gather adequate information about the area of study. Therefore, 70% of the affected households from Department of National Parks and Wildlife Human - wildlife conflict SMART raw data was used. Subsequently, Descriptive Statistics, using averages and totals to analyse quantitative data, was used while qualitative data was analysed using Content and Thematic Analysis.

Findings: The summary of the results showed that economic damage in agriculture was quite enormous affecting farmers with K180, 317.00 being the highest in the damage range of 25-50 percent. Regarding the estimation on economic value related with problematic animal control by killing, it was established that the government of Zambia incurred huge revenue loss amounting to K 4,318,049.86 if such animals or trophies were sold. On the effectiveness of response strategies, the majority of the participants stated that few measures were put in place to solve Human – wildlife conflict. In Zambia, several researchers and scholars have reviewed Human – wildlife conflict phenomena. However, there has been no study that has sought to establish economic implication on small scale farmers and revenue loss to the government through control by killing of problematic animals. This study therefore seeks to fill this knowledge gap looking at estimation of economic implications of Human – wildlife conflict in the study area.

Unique Contribution to Theory, Practice and Policy: The results of this study could influence formulation of appropriate mitigation measures and policies for wildlife conservation and revenue recovery from controlled by killed of such animals in Zambia.

Keywords: *Game Management Area, Wildlife, Human Wildlife Conflict, Coping Strategies, Control of Problematic Animals*

INTRODUCTION

Conflicts between humans and wildlife currently rank among the highest main threats to conservation. This has been coupled with rapid expansion of the human population, extensive habitat loss and fragmentation increasing the potential for people and animals to come into contact often with devastating consequences for all involved (Nyirenda *et al*, 2011). Human lives and livelihoods can significantly be impacted by wildlife through the predation of livestock and game (Loveridge *et al*., 2017), damage to crops and property and direct attacks resulting in human injury or even death (Amarasinghe *et al.*, 2015). This situation moreover gives some individuals who may experience psychological trauma including fear, extreme stress, and diminished mental well-being (Barua, Bhagwat and Jadhav, 2013). On the other hand, the consequences for wildlife can also be extensive and severe through retaliatory killing, hunting, and habitat destruction (Torres, Oliveira and Alves, 2018).

Crop-riding by wild animals is one of the major effects for HWC (Dickman, 2010). Elephant is considered as one of the top crop-raiding wildlife in many African countries like Gabon, Ghana, Malawi, Uganda and Zimbabwe (Patience, 2015). Similarly, the percentage of crop lost by elephant in Zimbabwe and Mozambique is also significant that affected food security and escalate human - elephant conflicts (Mashapa *et al.*, 2014). This phenomenon is not restricted to a particular geographical area or climatic region but is common to all areas where wildlife and humans share limited resources.

In Lupande Game Management Area (GMA), increased human population has led to the expansion of human settlements leading to encroachment in Protected Areas (PAs), this has led into the constriction of species into wildlife habitats (Nyirenda *et al.,* 2013). The animal population has increased which has resulted in many animals straying out on people's field crops, big cuts killing livestock a situation that has led to increasing poverty by affecting household's income (Mambwe District Council, 2020). The government of the republic of Zambia and other stakeholders have always put a concern to policy on how the Human - wildlife conflict cases can be managed (Zambia Wildlife Act No. 14, 2015). The intervention measures put in place by conservationist ranging from the use of solar electric fences, chili fencing, and control of problematic animals by killing and translocations (Patience, 2015). Therefore, this study will attempt to gain insights into Human – wildlife conflict and its associated economic implications arising from crop raiding, livestock depredation, control by killing of problematic animals. The study also suggested options for addressing the problem.

Statement of the Problem

Human – wildlife conflict is a growing problem in today's crowded world, and can have significant impacts on both human and wildlife populations (Nyirenda, *el al,* 2013). For instance, species most exposed to conflict are shown to be more prone to extinction because of injury and death caused by humans; these can be either poaching, control of problem animals by killing, retaliatory killing of problem animals by some affected community members and also by poisoning or capture. Such human-induced mortality affects not only the population sustainability of some of the most endangered species, but also has broader environmental impacts on ecosystem and revenue loss to the government. It further undermine human welfare, health and safety, and have economic and social costs. The interaction encounters with animals, exposure to physical injury or even death.

Consequently, humans can be economically affected through destruction and damage to property and infrastructure (e.g. agricultural crops, grain stores, water installed facilities and fencing), livestock depredation, transmission of domestic animal diseases, such as African yellow fever. Negative social impacts include missed school and work, additional labour costs, loss of sleep, fear, restriction of travel or loss of pets. Therefore, most studies conducted often failed to grasp the economic implications of Human-wildlife conflict with appropriate mitigation efforts considering (Patience, 2015). Despite the application of different management practices, both locally and globally, the problem still exists. This calls for methods and ground breaking approaches that could make a meaningful contribution to resolving such a long-term problem. To come up with such revolutions, one approach is to establish the estimated economic losses and costs farmers encounter on damage in agriculture and the revenue the government is losing from control by killing of problem animals in the study area. This will provide the information to the policy formulators on the magnitude of Human – wildlife conflict with economic implications and how the problem can be addressed using financial approach. Therefore, the study intended to collect data on damage in agriculture, controlled animals by killing and investigated the direct costs associated with Human – wildlife conflict management response strategies in Lupande Game Management Area. The results of the study provided information to contribute towards the knowledge gap identified above.

LITERATURE REVIEW

The most visible consequences of Human – wildlife interactions concern the economic costs incurred through depredation of livestock, and damage to crops and property (Dickman and Hazzah, 2016). Livelihoods can be substantially impacted, and costs can be severe, especially in less developed countries, where high percentages of the population are in poverty and often live in close proximity to wildlife protected areas (Loveridge *et al.*, 2017). In Zimbabwe for example, livestock loss due to predation reduced the annual income of agricultural communities by up to 20% (Butler, 2000), and those living in the Bhadra Tiger Reserve, India, were found to lose 11% of total crops to elephant damage and 12% of livestock to big cats per annum (Madhusadan, 2003). A highly common strategy to manage conflicts is therefore to lessen this economic burden by compensating for incurred losses, and effectiveness is generally measured as apparent improvement of tolerance (Loveridge *et al.*, 2017).

Patience (2015) reveals that Human - wildlife conflict is escalating and illustrates a worldwide issue. The most visible consequences of Human – wildlife interactions concern the economic implications incurred through despoliation of livestock, damage to crops and property visa vie the lost income by the state through lethal control of wildlife and frustration by the community (Gandiwa, 2013). Crop-raiding and livestock depredation by wild animals occurs all over the world with different wild animal perpetrators in Zimbabwe. Most studies conducted on a variety of wildlife species causing crop destruction and livestock depredation have investigated factors and determined patterns and influencing parameters that may help in predicting cases of Human - Wildlife Conflict (Gandiwa, 2013).

Human - wildlife conflict is a growing problem in Zambia as wild animals destroy people's crops, livestock and kill or threaten their lives, and this problem is not restricted to a particular geographical area or climatic region but is common to all areas where wildlife and humans share

limited resources (Nyirenda *et al,* 2013). In Lupande GMA for example, increased human population has led to the expansion of human settlements in protected wildlife habitats, this has led into the constriction of species into wildlife habitats leading to the high incidences of crop damage (Nyirenda *et al,* 2013). Still in Lupande GMA, it has been reported that Human - Wildlife Conflicts has been on the increase where animals damage people's crops and are a threat to their lives. For example, in the year 2021, 2304 Human – wildlife cases in Eastern Province (DNPW, 2021)

A study conducted by (Urmar and Kapembwa, 2020), examined views on economic benefits, local participation in wildlife management and conservation principle among residents of three chiefdoms in Mambwe district, Eastern Zambia. The study outcome showed that 68% of the residents who live in the Lupande Game Management Area are not in any way involved in community wildlife management. Reasons attributed was only few individuals or few residents' benefits from the wildlife revenues. After reviewing the literature, this motivates the Human-wildlife conflicts induced by wild animal towards crop raiding, property destruction, and loss of human life which is perceived economic lose prohibited the development of conservation among residents of Lupande Game Management Area (Urmar and Kapembwa, 2020). The literature did not highlight the estimated economic implication on farmers and Government through control by killing of problematic animals.

WWF (2008) in Indonesia losses of human lives as well as captures and deaths of elephants due to HWC indicate that the vast majority of human and elephant deaths occurred in or around elephant pouch areas which have lost significant amounts of forests. Looking from a different perspective, the lack of effective land-use planning at an appropriate scale in Riau, has resulted not only in high levels of HWC and the near decimation of elephant populations (a decline of 80% in less than 25 years,) but will also likely result in the province being unable to capitalize on possibly its most important and valuable resource – its carbon rich peat swamp forests. If current trends continue, Riau will be left with just 6% of forest cover by 2015 and will thus have relinquished an enormous opportunity to generate economic benefits and development opportunities for its rural communities through globally exchanged carbon credits, whilst simultaneously stabilizing the global environment and conserving its unique and spectacular biodiversity.

Governments employ regulated methods of lethal control as a tool to alleviate unwanted human–wildlife impacts, such as depredation (McManus et al., 2015). Forms of lethal control include harvesting, culling, legalized hunting, and selective or targeted killing of 'problem' animal individuals. The latter method is often used in instances where animals pose a direct threat to human safety or property, such as African elephants (Hoare, 2015); and several species of shark (McCagh, Sneddon and Blache, 2015). Lethal control is often considered a cheap and cost-effective method of reducing negative human– wildlife impacts, potentially explaining its popularity with governments (Naughton-Treves, Holland and Brandon, 2005). This strategy applies in the present study area and is highly supported by the (Zambia Wildlife Act, 2015).

Deterrents provide another non-lethal conflict Human – wildlife management innervation strategy, commonly used to dissuade species from entering human settlements and accessing resources. Types of deterrents are many and varied, ranging from olfactory repellents – such as the use of

chilli, electric fences to deter elephants (Hoare, 2015) or chemicals to repel sharks from popular swimming areas (Guerra, 2019). Acoustic devices are largely used in the marine environment, the most obvious examples being acoustic harassment devices that are employed to discourage marine mammals from approaching fishing fleets (Guerra, 2019). Finally, biological deterrents such as beehive fences are increasingly being applied as a way to combine conflict management with additional revenue for local communities. An example includes the Elephants and Bees project, implemented and supported by the charity Save the Elephants. The effectiveness of deterrents is often evaluated by changes in the rate of predation or crop raiding events before and after application. In the case of African elephants, several studies claim that olfactory and biological deterrents have decreased incidences of crop raiding (Hoare, 2015). 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).

While studies have provided sufficient evidence that Human – wildlife conflict affects peoples walfare and frustrates conservation efforts in Zambia and the world at large, non of the studies have attempted to establish the economic losses farmers experience through damage in agriculture and how much revenue the Government is lossing from control of problematic animals by killing. Therefore, this research will attempt to cover the gaps by exploring the financial losses affecting the small scale farmers and how much revenue the government of the Republic of Zambia lost from Human - wildlife conflict during the study period. The research further will contribute to the finding of the long-term management strategies that will help in policy formulation targeting to reduce the Human - wildlife conflict in Lupande Game Management Area.

Theoretical Framework

This research was augmented by Sanford (1962) development theory of challenge and support. Sanford's theory (1962; 1966) is premised on two fundamental concepts associated with development and these are: cycles of differentiation and integration, and readiness, challenge and support in a college environment. The first foundational concept of Sanford's Community Development Theory (1962) involves the cycles of differentiation and integration. Differentiation occurs when people understand themselves as unique individuals, while integration happens when people recognize themselves as members of various groups. Through this process, community members protect the community environment to ensure they get the value out of the community investment. To achieve this, the community members ensure that they protect the economic value which they have invested in their communities, and this brings conflict with the other stakeholders. Therefore, this should be a mind changer for the communities to develop.

Gardener (2009) noted that the second fundamental concepts of Sanford's Development Theory examine three evolving conditions: readiness, challenge, and support. Readiness refers to the maturity and preparedness of the community to deal with the cost of the actions they are taking in the environment. Challenge relates to circumstances where the community does not have the necessary skills to cope with the situation and support focuses on providing an environment that is encouraging and allows the community to explore the conditions of their identity in a safe setting. In such a manner, the cost of engagement is reduced as the community develops early alerts on the perceived dangers in the community. With such at hand, the wildlife officers and the

community member's gain as the animals do not reach the farms to graze and destroy crops. When a challenge is presented to a community, it requires them to change their behaviour and further grow in their development (Sanford, 1962). Support is a direct component in that it helps with the community's ability to be successful with the challenge (Sanford, 1967).

According to Sanford (1966), the amount of challenge a community can handle should be dependent of the support available from the stakeholders. The cost of handling the challenge should be proportionate to the cost the parties will incur so that not part of the two should be bound to lose in the process. If there is too much challenge and not enough support, community members may degenerate to less adaptive behaviours, ignore the challenge, or try to escape the challenge so that the cost should be reduced in one way or the other so that lives are saved. The wildlife officers in this case should work together to ensure the associated direct costs which are involved in responding to Human – Wildlife Conflict management are reduced before they are incurred. Preventive measures are what they have to engage into. Sanford (1966) further argued that a community environment should be considered as a developmental community where members' abilities ought to be nurtured to enhance their agricultural progress from the local resources. The ultimate outcome is to find the range of optimal dissonance in a person's environment. The environment should not present too many challenges for an individual as this may lead to regression and allow for less adaptive modes of behaviour. If the environment seems too challenging, individuals may want to escape or ignore the situation, and this brings conflict with the surrounding stakeholders.

METHODOLOGY

The mixed method was employed for this study where descriptive design was utilised. Convenient sampling was used to the key informants by applying semi structured interview guide that include 6 CRB chairpersons, 2 officers from the Conservation South Luangwa, 2 from Zambia Carnivore, 4 from Department of National Parks and wildlife, 2 from BioCarbon Partners, 2 from Community Markets for Conservation (COMACO) and 2 from Chipembele Wildlife Education Trust. The interview helped the researcher to understand the latitude of Human - wildlife conflict in relation to the research objectives. Purposive form of sampling was also applied on twelve (12) focus group discussion meetings using focus group discussion guide in Human – wildlife conflict most hot spot areas. The researcher further used secondary data to gain more understanding and gather adequate information about the area of study. Therefore, 70% of the affected households from Human - wildlife conflict SMART raw data from Department of National Parks and Wildlife was used. Descriptive Statistics comprising averages, totals and percentages were used to analyse quantitative data. The qualitative data was analysed using content and thematic analyses (Bryman, 2012). Using the themes created during processing, insights into the data was done by comparing responses to key questions from different data sources and relationships between different actors. Thereafter, graphical representations of the data were made necessary using pie charts and graphs. The researcher obtained a research permit from the Department of National Parks and wildlife to use the Human – wildlife conflict SMART raw data sets. Ethical clearance was obtained from University of Zambia.

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RESULTS

The findings were categories into three broad areas namely: Demographic information, economic value of damage in agriculture, economic value from control by killing of problematic animals, and effectiveness of response strategies in addressing Human - wildlife conflict

Demographic Data

This section presents the demographic characteristics of the participants and the research area of the study.

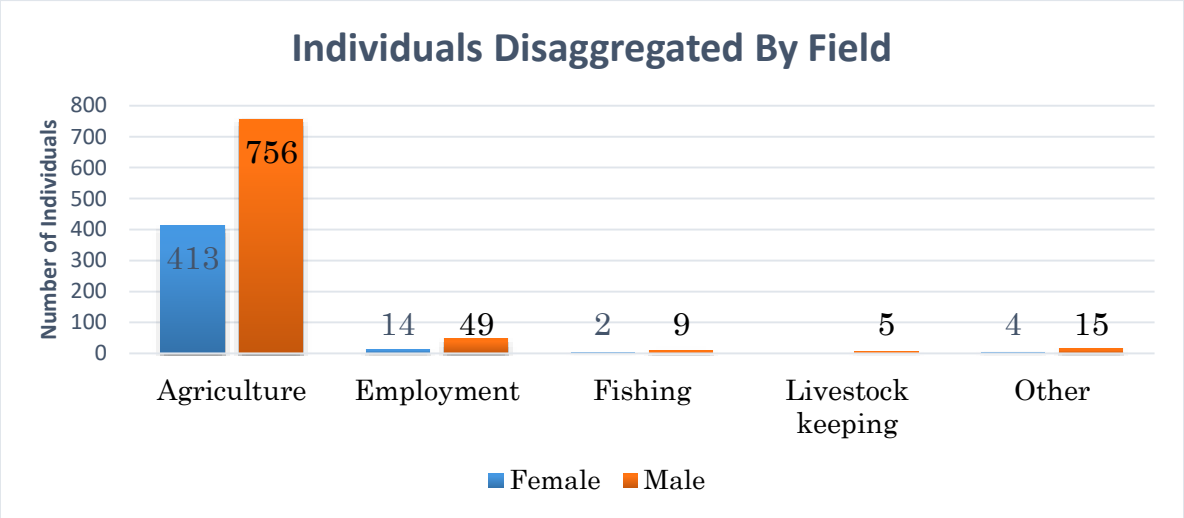

Figure 1: Shows the Number of Individuals Affected by Human Animal Conflict Demographics

The demographic data in figure 1 show that 756 males and 413 females of those that logged complaints worked in the agricultural sector as small scale farmers, 49 male and 14 female were in employment, 9 male and 2 female were in fishing industry as fishermen, 5 males were in Livestock keeping and others represents 15 male and 4 female. From the graph it can be concluded that most of the people who logged in complaints to the Department of National Parks and Wildlife authorities were in the agriculture sector.

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The Economic Value of Damage in Agriculture

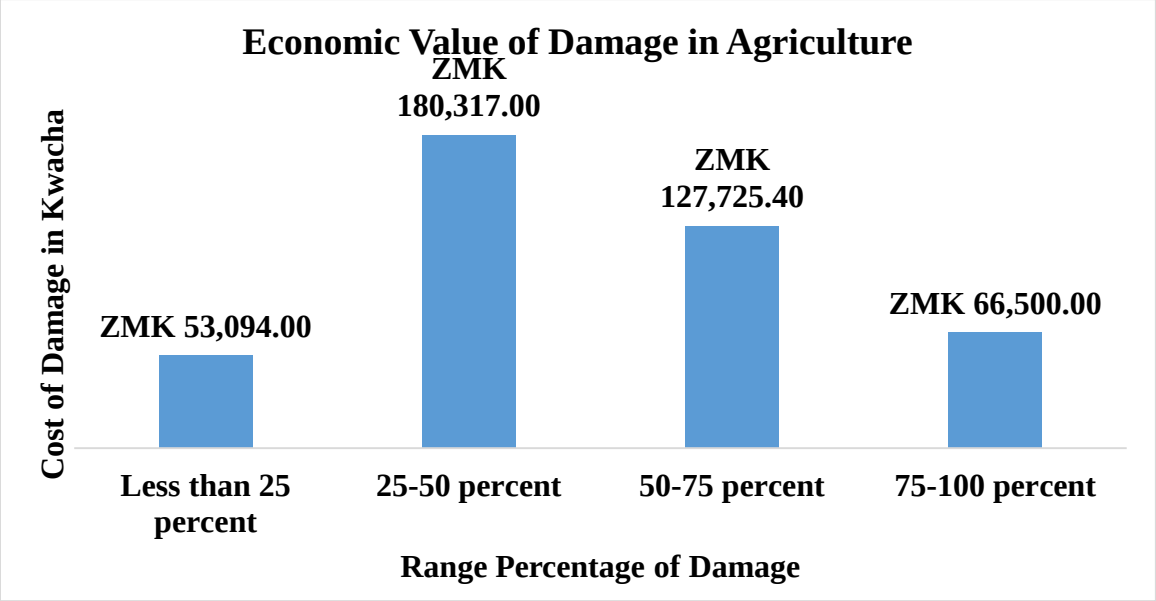


Figure 2: Shows the Economic Value of Damage in Agriculture

Results in figure 2 show the cost relating to the percentage of damage to agriculture with K180, 317.00 being the highest in the damage range of 25-50 percent, followed by damage of K127, 725.40 representing damage range of 50- 75 percent, third was K66, 500.00 with a range of 75-100 percent while K53, 094.00 being the lowest at less than 25 percent. The highest cost relating to the percentage of damage to agriculture was K180, 317.00 being in the range of 25-50 percent. From the findings, it can be deduced that the economic loss as a result of Human – wildlife conflict was huge in the sampled area.

Economic Value Related With Problematic Animals Controlled by the State as a Result of Human - Wildlife Conflict

This research question sought to establish economic value in relation with problematic animals controlled by killing. Data is presented in the figures below. Figure 3, presents animal species and number of controlled by killing of problem animals and figure 4, presents the category of revenue loss in sampled years. Figure 5, presents the summary of revenue loss for the study period in Lupande Game Management Area.

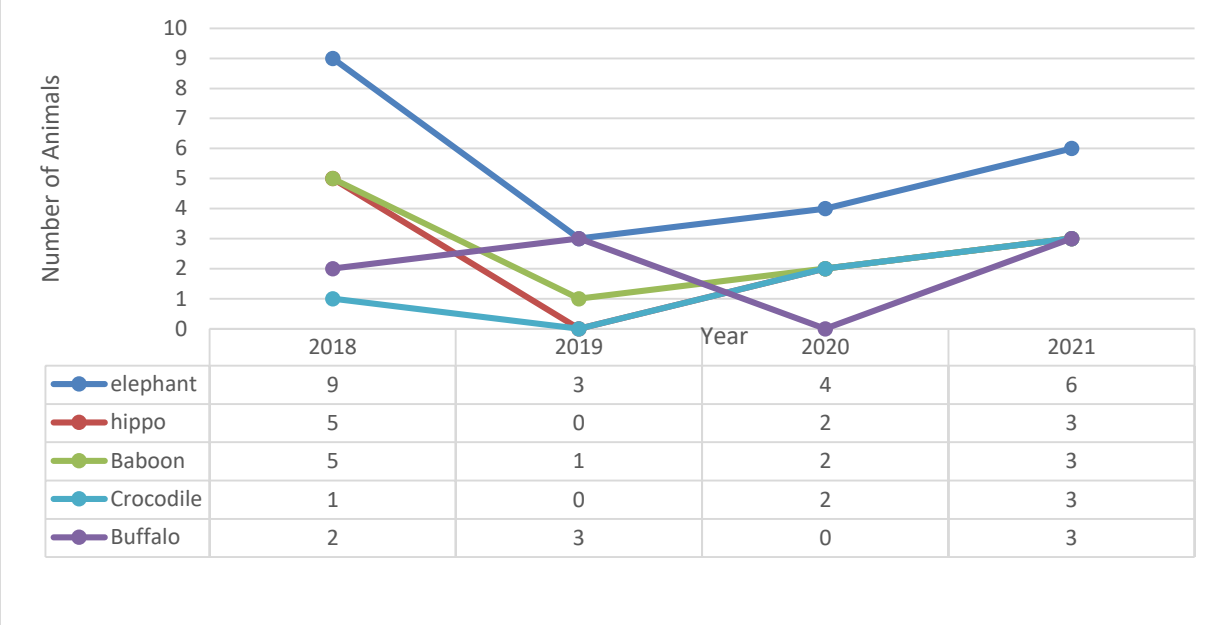
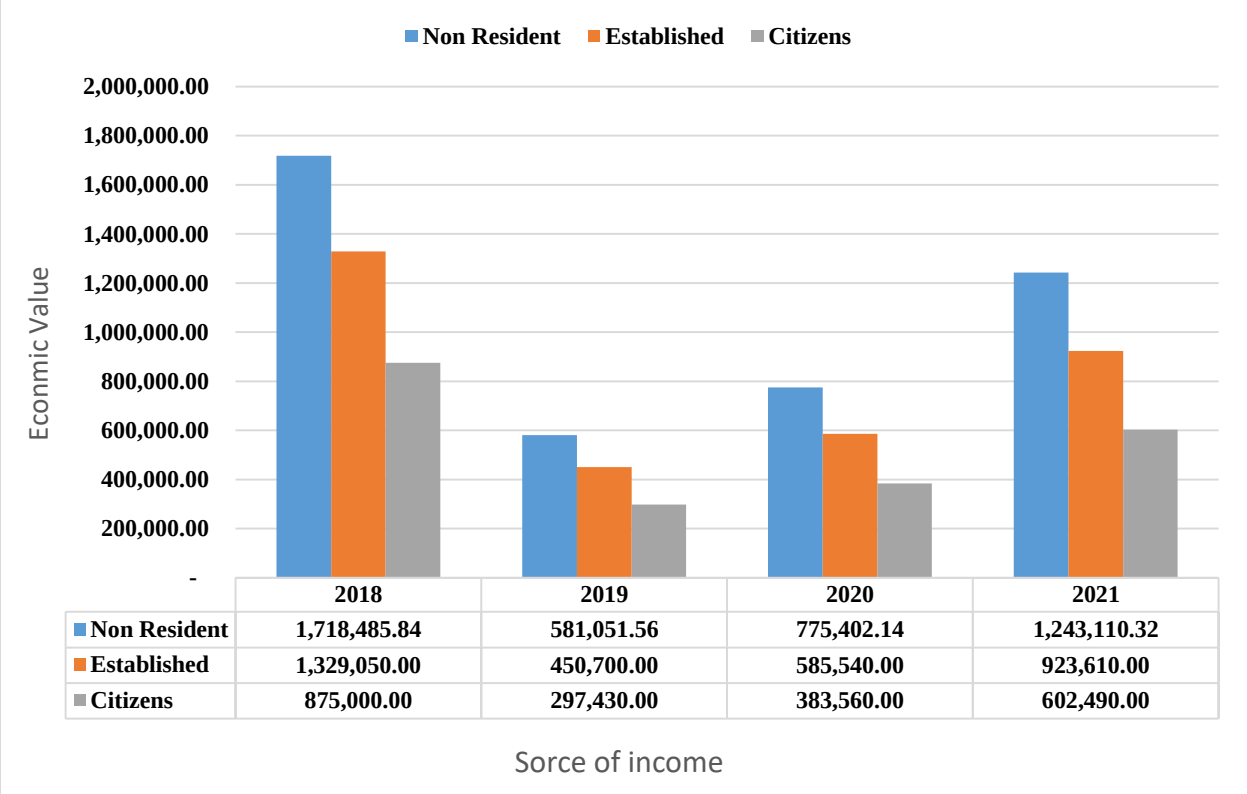


Figure 3: Showing the Number of Controlled by Killing of Wild Animals by the State

Results in figure 3 presents animal species and numbers controlled by killing. From the findings, the highest number of animal species controlled was that of the elephants with twenty two (22) and followed by that of Baboons with eleven (11). Others include Hippopotami with ten (10), buffalos with eight (8) and crocodiles with six (6). Therefore, 2018 represents the highest controlled by killing of problematic animals with twenty two (22), followed by 2021 with eighteen (18).

From the data presentation in figure 3, the researcher went further to establish the economic value of the controlled by killing of wild animals by state wildlife police officers. This was sought to establish how much the state is losing inform of revenue if the controlled animals were sold to the interested parties. Therefore data in figure 4, presents the revenue loss to the state indicating categories on sale of wildlife to the bidders.



	2018	2019	2020	2021
Non Resident	1,718,485.84	581,051.56	775,402.14	1,243,110.32
Established	1,329,050.00	450,700.00	585,540.00	923,610.00
Citizens	875,000.00	297,430.00	383,560.00	602,490.00

Figure 4: Shows the Revenue Loss from Control by Killing of Problem Animals in ZWK

Figure 4, presents results of the revenue lost from the control by killing of problematic animals. From the category of Non Residents, it is indicated that the Government of the Republic of Zambia in 2018 lost revenue amounting to K1, 718,485.85 followed by K1, 243,110.32 that was lost in 2021 all from the controlled or killed of wild animals causing trouble in the communities in Lupande Game Management Area. If the same animals were sold under the category of establishment, the revenue lost in 2018 was K1, 329,050.00 followed by K923, 610.00 in 2021. In the same way if the same animals were sold to the category of Citizens, the revenue lost was K875, 000.00 in 2018 followed K602, 490.00 in 2021. For all categories, 2019 recorded less amounts followed by 2020 respectively. From the results in figure 7, it was established that the highest amount representing the economic loss from control by killing of problematic animals occurred in 2018 with K 1,718,485.85. Therefore, the summary data of the amount that represents the economic loss from the controlled or killed wildlife by the state wildlife police officers, is presented in figure 5.

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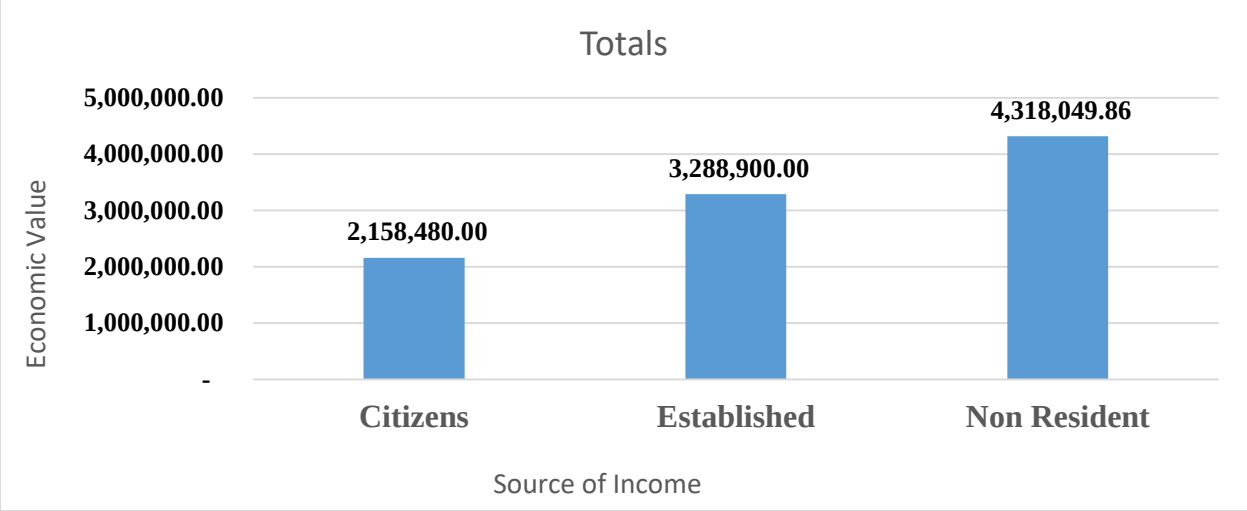

Figure 5: Shows the Summary of Economic Value of the Controlled Animals

Results from figure 5 show that the economic loss from the control by killing of problematic animals was K 4,318.49.86 in the category of Non-residents. If the controlled animal species were sold to the category of established, the government would realise the revenue amounting to K 3,288,900 and K 2,158,480.00 under the category of citizens. From the table, it can be argued that the government of Zambia through controlled or killed problematic animals incurred revenue loss amounting to K 4,318,049.86 which would have created more investment if such animals were sold to the bidders during the study period.

Effectiveness of Response Strategies on Human - Wildlife Conflict in Lupande GMA

The fourth research question sought effectiveness of response strategies on HWC data for this research was collected from respondents and data from SMART was analysed and presented in the figure below.

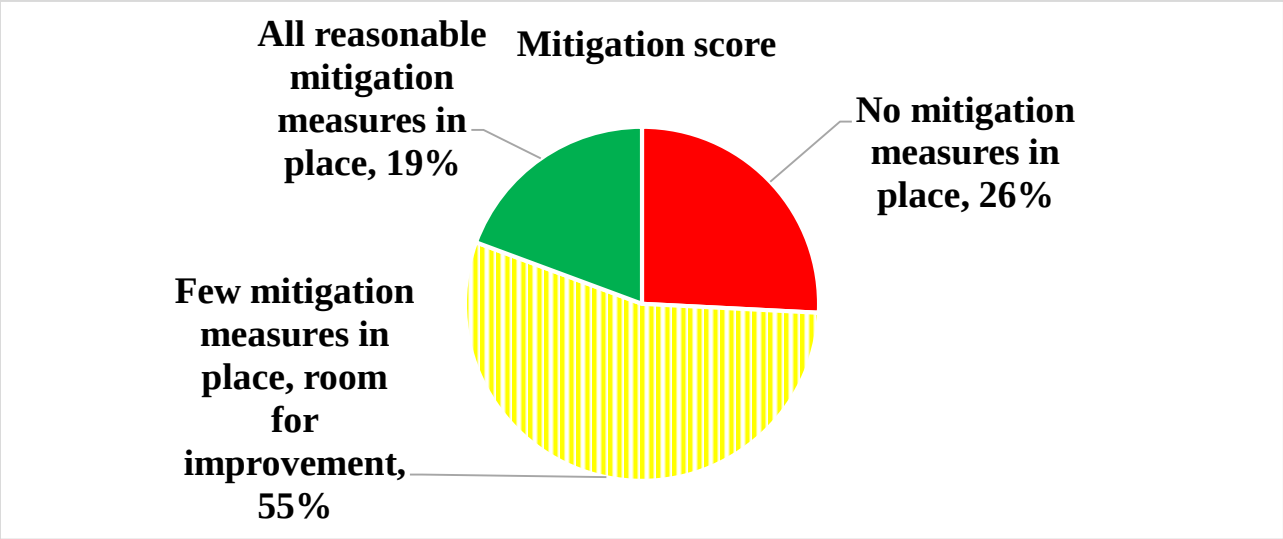

Figure 6: Results showing the mitigation efforts by percentage

Results in figure 6 shows the mitigation efforts taken when HWC occurs. The graph illustrates that 55 percent of the responses had few mitigations measures in place, 19 percent got all reasonable mitigation measures in place while 26 percent had no mitigation measures in place. The majority of the participants stated that few measures were put in place to solve human animal conflict.

DISCUSSION

Economic Value of Damage in Agriculture

The study established that there has been a lot of damage caused by Human – wildlife conflict in Lupande Game Management Area. The highest cost relating to the percentage of damage to agriculture was K180, 317.00 being in the range of 25-50 percent according to figure 4. This finding is in line with the literature done by, Butler (2000) in Zimbabwe who established that livestock loss due to predation reduced the annual income of agricultural communities by up to 20%. These findings are supported also by Gangi (2016) who also found that elephants in Kenya were the main causer of agricultural loss in the communities near the Serengeti national park. He argued that year in year out animals scavenge in the fields of the local farmers because the farmers have encroached in the national park area where the animals were grazing from. Therefore, animals know their territory and what they graze is within their boundaries. Similarly, Masethele *et al.*, (2015) who also found that elephants in the Mosi Oa Tunya National Park in Livingstone caused a lot of crop damage to the nearby farmers in the town of Livingstone as the local farmers recorded a lot of losses when their land was grazed by elephants.

Economic Value Related with Problematic Animals Controlled

The results from the control by killing of problematic animals by the state showed that the government of Zambia lost huge revenue amounting to K 4,318.49.86 which would have created more investment in the study area if such animals or trophies were sold. It was found that to control Human - wildlife conflict in Lupande Game Area, there was need to kill animals which mostly

terrorize villagers. This finding is in line with the findings by McManus *et al.,* (2015) who notes there is need for governments employ regulated methods of lethal control as a tool to alleviate unwanted human– wildlife impacts, such as depredation. These findings also are in line with Gross, *el, al.,* (2008) who indicated that there were losses of human lives as well as captures and deaths of elephants due to Human – wildlife conflict indicating that the vast majority of human and elephant deaths occurred in or around elephant pouch areas which have lost significant amounts of forests. However, the farms that were larger and not fenced were more likely to be raided by elephant and other animals that graze the local crops. It can be concluded that the occurrence of crop-raiding was predicted by settlement density, distance from daytime elephant refuges, and percentage of cultivation (Graham *et al.,* 2010). Therefore, some problematic animals controlled by the state included elephants, buffalos and hippos in most cases.

Effectiveness of Response Strategies

Results on effectiveness when responding to Human – wildlife conflict cases showed that the majority of the participants stated that few measures were put in place to solve Human - wildlife conflict. Some of the measures established include, control or kill animals which mostly terrorize villagers, electric fencing in few areas, chilli bomb and planting of early maturing variety. This finding is in line with the findings by McManus *et al.,* (2015) who notes there is need for governments employ regulated methods of lethal control as a tool to alleviate unwanted Human– wildlife impacts, such as depredation. Lethal control is often considered a cheap and cost-effective method of reducing negative Human– wildlife impacts, potentially explaining its popularity with governments (Naughton-Treves, Holland and Brandon, 2005). This strategy applies in the present study area and is highly supported by the (Zambia Wildlife Act, 2015). Therefore, this method ensures that animals which have been noted to be a threat to the community are killed so that there is safety for the local people. However, there is need to be careful in using this method, there are possibility that people may end up depleting wild animals in the name of killing a stray lion or elephant. The finding further is in resonance with Hoare (2015) who found that deterrents provide another non-lethal conflict Human – wildlife management innervation strategy, commonly used to dissuade species from entering human settlements and accessing resources. Though this method provided may be effective it does not provide sustainable solution as animals easily forget and may terrorize the area once more after some time (Zambia Canivore Programme, 2020).

The foregoing findings correspond to Sanford's Community Development Theory. The first foundational concept of Sanford (1962) involves the cycles of differentiation and integration. Differentiation occurs when people understand themselves as unique individuals, while integration happens when people recognize themselves as members of various groups. Through this process, community members protect the community environment to ensure they get the value out of the community investment. To achieve this, the community members ensure that they protect the economic value which they have invested in their communities, and this brings conflict with the other stakeholders. Through this theory, the economic value has to be protected in the communities so that the animals and the agricultural land should be of value in the communities.

CONCLUSION AND RECOMMENDATIONS

Conclusion

From the findings on damage in agriculture, it can be deduced that the economic loss as a result of Human – wildlife conflict was huge affecting farmers in the study area. From the findings, it was established that it was cheaper to control by killing of problematic animals than translocation. Though it was cheaper to kill problem animals, results further showed that killing of the animals would negatively affect their population growth and revenue loss to the government. From these findings, therefore, it can be seen that the Government of Zambia through controlled or killed problem animals, incurred revenue loss amounting to K 4,318,049.86 which could have created more investment if such animals were sold to the bidders. In order to effectively respond to Human - wildlife conflict in Lupande Game Management Area, the findings showed some response strategies such as control by killing of problematic animals, use of chilli bomb to scare away animals, erecting solar fence in conflict hot spot areas and planting of early maturing crop varieties.

Recommendations

There is need for the government through stakeholders to enhance the construction of restraining solar powered electric fences near human settlements and agricultural fields in Lupande Game Management Area. This would enable massive reduction on damage in agriculture and retaliation on wildlife by affected communities. The government through stakeholders need to invest in infrastructure such as improved construction of watch tower vantage points to ease monitoring of problem animals, construction of improved livestock enclosures and improved granaries. This would further help protect livestock predation and elephants from damaging traditional granaries. Due to the huge revenue loss on control of problem animals causing damage on agriculture, there is need for the government to consider formulating a policy towards the revenue recovery from controlled animal trophies.

For this suggestion to be done properly, the controlled animal trophies should be well preserved by the Department of National parks and Wildlife to add value in order to attract the clients who are interested. The recovered revenue or money would not only increase the government treasury but also to recover the cost officers use to kill the problem animals. The Government of Zambia should consider increasing man power (wildlife police officers). The increased man power would enhance quick response to protect both wildlife, human life and property in Lupande Game Management Area. The Government to consider employing a specialized Ecologist in the area of Human – wildlife conflict in the Luangwa Ecosystem. This recruitment would help the government with strategic professional information at the larger spectrum and enhance policy formulation towards Human – wildlife conflict.

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