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Patterns of Crop Raiding Around Mabira Forest Reserve, Uganda

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Abstract: The objectives of this study were to determine wildlife species causing crop raiding and the crops they raid the level of crop raiding as estimated by farmers the factors perceived to determine the level of crop raiding among farmers' gardens and the methods that farmers use to control crop raiding. The study was conducted in seven village enclaves of Mabira forest reserve, Uganda using individual household interviews from a total of 70 households representing the management zones constituting the forest. The crop-raiding wild life species around Mabira forest reserve include red-tailed monkeys, grey-cheeked mangabeys, bush pigs, rodents, porcupines and antelopes. The 1st two species are the major crop raiders. They mainly raid maize, bananas and passion fruits. Approximately 40-70% of the crop yields is lost to crop-raiding by wild animals. The level of crop raiding was most severe with maize followed by bananas then passion fruits and least was cassava. According to the farmers, crop raiding among management regimes is higher in the production (low impact) zone but did not differ between the other two. Farmers believe that susceptibility of the crop, intercrop of susceptible and less-susceptible crops and weed management are important factors affecting the level of crop raiding by wild animals. The methods used by farmers to control crop raiding include guarding, use of scarecrows and smearing with cow dung. It is recommended that intercropping susceptible crops such as maize and bananas with the less susceptible or non-edibles such as coffee, sugarcane, planting of buffer crops, enrichment planting in the forest could help reduce the extent of raiding on some crops as well as diversifying production.

Key words: Crop raiding, pattern, Mabira forest, planting, fruits, Uganda

INTRODUCTION

Forest-edge communities and wildlife have interacted for long and so is human-wildlife conflict. There are increasing complaints about crop raiding by wild animals in the agricultural areas adjacent to protected areas and requests by adjacent farmers for compensation and/or permission to kill them (Baranga, 2007). To avert actions that may jeopardize the conservation of species of conservation concern, it is necessary to evaluate the factors controlling the impact of wildlife species on farmers' crops.

Farmers' complaints usually are based on subjective estimates and these may not be very useful in determining compensation where it may be required.

While most studies rely on interviews with farmers to obtain estimates of crop loss (Maples *et al*., 1976; Hill, 1997, 2000; Naughton-Treves, 1998, 2002; Chapman and Chapman, 1999; Tweheyo and Obua, 2001), the few that measure actual impact and test factors that affect crop raiding (Kagoro-Rugunda, 2004; Nyhus and Tilson, 2004; Osborn and Parker, 2003; Barnes *et al*., 2005; Sitati *et al*., 2005; Chiyo *et al*., 2005) do not always address the issue of cropping systems and forest management as a whole. This information is useful in guiding decisions on selection and use of appropriate measures to control crop raiding in farmers' gardens. In addition, the lack of this information may lead to inaccurate predictions and meager recommendations. Given the gravity of conflict arising from crop raiding and the high cost of current management options there is urgent need to undertake a holistic evaluation of crop raiding by assessing the influence of forest management zoning and cropping systems.

Therefore, the objectives of this contribution is to determine wildlife species causing crop raiding and the crops, they raid the level of crop raiding as estimated by farmers, the factors perceived to determine the level of crop raiding among farmers' gardens and the various methods that farmers use to control crop raiding.

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MATERIALS AND METHODS

The study was conducted in village enclaves of Mabira forest reserve (0°24' and 0°35'N and 32°52' and 33°07'E), located 54 km from Kampala city and 26 km from Jinja, the second largest town in Uganda. The forest covers an area of 306 km^2 (31,293 ha) traversing Mukono and Kayunga districts of Uganda. The study was conducted in three zones of the forest; the nature reserve, recreation buffer and production (low impact zone). The zones were selected because they represent the different levels of human impact on the forest. In the nature reserve, extractive use is completely prohibited, implying negligible disturbance of the forest ecology.

In the recreation buffer, minimal extractive use of fuel wood extraction and medicinal plants is permitted thus, representing moderate human disturbance. In the production zone however, there is more severe disturbance due to permitted logging and charcoal burning.

The approximate area of the nature reserve, recreation buffer and production zones are 7,350, 10,247 and 15,732 ha, respectively. Seven villages (Namusa, Kayunga, Kasokoso, Najjembe, Buwola, Sanga and Naggojje) were selected based on their location within 300 m relative to the different forest management zones. In each management zone, households located within 300 m of the forest boundary were selected for interviews.

Household interviews were conducted with a total of 70 households selected from seven villages in three forest management zones. Choice of the households to be interviewed was subjective in order to allow the distribution to be uniformly throughout the village. Interviews were guided to ensure that the appropriate response was given. Farmers ranked the factors according to their perceived relative importance to raiding by wild animals. The reasons were weighted by multiplying the rank with the number of farmers in the category. On a 0-10 scale, farmers were asked to estimate the level of crop raiding on selected crops in any particular growing season. Each session of the interview took about 30 min.

Data analysis: Identification of the crop raiders, the crops they raid, methods used to control raiding, ranking of raiders and perceived factors that enhance crop raiding were analyzed qualitatively. Farmers' perceived factors enhancing crop raiding were weighted by multiplying the rank index by the number of farmers mentioning that index. Crop raiding was expressed by the farmer by translating the 0-10 scale into the percentage scale. To compare the level of crop raiding among farmers in different management zones, the crop raiding estimates were square-root transformed before ANOVA was performed. The reported mean values are back-transformed values.

RESULTS

Wildlife crop-raiders and crops raided: The major crops grown by farming communities surrounding the Maira forest reserve are shown in Table 1. Bananas, maize, coffee and passion fruits are the major crops. Other less cultivated crops include cassava, yams and potatoes. All these crops can be found all the surveyed villages but with varying amounts cultivated.

Different crop raiding wildlife species raided on different crops and at different stages of growth (Table 2). Bananas and maize were raided at all stages of growth from the time of flower emergence to maturity. All the sampled farmers in the seven village enclaves reported primates to be the most destructive crop-raiders. The two primate species reported and observed were the red-tailed monkeys (*Cercopithecus ascanius larvatus*) and grey-cheeked mangebey (*Lophocebus albigena*). Other wild animal species reported include bush pigs, crested porcupines, antelopes, foxes and giant rats.

Farmers reported that raiding occurs throughout the day ranging from sometime before 7:00 a.m. to about 7:00 p.m. for as long as there is day light. Majority of the farmers reported that the primates usually raided early afternoon between 1:00 and 3:00 p.m. and late afternoon. They also reported that in gardens immediately neighboring the forest boundary, the primates always hid in the forest canopy and wait for the farmers leave the gardens before they come to raid.

Table 1: Major crops in the Mabira forest management zones

Forest management zone	Villages sampled	Major crops grown
Recreation buffer	Kasokoso, Ssese Najjembe	Maize, bananas, passion fruits, sweet potatoes, yams, coffee, cassava
Nature reserve	Namusa	Bananas, coffee, cassava, sweet potatoes, passion fruits, yams
Production (encroached)	Sanga 1Buwola Naggojje	Bananas, yams, cassava, vanilla coffee, beans, maize

Table 2: Crop raiders and the crops they raid and local people's perception on the level of crop raiding severity (N = 70)

Crop raiders reported	Perceived level of crop raiding	Crops raided
Red-tailed monkeys	High	Maize, bananas, passion fruits, sweet potatoes, coffee
Grey-cheeked mangabeys	High	Maize, bananas, passion fruits, sweet potatoes, coffee
Porcupines, mole rats	Low	Cassava, yams, sweet potatoes
Bush pigs*	Low	Cassava, sweet potatoes, yams

*No individuals or evidence of their presence in the gardens were not observed

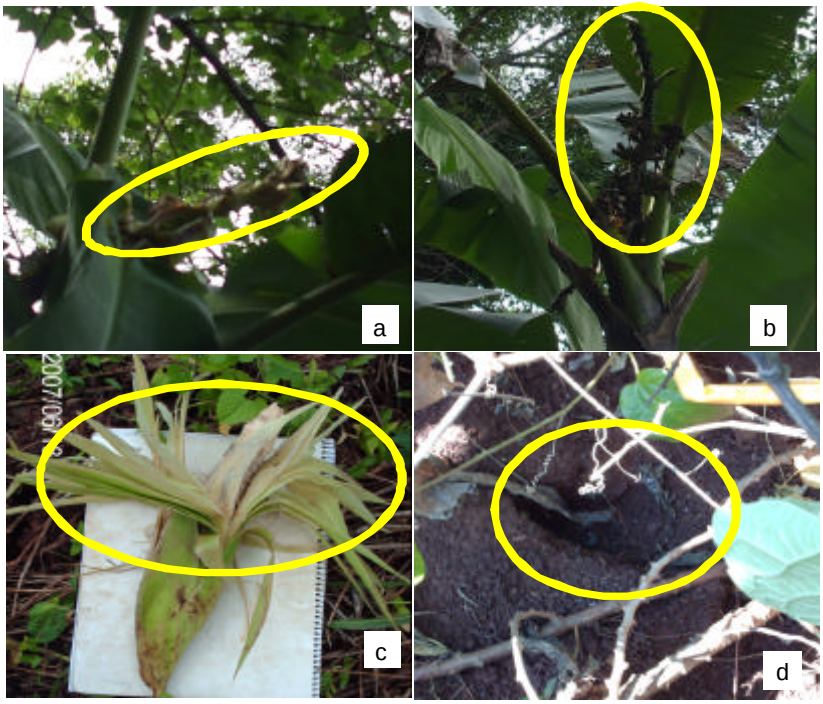

Fig. 1: Evidence of crop raiding by wild animals around in Mabira forest reserve: a) emerging banana flower; b) maturing banana; c) mature maize, raided by primates and d) cassava raided by rodents

The wild animals raided many types of crops but mainly maize, bananas, passion fruits, coffee, cassava sweet potatoes and yams. Two types of crop raiders are clearly recognized; above ground (primates) and ground (bush pigs and rodents) raiders. Each of the above categories raided different types of crops-above ground raiders raid plant parts above ground while ground raiders raided surface or sub-surface plant parts. Cassava is the least affected and is reportedly attacked mainly by bush pigs, rodents and porcupines. Figure 1 shows some of the evidence of crop raiding.

Red-tailed monkeys and grey-cheeked mangabeys are reportedly the major raiders of maize and bananas although, they are also reported to raid sweet potatoes especially in times of food scarcity. The farmers however, reported that the grey-cheeked mangabeys are fewer in number but more destructive once they entered the gardens. In Namusa and Kasokoso (Nature reserve and recreation buffer zones, respectively) while passion fruits are extensively grown, all the 20 farmers who had gardens of passion fruits reported raiding by primates as the major causes of crop losses.

The bush pigs are reported to be destructive crop-raiders of cassava, sweet potatoes but raid only occasionally (i.e., once or twice a year), especially in gardens neighboring the production zone and in the recreation buffer. On the basis of major crop raiders, farmers were asked to partition total raiding estimate of particular crops among the crop raiders. Bananas, maize and passion fruits were selected for analysis because the other crops were raided only occasionally. An analysis to determine whether raiding estimates by farmers were associated with a particular species of primate raider showed no evidence of more raiding associated with a particular primate raider.

Levels of crop raiding by wild animals: Crop for which estimates were obtained were maize, bananas, cassava and passion fruits. For all the crops combined, farmers estimated that between 40-70% are lost to crop-raiding by wild animals. The individual estimates for raiding on maize, bananas, cassava and passion fruits were 70, 65, 44 and 50%, respectively (Fig. 2). Maize, bananas and passion fruits raiding estimates were significantly higher than those of cassava ($F_{5, 507} = 12.5$, $p<0.001$). Estimates of crop raiding on bananas and maize did not differ significantly but were generally higher than those for passion fruits.

Estimates of level of raiding on cassava were significantly lower that all the other crops. Other crops such as yams and coffee are also reportedly raided but farmers did not regard the level of raiding to be of significant importance and were thus left out of the analysis. Raiding estimates by farmers were also

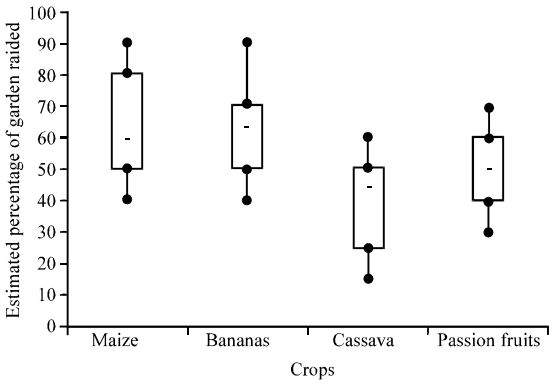

Fig. 2: Farmers' estimates of crop raiding by wild animals on major crops around Mabira forest reserve

compared based on farmers' location in different forest management zones. For maize and cassava, the overall mean estimates of crop raiding for these crops were 59% (SD = 0.01), 54% (SD = 0.02) and 52 (SD = 0.02) for farmers in the recreation buffer, Nature reserve and production (low impact) zone, respectively. Raiding estimates did not differ significantly among management regimes ($p>0.063$) (Fig. 3).

However, bananas and passion fruits were reported to be raided more in the recreation buffer zone ($F_{5, 504} = 18.6$, $p = 0.033$), there being no difference in raiding between bananas and passion fruits in the Nature reserve and production (low impact) zone ($p = 0.055$). The overall mean estimate for all the crops was significantly higher in the recreation buffer ($p = 0.04$) but the production zone and Nature reserve were not different.

Factors perceived to affect levels of crop raiding: Farmers the factors perceived to increase the extent of crop raiding by wild animals are shown in Table 3. Whereas, season is beyond the farmers' control, the rest are factors on which the farmer can have great influence. Results in Table 3 show that when farmers plant more susceptible crops such as bananas and passion fruits, the likelihood that they will be raided is higher compared to if they plated the less susceptible ones such as cassava, coffee, among others. The results also show that intercropping the susceptible with less susceptible crops could reduce the level of raiding by wild animals.

Control methods against crop raiding: Several methods were used by farmers to control crop raiding by wild animals (Table 4). During the plot monitoring phase, the control methods used in and in outside the sampling plots were also recorded in order to validate farmers' assertion. Farmers used the methods either alone or in combination. The factors that determined the method(s) used included

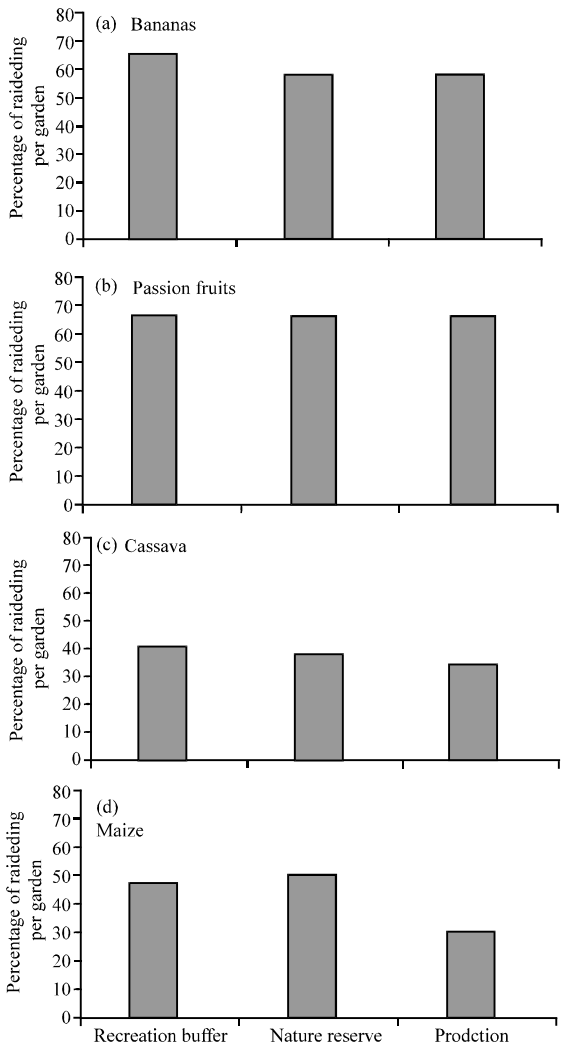

Fig. 3: Farmers' estimates of crop raiding in community farms based on location relative to the forest management zones

Table 3: Factors perceived by farmers to enhance crop raiding by wildlife species

Factor influencing raiding by wild life	No. of farmers mentioning method	Weight rank
Season-dry or wet	63	726
Susceptibility of the crop-preference	70	517
Intercropping-edible or non-edible	57	420
Weed control regime	60	400
Human activities in/around garden	10	212
Guarding efforts	12	56
Forest use practices	8	12

Rank index: 7 = most influence, 1 = least influence, 0 = not mentioned

the raiding species present in the area and the level of threat to the crops. Guarding, use of scarecrows and smearing with cow dung were the most common methods among most farmers especially those growing maize (Table 4). The less commonly used methods included

Table 4: Crop raiding control method, crop protected and targeted animal around Mabira forest reserve

Control measures	Crops protected	Targeted animals	Farmers using method (N = 70)	Plots with method (N = 80)
Guarding	All but mainly maize	Mainly primates	56	16
Smearing with cow dung	Maize and Bananas	Primates	23	12
Scarecrows	Mainly maize, bananas, passion fruits	Mainly primates	18	40
Wrapping with cloth	Bananas	Monkeys and mangabeys	8	15
Lighting fire at night	Cassava, potatoes	Bush pigs	6	5
Trenches	Cassava, yams, potatoes	Bush pigs	6	2
Poison baits	Maize, bananas, passion fruits	Mainly primate raiders	2*	-

*Farmers who reported this method preferred anonymity

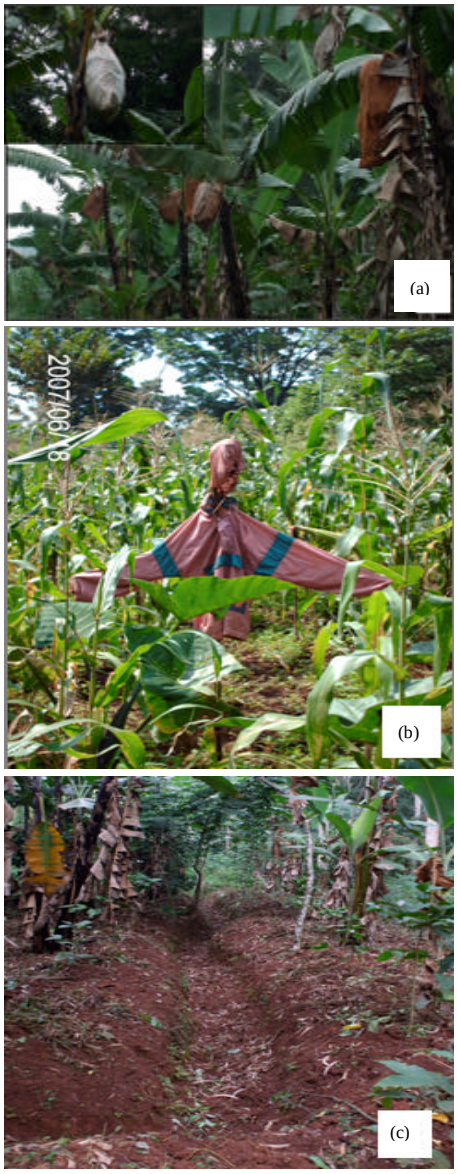

Fig. 4: Methods used by farmers to protect crops from raiding by wild animals: a) Wrapping bananas with bags;v b) Scares crows in maize garden and c) Trech to protect against bush pigs

wrapping with clothes, lighting fires at night and digging trenches at the boundary of the garden. One half of the farmers who used control methods against wild animals employed >1 method concurrently either against the same or different raiders. Out of the 15 farmers who used wrapping as a control on bananas, four wrapped all the bananas in the whole garden while the others rapped between one third and one half of the entire garden. The rest wrapped between 20 and 50% of all the bananas in the gardens. Figure 4 shows some of the methods to protect crops against raiding by wild animals.

DISCUSSION

Wildlife crop-raiders and crops raided: Mabira forest reserve is surrounded by large towns on the eastern and western side and has undergone substantial degradation. The larger parts of the forest have experienced heavy logging for timber and charcoal burning (Howard, 1996). Probably, this has largely destabilized the ecology of forest, leading to the disappearance of most large mammals there by leaving few primates such as monkeys and mangabeys and these monkeys form the largest part of the crop raiding wild animals. This is because farmers say, there is little fruiting in the forest. Thus, the wild animals concentrate on the forest edge largely dependent on crops from farmers' gardens.

Hill (1997) noted that baboons and wild pigs were the animals most feared by farmers locally and attributed the under-reporting of raiding by other species for the reason that they are less conspicuous or the raiding they cause is ascribed to the major pests. The fact that red-tailed monkeys and grey-cheeked mangabeys are less shy animals (Waser, 1985) and their movement in the forest can be easily detected cannot be underestimated in explaining most crop raiding being attributed to them. Bush pigs are not dreadful crop raiders around Mabira forest reserve probably because they have been hunted down over time by the local people. They are reported by farmers to appear only intermittently when they are relocating in the attempt to escape from hunters.

Bananas are a major crop grown locally around Mabira forest reserve where the forest is located. Maize is generally preferred globally because of its high carbohydrate content, ease of cultivation and shelf life

(Brown, 2004). Chiyo *et al.* (2005) also reported maize and bananas as the most raided crops around Kibale national park. It is possible that primates move from the forest to the gardens to benefit from the high carbohydrate content of the maize.

Newmark *et al.* (1994) also noted that crops such as cassava and sweet potatoes are more difficult for red-tailed and mangabeys to raid because the edible parts are underground and thus bush pigs, rodents and porcupines are major raiders.

The results of this study lend support to those of Naughton-Treves (1998) who found out that studied the primates (red-tail monkeys *Cercopithecus ascanius*, olive baboons *Papio cynocephalus* and chimpanzees *Pan troglodytes*) selected different crops or plant parts but red-tail monkeys and chimpanzees selected maize and/or bananas instead of other ground crops.

Early morning and evening correspond to the time before farmers come to the gardens or return home after working in their gardens, respectively. Thus, the primates probably take advantage of the farmers' dearth from the garden and so, they execute the raiding. Because of the acumen behavior of the raiders, especially the primates, raiding does not follow a predictable time slot. The ability of primates to hide among tree branches in the forest neighborhood of farmers' gardens, even in the farmers' presence, implies that farmers have limited ability to daunt the raiders completely.

Levels of crop raiding: Forest primates are the most formidable raiders in Mabira forest reserve and since, they like passion fruits, bananas and maize, it is expected that raiding on a garden containing these crops would be higher compared to other crops. Similarly in intercrops where the major crops are preferred by raiders, raiding should be higher because of the high resource concentration. Overall, the results clearly show this trend. Forest primates, the most serious crop raiders, prefer maize, bananas and passion fruits and gardens having these crops experienced comparatively higher raiding levels. Studies of Naughton-Treves (1998) suggest that planting agroforestry buffers along park edges creates ideal habitat for crop-raiders. A variety of methods that can be used to express raiding make it difficult to determine whether Fig. 4a-c on crop raiding are comparable or not.

Hill *et al.* (2002) emphasized the fact that a greater degree of clarification of the exact measures used and how they have been manipulated by the researcher would be beneficial when trying to decide whether results across studies are comparable or not. In addition, perhaps some standardization of methods of data collection and data handing me needed. The extent of raiding from the farmers estimates was consistent with previous studies such as Deodatus (2000) and Jackson and Wangchuk (2000), farmers probably imagine that by over-stating the extent of raiding, compensation schemes, once implemented would earn them more.

Sitati *et al.* (2005) and Gillingham and Lee (1999) argue that the lack of compensation for wildlife-imposed raiding provides strong incentives for exaggeration of human-wildlife conflicts. Sometimes they wish to express their sorry state to attract sympathy from other people.

Noteworthy is that farmers may not necessarily inflate their estimates intentionally but several other reasons may result in this. For example, it can be difficult to estimate accurately in retrospect (simple 24 h nutritional recall studies give ample evidence of that). Additionally, something as emotive and important to a farmer as crop loss is likely to be a conspicuous and therefore, highly significant event which may well influence their perceptions and thus their accuracy when estimating amounts/values of losses. From the results, the perception of raiding by wild animals is the same irrespective of the location of the farmers with regard to the forest management zones. Explaining raiding levels in different forest management zones is mystified by a wide array of plausible views. Does abundance of human activities in the degraded forest areas shove raiders out of the forest to the boundary, resulting in more crop raiding in the gardens? Do communities spend most of their time in the forest engaging in degradation activities at the expense of their farms?

It is logical to suppose that if the forest interior is moderately degraded, more wild foods emerge, thereby reducing primate crop raiding. On the contrary because of their tendency to concentrate on particular types of food, it can be envisaged that wild life crop raiders are more concentrated at the forest boundary neighboring gardens because they want foods that are either more nutritious or require less energy to acquire. With knowledge of the existence of preferred foods at or near the forest boundary, only the relative abundance of the primates will determine the extent of raiding cause. The zoning of Mabira forest reserve could have been done in principle but illegal activities continue to undermine the integrity of the forest in different parts. Alternatively, the forest has not had time to develop typical characteristics of the management zones. Therefore, the ecological differences do not significantly affect the population of crop raiders.

Control methods against crop raiding: The diversity of raiders requires an integration of methods to dissuade them. For canopy tree raiders such as primates, farmers

use scaring, scarecrows fires and wrapping while trenches, fences are mainly for ground raiders such as bush pigs. Rodents and porcupines are more difficult to deter because their small size allows them to have several access options. Fortunately, they do not seem to be formidable raiders according to farmers and from field observations. Even in the presence of several methods, the primates are able to discern over time the potential harm that these methods can cause to them.

The poor coverage of the gardens due to high labor involved in implementing them, the effectiveness of the control methods is notably reduced. Methods such as wrapping bananas with clothes and polythene appear to be more valuable than scarecrow for example. However, considering the costs of buying the materials and labor involved in wrapping the so many bananas in each garden, only a few bananas are in effect protected. For crops such as maize, smearing with cow dung is reportedly effective but in rainy weather, it is effective over a short period because the dung is washed away by the rain. Added to this, the source of cow dung is limited as there are not many farmers with cows and even those who have it use it for their crops or as manure in their gardens.

CONCLUSION

The crop-raiding wild life species around Mabira forest reserve include red-tailed monkeys, grey-cheeked mangabeys, bush pigs, rodents, porcupines and antelopes. The 1st two species are the major crop raiders. They mainly raid maize, bananas and passion fruits. The bush pigs, rodents and porcupines raid mainly cassava and sweet potatoes. Farmers estimated that between 40-70% are lost to crop-raiding by wild animals. The crop level of crop raiding was most severe with maize followed by bananas then passion fruits and least was cassava. According to the farmers, crop raiding among management regimes is higher in the production (low impact) zone but did not differ between the other two. Farmers believe that susceptibility of the crop, intercrop of susceptible and less-susceptible crops and weed management are important factors affecting the level of crop raiding by wild animals.

The methods used by farmers to control crop raiding include guarding, use of scarecrows and smearing with cow dung.

RECOMMENDATIONS

It is recommended that intercropping susceptible crops such as maize and bananas with the less susceptible or non-edibles such as coffee, sugarcane could help reduce the extent of raiding on some crops as well as diversifying production. Another alternative would be to plant buffer crops between the forest boundary and highly susceptible crops. The possibility of enrichment-planting of especially primate foods in the forest should be undertaken to increase forest-derived feed and thus reduce the tendency for the primates to move out of the forest.

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REFERENCES

Baranga, D., 2007. Observations on resource use in Mabira Forest Reserve, Uganda. Afr. J. Ecol., 45: 2-6.

Barnes, F.W., E.M. Hema, A. Nandjui, M. Manford, U.F. Dubiure, E.K.A. Danquah and Y. Boafo, 2005. Risk of crop raiding by elephants around the Kakum conservation area, Ghana. Pachyderm, 39: 19-25.

Brown, L.R., 2004. Outgrowing the Earth: The Food Security Challenge in an Age of Falling Water Tables and Rising Temperature. Norton Press, New York.

Chapman, C.A. and L.J. Chapman, 1999. Implications of small scale variation in ecological conditions for the diet and density of red colobus monkeys. Primates, 40: 215-231.

Chiyo, P.I., E.P. Cochrane, L. Naughton and G.I. Basuta, 2005. Temporal patterns of crop raiding by elephants: A response to changes in forage quality or crop availability? Afr. J. Ecol., 43: 48-55.

Deodatus, F., 2000. Wildlife Raiding in Rural Areas with Emphasis on Malawi. In: Wildlife Conservation by Sustainable Use, Prins, H., J. Grootenhuis and T. Dolan Eds.). Kluwer Academic Publishers, Dordrecht.

Gillingham, S. and P.C. Lee, 1999. The impact of wildlife-related benefits on the conservation attitudes of local people around the Selous Game Reserve, Tanzania. Environ. Conserv., 26: 218-228.

Hill, C., F. Osborn and A.J. Plumptre, 2002. Human-wildlife conflict: Identifying the problem and possible solutions. Albertine Rift Technical Report Series Vol. 1. Wildlife Conservation Society, Kampala, pp: 23-35.

Hill, C.M., 1997. Crop raiding by wild veterbrates: The farmers perspective in an agricultural community in western Uganda. Int. J. Pest Manage., 43: 77-84.

Hill, C.M., 2000. Conflict of interest between people and baboons: Crop raiding in Uganda. Int. J. Primatol., 21: 299-315.

Howard, C., 1996. Nature Conservation in Uganda's Tropical Forests. IUCN, Kampala.

Jackson, R. and R. Wangchuk, 2000. People-wildlife conflicts in the trans-Himalaya. Paper Presented at Management Planning Workshop for the Trans-Himalayan Protected Areas, Ladakh.

Kagoro-Rugunda, G., 2004. Crop raiding around Lake Mburo National Park, Uganda. Afr. J. Ecol., 42: 32-41.

Maples, W.R., M.K. Maples, W.F. Greenhood and M.L. Walek, 1976. Adaptations of crop-raining baboons in Kenya. Am. J. Phys. Anthropol., 45: 309-316.

Naughton-Treves, L., 1998. Predicting patterns of crop damage by wildlife around kibale national park, Uganda. Conserv. Biol., 12: 156-168.

Naughton-Treves, L., 2002. Wild animals in the garden: Conserving wildlife in amazonian agroecosystems. Ann. Assoc. of Am. Geographers, 92: 488-506.

Newmark, W.D., D.N. Manyanza, D.G.M. Gamassa and H.I. Sariko, 1994. The conflict between wildlife and local people living adjacent to protected areas in Tanzania: Human density as a predictor. Conserv. Biol., 8: 249-255.

Nyhus, P. and R. Tilson, 2004. Agroforestry, elephants and tigers: Balancing conservation theory and practice in human-dominated landscapes of Southeast Asia. Agric. Ecosyst. Environ., 104: 87-97.

Osborn, F.V. and G.E. Parker, 2003. Towards an integrated approach for reducing the conflict between elephants and people: A review of current research. Oryx, 37: 80-84.

Sitati, N.W., M.J. Walpole and N. Leader-Williams, 2005. Mitigating human-elephant conflict outside protected areas in Africa: Crop raiding in Transmara District, Kenya. J. Applied Ecol., 42: 1175-1182.

Tweheyo, M. and J. Obua, 2001. Feeding habits of chimpanzees (*Pan troglodytes*), red-tail monkeys (*Cercopithecus ascanius schmidti*) and blue monkeys (*Cercopithecus mitis stuhlmanii*) on figs in Budongo Forest Reserve, Uganda. Afr. J. Ecol., 39: 133-139.

Waser, P.M., 1985. Spatial structure in Mangabey groups. Int. J. Primatol., 6: 569-580.