



Human-Baboon Conflict on Resettled Farms in Zimbabwe: Attitudes and Perceptions among Local Farmers

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Authors' contributions

This work was carried out in collaboration between both authors. Author JN designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Author EHN managed the analyses of the study. Authors JN and EHN managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

As human populations expand into areas where wildlife exists, competition for resources and confrontation arises as a result. Some parts of rural Zimbabwe are typical of this problem especially in newly resettled areas. The aim of this survey was to examine the impact of crop raiding and livestock depredation by baboons (*Papio ursinus* Kerr) on farmers living around the edge of Makumbiri mountains in Concession, Mazowe District in Mashonaland Province of Zimbabwe. The survey was conducted from January to mid-April 2018 using a set of structured questionnaires complemented with field survey, focus group discussion and in-depth interviews. Fifty-nine crop fields were surveyed and forty newly resettled farmers within the five villages surrounding the mountains were interviewed. The purpose was to elicit information on their experiences with crop/livestock losses incurred from baboons, and to quantify these losses as well as to evaluate their attitudes and perceptions towards the baboons and their mitigation strategies towards their losses. Apart from maize, some respondents (20%) reported that other crops raided

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were vegetables and other small grains such as rapoko (30%). About 62.9% of the respondents indicated livestock losses by baboons during the 2017 cropping season. The total maize crop destroyed in each field was compared with the total estimate of the crops grown in that field producing an average percentage loss of 0.11%. The χ^2 test showed that there was no relationship between the level of crop destruction and the distance from the edge of the forest ($\chi^2 = 4110$, $df = 58$, $p = 0.086$). Many (62.5%) farmers felt that baboons were retarding their success as a community but many opted to coexist with baboons. Although baboons are vermin in a society relying on subsistence agriculture, their impact is perceived to be overly moderate. Peaceful coexistence between humans and baboons seems to be the favoured conservation strategy.

Keywords: Baboons; primates; human-wildlife conflict; attitude; crops.

1. INTRODUCTION

Human wildlife conflict is a significant and critical threat to conservation across the world [1]. This threat occurs when the needs of human population overlap with the requirements of the wildlife which usually results in costs to both the local residents and animals [2]. Madden, [3], defines human wildlife conflicts as conflicts which occur when the needs and behaviour of wildlife impact negatively on the goals of humans, or when the goals of humans negatively impact the needs of wildlife. According to [4], local farmers may resort to lethal means of dealing with wildlife, because they view them as pests and hence try to protect their land. However, this often results in the decline of wildlife populations. The losses experienced by local farmers encompass financial losses when crops are damaged, resulting in yield reduction. In some instances, local farmers are forced to replant, thus incurring an added cost on inputs. Local farmers also experience other psycho-social stresses as they try to safe guard their crops, sleeping late and waking up early and sometimes having to assign guarding duties to school- going children and the elderly.

Wild animals have also been blamed for loss of property and livestock. In Kariba, Zimbabwe, for example, [5] reports that the proximity of human settlements to the game reserves increases the chance of conflict. In Gokwe, Zimbabwe, [6] reports that households reported a 12% loss in livestock due to lion and baboon raids between 1993 and 1996. In Tsavo Conservation area in Kenya, [7] have also reported that children's learning is disrupted by elephants, reducing their contact hours with the teachers at school. Some of the elephants have been observed visiting the schools while others prevent movement to or from school. This has been observed to affect the performance of pupils in the national school examinations.

Conflict between humans and wildlife is viewed as a major factor which affects conservationists' efforts in Africa [8]. Conservationists are however pushing for increased tolerance of the animals' behaviour and some even advocate for cohabitation between the wild animals and humans. Some conservationists believe that with more information from local farmers, citing their losses, feelings, experiences and losses may actually help in the formulation of mitigating strategies in this human wildlife conflict [9].

Crops near forests are often predictable and accessible sources of nutrition for wildlife [10]. Extensive damage through crop raiding can adversely impact local farmers' livelihoods [11], and thus compromise their food security [12]. Local farmers settled around Makumbiri mountain ranges situated in Concession, Mazowe District of Mashonaland Central Province in Zimbabwe experience crop and livestock raids by the Chacma baboons (*Papio ursinus*) and other wild animals. The previous white commercial local farmers in Zimbabwe, who used to own the farms surrounding these mountains, used to ward off baboons and other wild animals through the use of rifles, and could afford to put up barricades around their farm lands, which protected their crops from the animals. Such deterrents, which made the animals stay away from the farms, are not easily available to the new local farmers and hence they experience periodic raids from wildlife. Each season, the local farmers have to spend money and time to guard their crops from attack by baboons.

An area that has received little attention within agricultural development is the potential damage that baboons can cause to farmers' fields. In Africa, baboons *Papio* spp. and vervets *Chlorocebus* spp. top the list of crop-raiding primates [13,14]. Farmers in developing countries often have limited access to cash and

are rarely compensated for their losses. Individual economic losses suffered from crop-raiding can be relatively high [15]. No studies have been conducted on crop damage by baboons in the resettled farms of Concession, hence, there is still an increasing need for a proper understanding of crop raiding patterns and the need to document the level of conflict between humans and these primates. According to [8], a good understanding of the economic and social costs of living with wildlife will go a long way towards alleviating the problem. For the purpose of adopting measures for baboon conservation in and around these new human settlements, [14] advocates a comprehensive record of crop-raiding activity, including patterns of raiding, farmer and raider behaviour, crop losses, and the parameters of raiding events. The aim of this research was to evaluate the extent to which local farmers incur losses due to baboon raids, and to determine whether baboons are as much of a threat as they are perceived to be by the local farming community.

2. METHODOLOGY

2.1 Study Area

The research was conducted from January to mid-April 2018 at forest-agriculture interfaces around Makumbiri mountain ranges, which are situated in former Bellavista farm (17°30' 31" S and 30°40' 29" E, altitude 2183 to 2268 m above sea level) in Concession, Mazowe District of Mashonaland Central Province in Zimbabwe. Concession is located about 33 km north of Harare and 112 km west of Bindura. The forest covers an area of about 57 hectares. The average annual rainfall is 1739 mm, with the rainy season stretching from November to March and a relatively dry period from May to October. There is a high variation of temperature throughout the year but the maximum temperature is in October. The main crops cultivated are maize, groundnuts, sorghum, tomatoes, onion and various types of leaf vegetables. The farmers are also involved in small-scale livestock rearing. Cattle, goats and chickens are the main livestock animals reared.

2.2 Study Population

All the households which surround the Makumbiri mountain ranges were included as the study population. All study fields adjoined forest and were surveyed for vulnerability to livestock and crop-raiding. These farmers were selected because they live near the mountains and some

have their fields near the forest or mountains. Thus, those local farmers who had previous conflicts with the Chacma baboons, *Papio ursinus* were selected for this study. The families of these local farmers also qualified for selection, as they also faced the same problems. Only a single person was taken to represent their household. A total fourteen (14) households from the north side of the mountain ranges and twenty-six (26) households from the south side of mountain ranges constituted the study population. A total of fifty-nine (59) fields were observed from the forty (40) households.

For the human-baboon conflict assessment, participatory techniques, focal group discussions, key informant interview and structured questionnaire survey of households were used. Participatory techniques involved making visits to the maize fields and talking to people guarding the fields. Focus group discussion was used to gather information on how the local farmers perceived the baboon problem, their level of tolerance and suggestions on mitigating strategies. Selection of participants was based on those who have lived in the area for a minimum period of ten years. Key informant interviews were carried out with community leaders and the elderly to solicit their views on baboon problems and mitigatory strategies. In addition, relevant written information was gathered from the district's agricultural office.

2.3 Ethical Considerations

Field work commenced with a period of familiarization in which the researchers briefed members of the local community on the intentions of the study to allay any suspicions. Ethical considerations of anonymity, right of refusal, and clarity of outcomes were adhered to, by not recording names or guaranteeing solutions [16].

2.4 Field Observations / Direct Assessment

Only the maize fields were considered in this study. The first observations were undertaken starting in February 2017 when the maize was at tasseling stage until harvesting time in April, 2017. Walk transects around the fields were carried out once every fortnight and measurements taken of how far the fifty-nine fields were from the edge of the forest. Quadrats measuring 50 mx50 m were randomly demarcated and the number of maize plants

whose cobs were plucked by baboons were counted. For each maize field we aimed at 10% of the sampled area. The percentage damage was calculated by dividing the total number of cobs plucked per quadrat by the total population of maize plants in the quadrat.

The distance of each field from the forest edge was measured so as to ascertain the relationship between the crop losses and the distance from the forest edge. Observations on the time taken to guard the fields from the baboons was recorded.

2.5 The Questionnaire

A questionnaire survey was used to acquire information on the various aspects of the study about the different variables with questions being both open and close ended. The questionnaire survey was carried out between February and April among all local farmers who own fields around the forest edge. Interviews were also held to establish in-depth information about crop raiding problem and consequences on farmers' livelihoods. The questionnaire, consisting of twenty-two questions, was designed to solicit information on the losses by farmers due to baboons and preventative strategies taken to alleviate the problem. The questionnaire also sought to investigate the community's attitudes and perceptions towards baboons, and what they viewed as the best option to resolve this human-primate conflict.

2.6 Data Presentation

Data gathered was compiled in form of tables, pie-charts and graphs from the questionnaires and observations made. Accordingly, descriptive statistics in the form of percentage and frequency were generated for the types of crops cultivated by farmers, types of crops mostly damaged by the baboons, the main causes that increase human-baboon conflict, effect of human-baboon conflict on livelihood of farmers.

2.7 Data Analysis

The χ^2 test was used to establish the presence or absence of relationships between the chosen

variables. Results were considered to be statistically significant when $p < 0.05$. Relationship like the distance from the edge of the forests and the amount of damage was carried out.

3. RESULTS

3.1 Estimates of Maize Losses Incurred in the Field

The fields sizes ranged from 0.25 hectares to 3.00 hectares with an average maize population of approximately 24 505±3763.7 plants per hectare. The average number of cobs plucked by baboons per hectare was 48±6.7 giving an average loss of about 0.20% per hectare. Of the 59 fields, the smallest distance from the edge of the forest was 33 m while the furthest was 479 m. The average distance of the sample fields from the edge of the forest was 206±15.4 m. There was no significant relationship between the distance from the edge of the forest and the amount of damage to the maize crops ($\chi^2 = 4110$, $df = 58$, $p > 0.05$).

3.2 Other Losses Experienced by the Farmers

Apart from maize, the other crops raided were vegetables and other small grains such as rapoko. Goats and chickens were also raided (Fig. 1).

3.3 Questionnaire Responses

3.3.1 Demographic characteristics of the respondents

All the 40 questionnaires were answered and returned, giving a 100% return rate. There were 25 males and 15 females who filled in the questionnaire.

3.3.2 Educational level of the respondents

Most of the respondents had no college level of education with the highest number (71.8%) of respondents having reached Grade 7 and below. Only 7.7% of the respondents had reached A level and only 5.1% had attained degree level of education (Fig. 2).

Table 1. Age of respondents

Age	19 and below	20-29	30-39	40-49	50-59	60-69	70+
Percentage/%	12.5	22.5	32.5	20	10	0	2.5

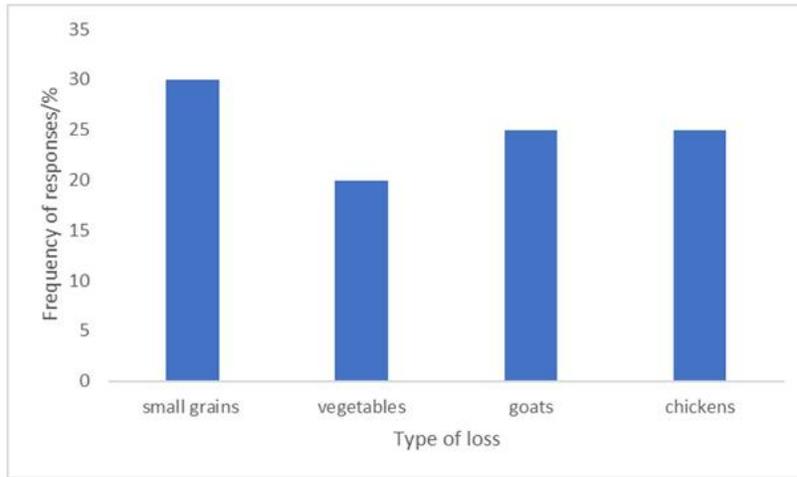


Fig. 1. Other losses incurred by farmers

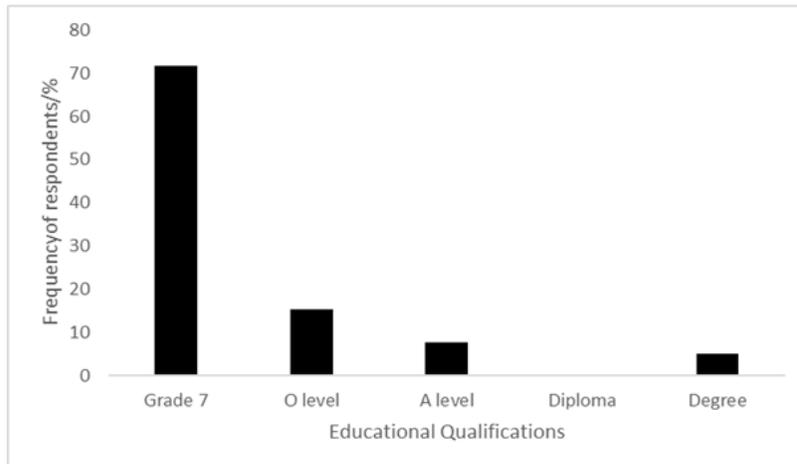


Fig. 2. Educational qualifications of the respondents

3.3.3 Perception of the size of the problem

Regarding perception of the size of the problem (Fig. 3), 33% of the respondents felt that the baboons were a major problem in the area, while 38% perceived it to be an average problem. Only 27% of the respondents felt that the conflict was a small issue and 2% believed that the conflict was non-existent.

3.3.4 Preventative strategies taken against baboon raids

The majority of the respondents (39%), (Fig. 4) reported that they resorted to guarding their fields against the baboons. Only 2% of respondents suggested increasing security in the fields, while 17.5% of the population said that

they attacked the baboons with intention to injure or kill. None of the respondents interviewed had reported their problem to the national parks authorities.

3.3.5 Gender and ages of those who guard the fields

The largest proportion (Fig. 5) of respondents who reportedly guarded were adult males in the 20 to 59-year age group. These made up 60% of the sample, followed by adult females (27.5%). There was a small percentage (7.5%) of older people over the age of 60 also reported guarding the fields. Boys and girls of school going age were 5% and 0% respectively in as far as guarding the fields was concerned.

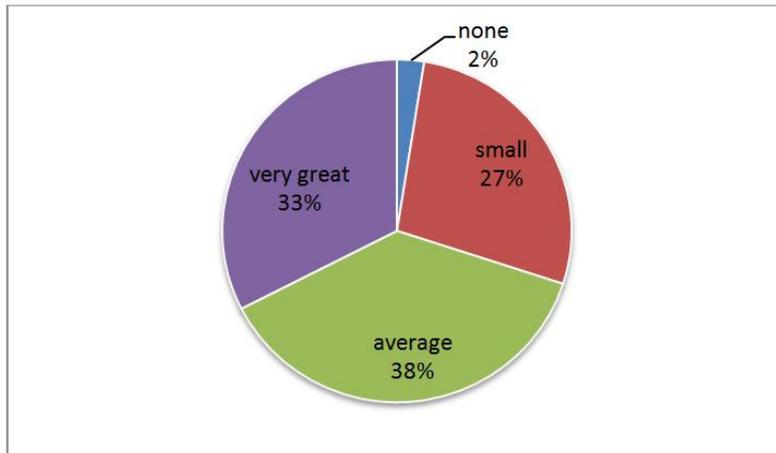


Fig. 3. Perception of the human-baboon conflict

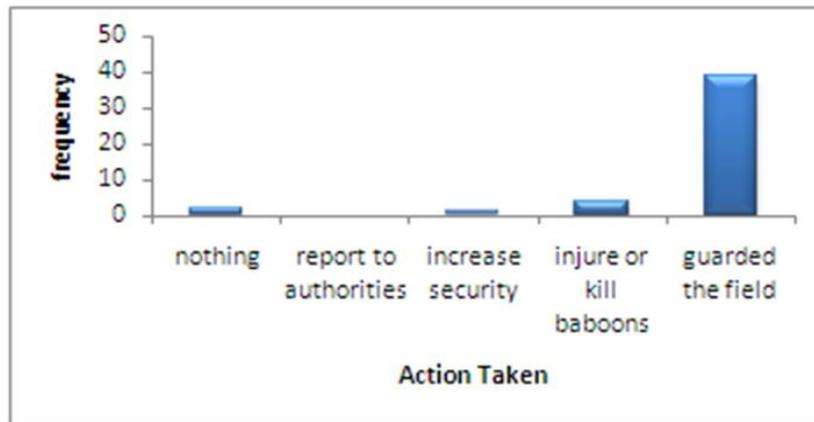


Fig. 4. Preventative strategies by local farmers against baboons

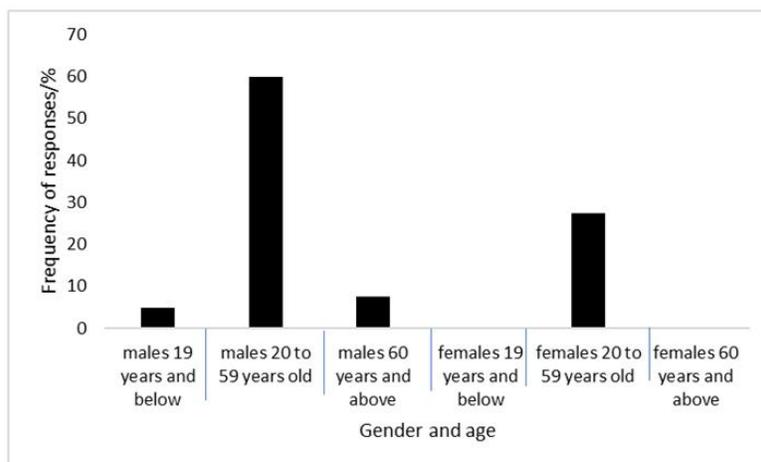


Fig. 5. Gender and ages of those who guard the fields

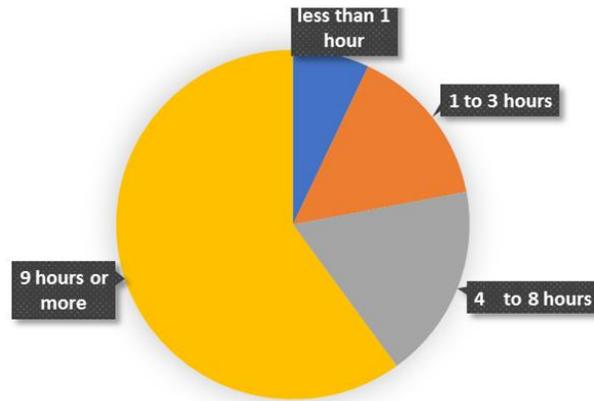


Fig. 6. Time spent per day guarding the fields

3.3.6 Time used in guarding the fields

Nearly all local farmers interviewed suggested that they take some time to guard and protect their crops. Of these local farmers, 60% reported spending more than 9 hours per day (Fig. 6) guarding the fields, while 18% reported that they spent between 4 and 8 hours per day. Those who spent between 1 and 3 hours per day guarding their fields accounted for 15% of the total population and 7% of the respondents reported spending less than 1 hour per day.

3.3.7 Attitudes and perceptions towards baboons

Amongst all the respondents, 55% felt that baboons were a threat to the development of their community while 45% did not agree with that notion. Most individuals who said that the baboons were a threat also mentioned issues such as the long time that they have to spend guarding their fields from baboons and the amount of money they have to use to re-sow the seeds which the baboons scratch out of the ground, as well the young maize cobs which they pluck off. Of the 55% respondents they felt that they might have done other meaningful household chores if they did not spend all that time and money on guarding fields against baboons.

Out of all respondents, 62.5% of them felt that humans and baboons can actually coexist, while 37.5% of the respondents disagreed that they could not coexist with the baboons. The higher number of those who believed in a possible coexistence mentioned reasons which suggested that the baboons and other wild animals were

God's creation and, hence they should have a fair chance of existence. A small percentage of the respondents mentioned issues to do with species preservation, as they felt that their children had a right to know how the baboons look like and would not want to take their children to parks and to zoos in order to see these animals in their natural original habitats. The people who spoke against coexistence indicated the damage which baboons cause as well as the time people spend in guarding as reasons to why they would not want to have the baboons living in areas near human settlements.

4. DISCUSSION

The crops raided ranged from maize, small grains to vegetables while livestock ranged from goats to chickens. Such a situation indicates the vulnerability of the local farmer due to the omnivorous nature of baboons. This therefore presents a problem to the farmer in that he/she has to allocate simultaneously resources and time to protect both crops and livestock from the marauding primates.

Results also showed that no relationship seemed to exist between the distance from the edge of the forest and the number of crops raided in the fields. According to [17], the further the field is from the edge of the forest the lesser the losses which are expected to be found in the field. The lack of a direct relationship between the distance from the field and the amount of losses inflicted was quite unexpected and deviated from the norm. This could be attributed in part to baboons being unpredictable and their highly adaptable nature, and their ability to learn very rapidly and change their behaviour accordingly [18].

The financial losses calculated translate to about US\$0.44 per every tonne. Taking into consideration the current Zimbabwe Grain Marketing Board (GMB) producer price of US\$390.00 per tonne, this only translates to about 0.11% loss in monetary terms. These results are in agreement with those reported by [19] in South Africa where she reported that tolerable levels of loss among farmers in Limpopo Province ranged from zero to up to 10% of the crop. According to [20], it has been estimated that the annual cost of elephant raids to crops ranges from US\$60 (Uganda) to US\$510 (Cameroon) per affected farmer. For Zimbabwe however, the cost incurred due to baboons is very low such that most farmers would not consider the baboon to be such a big menace which would warrant its removal from the area as compared to elephants. Most were content with guarding their fields during the cropping season. Thus, every farmer plans from the onset how they will guard their field from the baboons.

Wherever a forest neighbours agricultural farms, there will be some risk of crop loss. Ameliorating these losses and elevating local tolerance for wildlife incursion will require a sophisticated blend of technical, social and economic interventions [21]. Farmers have to accept a small amount of crop loss to wild animals. From the results of this study, the following recommendations were made to help reduce the effect of the crop raiding problem. However, this is in two categories. Those to minimise crop loss to wildlife and those to conserve wildlife. The study revealed that most local farmers and their families guard their fields to protect them from baboons more than any other method. This may be due to the fact that most of the local farmers do not have the money to erect fences and barricades. [22] suggest that fences can be very effective at deterring wild animals, especially electric fences. Most local farmers in Concession do not have electricity in their homes and most of them are financially constrained to erect wooden fences. The small wooden fences which they construct around their vegetable gardens are not effective against the baboons which can jump over the fence or even open the gates which they use and enter into the vegetable garden easily. Most of the local farmers never bothered to report the issue to the authorities like the parks and wildlife authorities or the police.

Most local farmers felt that it was a common problem which required no law enforcement. This

may actually cause an annoyance to the local farmers because after they experience losses due to baboons, there is no one to compensate them for their losses and they cannot afford to insure their crops as was the case with the former white commercial farmers.

The majority of the respondents indicated that they spent more than nine hours per day guarding their fields. Some respondents compared themselves to other local farmers who are not experiencing the baboon problem. They expressed concern that if this pest problem could be resolved or better controlled, they would have more time to be productive in other commercial ventures such as mining, where they would get extra income to supplement the income generated from the fields. This explains why 55% of the respondents stated that the presence of the Chacma baboon was counterproductive and working against the progress of their community. Some of the respondents were even against the idea of coexisting with the baboons and were advocating for their removal from the area.

5. CONCLUSION

The community in Concession resettled at the fringes of mountains, are particularly vulnerable to crop raids by baboons. Four major themes emerged from this study, that is, the nature of crop raiding, risks to crop yields, attitudes towards baboons and perceptions about baboons by local people in Zimbabwe. The attitude of local farmers toward baboons is negative. Most of the local farmers feel that the baboons are a major barrier to their community's development mainly due to the time they have to use in the guarding of their crops from the baboons. However most local farmers welcome the idea of coexistence with the baboons only if their destructive behaviour could be controlled.

Man and baboons are both primates, but man, being more superior and advanced than the other, should show distinguished superiority by using brain to resolve the conflict by devising techniques and practice that are non-lethal in dealing with baboons so as to maintain the co-existence.

6. RECOMMENDATIONS

Mitigating human-baboon conflicts needs to take into consideration techniques that would not result in the decimation or local extinction of the baboon population but rather would deter them

so that they spend more time in their natural areas, that is, the forests. The use of an electric fence appears to be effective at keeping most wild animals away from crops [19]. However electrical fencing has rarely been recommended for crop protection because its high cost renders it unfeasible as a mitigation method for subsistence farmers [23]. Perhaps through its relevant ministries and departments, the government could subsidize the local farmers in the erection of solar-powered fences around their fields. Although the start-up costs may be high, it may provide for a feasible long-term solution.

CAMPFIRE (Communal Areas Management Programme for Indigenous Resources) is a programme designed to give control of wildlife management to rural communities, so that they would invest in wildlife and habitat conservation and in turn, receive benefits such as dividends from trophy hunting. Under the program, villagers work with government agencies to develop sustainable wildlife management programs based on hunting a controlled number of wildlife from their areas [24]. Local farmers in Concession could benefit from CAMPFIRE's programme by inviting hunters who are willing to pay hunting fees. This way, crop and livestock loss would be minimised. Under international law trophy hunting is legal. Moreover, according to the International Union for the Conservation of Nature (IUCN), primates such as baboons are not considered endangered and so can be shot and their numbers reduced to manageable levels [25].

Farmers could also be encouraged to concentrate on crops which are not palatable to baboons such as paprika, Irish potato, onions, tea, tobacco, and pastures as buffer crops. However, this should be done carefully by encouraging farmers to practice cattle ranching, mixed farming, and crop production in that order as one moves away from forest edge or protected area.

More education can be provided to local farmers on current environmental laws and pest management techniques, particularly those who come into conflict with baboons on a regular basis. They can be informed in legal deterrent controls that would enable the farmers to only deal with baboons rather than seeing them as problem animals need of decimation.

CONSENT

It is not applicable.

ETHICAL APPROVAL

Field work commenced with a period of familiarization in which the researchers briefed members of the local community on the intentions of the study to allay any suspicions. Ethical considerations of anonymity, right of refusal, and clarity of outcomes were adhered to, by not recording names or guaranteeing solutions.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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