
Human-wildlife conflicts: Case study in Wondo Genet District, Southern Ethiopia

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To cite this article:

Muluken Mekuyie Fenta. Human-Wildlife Conflicts: Case Study in Wondo Genet District, Southern Ethiopia. *Agriculture, Forestry and Fisheries*. Vol. 3, No. 5, 2014, pp. 352-362. doi: 10.11648/j.aff.20140305.14

Abstract: The purpose of this research was to identify the type of human-wildlife conflicts and wild mammals that cause the conflict, determine the extent of damage and to provide a better understanding of the causes of human-wildlife conflict in Wondo Genet district. The study was carried out from December 2013 to June 2013. Four sample areas were selected to collect data on human-wildlife conflict; Gotu, Wosha Soyoma and Wethera Kechema villages and Wondo Genet College of Forestry and Natural Resources. Data were collected using questionnaires, one to one interviews, observations and cross checking of crop loss using quadrants in selected crop lands, reviewing of literature, and was later analyzed using statistical package for social scientists (SPSS). In order to achieve the objectives of the study, the target population comprised the households living in sampled areas, local administrators and staffs who lived within Wondo Genet College of Forestry and Natural Resources. The study established that crop damages, livestock killing, human disruption and property destruction were some of the mostly reported damages. The results of the study further indicated that animal species most involved in HWC were warthog (*Phacochoerus africanus*), bush pig (*Potamochoerus larvatus*), vervet monkey (*Chlorocebus pygerythrus*), Olive baboon (*Papio anubis*), porcupine (*Hystrix cristata*), Giant mole rat (*Tachyoryctes macrocephalus*) and African civet (*Civettictis civetta*). They were involved mostly in crop raiding/ damage. Most raided crops were maize (*Zea mays*), sugar cane (*Saccharum africanum*) and Enset (*Ensete ventricosum*). Over 75% of the population of Wondo Genet district was affected by crop raiders. Therefore, conservation education is paramount, coherent land use plans should be emphasized to determine where certain crops can be grown.

Keywords: Human-Wildlife Conflict, Crop Loss, Raiding Pests

1. Introduction

1.1. Background to the Study

Human-Wildlife Conflict (HWC) or negative interaction between people and wildlife has recently become one of the fundamental aspects of wildlife management as it represents the most widespread and complex challenge currently being faced by the conservationist around the world. HWC arises mainly because of the loss, degradation and fragmentation of habitats through human activities such as, logging, animal husbandry, agricultural expansion, and developmental projects [2]. As habitat gets fragmented, the boundary for the interface between humans and wildlife increases, while the animal populations become compressed in insular refuges.

Consequently, it leads to greater contact and conflict with humans as wild animals seek to fulfill their nutritional,

ecological and behavioral needs [7]. The damage to human interests caused by contact with such animals can include loss of life or injury, threats to economic security, reduced food security and livelihood opportunities. The rural communities with limited livelihood opportunities are often hardest hit by conflicts with wildlife. Without mitigating HWC the results are further impoverishment of the poor, reduced local support for conservation, and increased retaliatory killings of wildlife causing increased vulnerability of wildlife populations. Understanding the ecological and socio-economical context of the HWC is a prerequisite to bring about an efficient and long-term management of wildlife and its habitats [7]. Human wildlife conflict is one of the major threats to house hold food security and rural incomes. In Africa, the great dependence of a large proportion of the human population for their survival on land, coupled with the presence of many species of large mammals

leads to many sources of conflict between people and wildlife [3].

1.2. Problem Statement

Wondo Genet college of Forestry has a national significance regarding conservation of biodiversity and endemic species. Currently, Human encroachment in terms of the density and distribution of the human population around this area is increasing and the wildlife and their habitats have faced challenging because of deforestation and agricultural expansion. According to [1], the varied natural resources of Wondo Genet district are degrading at fastest rate. Land once covered by natural forest is now converted into agricultural land and settlement. For instance in 1977, 13% of the Wondo Genet Catchment was under natural forest but in 2000 it was reduced to 2 percent. During the same period land under vegetation cover (forests, woodland and forest remnant) decreased from 36 percent to 24 percent. On the other hand, area for cultivation and settlement had increased from 55 percent in 1977 to 65 percent in 2000 [1].

The people within and around the reserve are small scale farmers who entirely depend on subsistence agriculture for their livelihoods. Preliminary survey showed that some farmers around Wondo Genet College of Forestry complain that the wild mammals such as baboon, pigs etc are damaging their crops like sugar cane, maize and other vegetable crops. Therefore, the present study is initiated to assess the various dimensions of human-wildlife conflict.

Objectives of the Study:

- To assess nature and extent of human-wildlife conflict in the study area
- To identify animal species most involved in human-wildlife conflict
- To explore major causes giving rise to HWC

1.3. Significance of the Study

The specific significance of the study was to come up with recommendations that will help prevent future HWC while

ensuring sustainable conservation. The outcome of the recommendation could be used to review the current wildlife conservation policies in order to enhance its effectiveness and to formulate new policies. National's parks could also benefit by adopting measures suggested in the study. The findings are also important for decision and policy makers in providing them with greater insight on the problems that are usually associated with wildlife conservation. The area community developers can use the findings as a tool of awareness creation to the local community. Finally, the report contributes to the pool of wildlife conservation knowledge and hence is useful to the academic fraternity and those interested in wildlife conservation.

1.4. Research Questions

- What are the animals species most involved in human-wildlife conflict?
- What type of conflict is the community encounter by wild animals and to what extent?
- What are the underlying causes of the problem of HWC in the study area?

Definition of significant term

For the purpose of this study, the following terms had the attached meaning:

Human – This was taken to imply anthropogenic activities (relating to people) which include Agricultural activities, and settlement

Pest - means wildlife mammals which has caused crop raiding

Wildlife – This was constructed to imply the presence of wild animals within the context of their natural environment.

Human wildlife conflict (HWC) - was taken to imply negative results from the interaction between human and wildlife.

2. Materials and Methods

2.1. Description of the Study Area

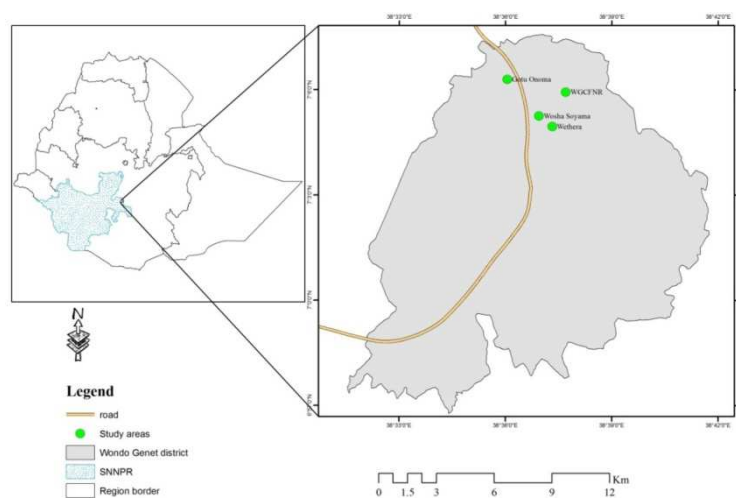


Figure 1. Map of the study area

Wondo Genet is located in the southeastern escarpment of the Ethiopian Great Rift Valley (7°06–07'N, 38°37'–42'E), approximately 260 km south of Addis Ababa (Figure 1). The altitude ranges from 1,800 to 2,580 m a.s.l. The average yearly rainfall is 1,210 mm, with a rainy season during March to September, and a relatively dry period from December to February. The average annual temperature is 20°C. The study area comprised 897 ha of natural and plantation forests, farmland and human settlements. The remnant forest vegetation is dry Afro-montane and is dominated by *Cordia africana*, *Albizia gummifera*, *Croton macrostachyus*, *Ficus*, *Celtis africana* and *Milletia ferruginea* [8]. Several cash crops are grown in the plantation areas, such as *Saccharum*, *Coffea arabica* and *Catha edulis*. Exotic plant species such as *Grevillea robusta*, *Pinus patula*, *Eucalyptus* and *Cupressus lusitanica* occupy the plantation forest.

2.2. Data Collection

2.2.1. Questionnaire Survey

Prior to data collection, extensive discussions with the key informants was undertaken to locate the sites with the highest incidences of HWC in the study area. Data was collected by employing combination of social survey methods involving participatory techniques (focal group discussions and key informant interview), structured questionnaire survey of households. Our queries was designed to solicit information such as the issues of HWC faced in the study area such as the type and number of incidences, extent of damage to wildlife and humans, attitude of humans in relation to HWC, and mitigation measures the community took towards damages by wild mammals. The questionnaire survey was carried out between December, 2013 and June, 2013 among local community in three villages of Wondo genet district; Wosha Soyama, Gotonoma and Wethera Kechema. Interviews were held with households, administrators at the local level and agriculturalists to establish in depth information about human wildlife conflict. We took approximately 10% sampling intensity in each village. These households were randomly selected by following a pattern of skipping two households, and the third house hold interviewed. The interview was conducted together with three research assistants; all were well-versed in local languages. Before initiating the fieldwork, the research assistants were trained to administer the survey and the questionnaire. Interview was in the form of a conversation, structured around a written questionnaire consisting of both fixed-response and open-ended questions. Respondents were asked whether conserving wildlife is important or not. Then their answer was considered as positive if they replied as conserving wildlife is important. However, if they responded as conserving wildlife is not important; their answer was considered as negative response. The positive attitude represents the respondents' good will to protect and utilize the local wildlife wisely whereas the respondents' negative attitude towards wildlife represent unwilling to utilize their natural resource in a wise way rather wish to destroy it. This approach mainly collected primary data.

2.2.2. Secondary Data

Secondary data on the other hand was sought from previous studies carried out on human-wildlife conflicts at global, regional and local levels. Such information was obtained from published reports such as journals, thesis and relevant documentation and the internet.

2.2.3. Observation / Use of Quadrants

For crop damage assessments, field visits and observations were mainly used to confirm the respondents' responses so that accurate and reliable information would be collected since most farmers have a tendency of exaggerating the problem. Observation was also important in identifying the particular problem animal species responsible for the damage through assessing the teeth marks left on the damaged plants and foot marks of the animals. Three Quadrants of 4m by 4m were placed randomly within the crop stand of 10 farmers in each village and observed two times a week to check if there was crop damage and to identify the type of animal that caused the damage. The proportion of damaged crops was derived from calculating the number of damaged or missing plants or plant parts, divided by the total crop population planted in the farm land. The mean of the three quadrant values for each damaged stand is a measure of the proportion of crop damage sustained in any one sample. The mean percentage crop losses for each farm, taking into account the number of stands planted was estimated, of each crop and the proportion of stands that sustained crop damage.

2.3. Data Analysis Techniques

First data were organized into different topics by following the objectives of the study and coded according to the topics already described.

Various techniques were used for the analyses and presentation of data. These include both quantitative and qualitative techniques. In quantitative technique, the analyses are to be characterized by the use of statistical package for social science, proportions, percentages and averages to arrive at a general picture for the generation of conclusion. Qualitative data from questionnaires as well as interviews were analyzed thematically. Qualitative techniques on the other hand were employed in the computation of statistical tables and bar graphs.

3. Results and Discussions

3.1. Demographic Information

The researcher begun by a general analysis on the demographic data got from the respondents which included; - the gender, age and educational level.

3.1.1. Gender of Respondents

Table 1: indicated the gender of the respondents. From the findings, it was indicated that 66.7% were male and 33.3% of the respondents were female.

Table 1. Gender of respondents

Gender	Frequency	Percent
female	40	33.3
male	80	66.7
Total	120	100

3.1.2. Age of Respondents

The study also sought to establish the respondent's age group. From the findings, the majority of the respondents in the age bracket of 15 – 35 years were shown by 46.7%, 30.8% of the respondents were between 36 - 50 years, 12.5% of the respondents were between 51 - 65 years and 10% of the respondents were above 65 years.

Table 2. Age of the respondents

Age	Frequency	Percent
15-35 years	56	46.7
36-50 years	37	30.8
51-65 years	15	12.5
above 65 years	12	10
Total	120	100

3.1.3. Education Level

The study sought to know the level of education of the respondents. From the findings, 73.3% of the respondents were able to write and read, 10% of the respondents indicated that they had reached secondary level, 16.7% of the respondents were uneducated.

Table 3. Education Level of respondents

	Frequency	Percentage
Reading & writing	88	73.3
Secondary	12	10
Uneducated	20	16.7
Total	120	100

3.2. Wildlife Conflicts

Table 4. Percentage of respondents encountered by wildlife conflicts

	Frequency	Percent
Yes	120	100
No	0	0
Total	120	100

Table 6. Sugarcane damaged/0.1ha by village and species

Species	Average Sugarcane stalk/0.1ha			Average Sugarcane stalk damage/0.1ha		
	Gotu	W/Soyama	Wethera	Gotu	W/Soyama	Wethera
baboon	4375.00	6200.00	5000.00	600	500	600
Warthog	4375.00	6200.00	5000.00	400	NR	500
Bush pig	4375.00	6200.00	5000.00	300	NR	400
Porcupine	4375.00	6200.00	5000.00	250	650	250
Vervet Monkey	4375.00	6200.00	5000.00	100	400	150
Total	4375.00	6200.00	5000.00	1650	1550	1900
Total loss (%)				37.67	25.0	38

NR- not reported, W/Soyama-Wosha Soyama

The extent of crop damage varied depending upon the villages and the type of animal that actually caused the crop damage. Wild mammals damage to sugarcane (*Saccharum africanum*) plantation accounted 1650(37.67%), 1550(25%)

All data regarding crop and livestock loss, animal behavior (preference, frequency, activity etc), raiding intensity, human threat and property destruction represents perceived data; this information was provided by farmers from each site, though actual crop losses were observed on farms through quadrant sampling, as a means of cross-checking. All crop loss reported refers to loss in the presence of guarding. Without guarding, farmers reported 100% loss to raiding pests.

The study sought to establish whether the locals encountered any conflicts with wild animals.

From the findings, all the respondents indicated that they encountered conflicts with wild animals as shown by 100%.

3.2.1. Type of Conflict

The study sought to establish the type of conflicts that the locals encounter with wild animals.

Table 5. Type of conflict the community encountered by wild animals

	Frequency	Percentage
Crop damage	90	75
Destruction of property	15	12.5
Human threat	5	4.2
Livestock killing	10	8.3
Total	120	100

From the findings, 75% of the respondents indicated that they encountered crop damage, 12.5% of the respondents indicated that they encountered destruction of property, 4.2% of the respondents indicated that they encountered human threat, 10% of the respondents indicated that they encountered livestock killing

3.2.2. Wild Animals Involved in Crop Damage

Wild animals that caused greater damage to crops damage were warthog (*Phacochoerus africanus*), bush pig (*Potamochoerus larvatus*), vervet monkey (*Chlorocebus pygerythrus*), Olive baboon (*Papio anubis*), porcupine (*Hystrix cristata*), African civet (*Civettictis civetta*) and Giant mole rat (*Tachyoryctes macrocephalus*).

3.2.3. Crop Loss Assessment

and 1900(38%) in Gotu, Wosha Soyoma and Wethera kechema villages respectively (Table 6). Warthog damage to sugarcane plantation was not only through consuming sugarcane but also through digging burrow to get a place to

hide itself from predators, and the cane guards. Warthogs damage sugarcane plantation at the roots and base of the sugarcane stalk which was supposed to give more yields per unit area.

Wild mammals damage to maize (*Zea mays*) accounted 200kg, 110kg and 140 kg for Gotu, Wosha Soyoma and Wethera Kechemma villages respectively (Table 7) while Enset (*Ensete ventricosum*) loss accounted 160kg, 250kg and 208kg for Gotu, Wosha Soyoma and Wethera Kechemma villages respectively (Table 8). The present study also indicated that there was no significant difference between villages for sugar cane and Enset loss ($p > 0.05$) while significant difference was observed between villages for maize loss.

The competitions for resources cause conflict between wild animals and people. Wild animal population is increasing and at the same time human populations expand year after year, which resulted in competitions for resources

between wild animals and human populations [4]. In the study area, the natural habitats of the animals were modified into crop cultivation like sugar cane, maize and Enset and settlement. As a result, animals in the surrounding area enter the sugarcane, maize, Enset plantation and caused damage. Furthermore, [6] reported that agricultural crops such as maize, sugarcane and sorghum which grow over two meters conceal larger animals such as Bush pig, warthog and primates.

Similarly, the current finding showed that the sugarcane plant was observed concealing baboon, vervet monkey and other large mammals that enter the plantation fields. As a result, the sugarcane was exposed to damage because the animals were not easily observed by the cane guards. Especially this enables warthog to dig burrows in the sugarcane plantation fields and hide itself against the cane guards.

Table 7. Maize loss (kg)/0.1ha by village and species

Species	Average maize yield (kg)/0.1ha			Average maize loss(kg)/0.1ha		
	Gotu	W/Soyama	Wethera	Gotu	W/Soyama	Wethera
baboon	700	400	375	60	40	40
Warthog	700	400	375	50	NR	30
Bush pig	700	400	375	35	NR	10
Porcupine	700	400	375	30	35	30
Vervet Monkey	700	400	375	25	30	25
African civet	700	400	375	NR	5	5
Total(kg/0.1ha)	700	400	375	200	110	140
Total loss (%)				28.5	27.5	37.3

NR- not reported, W/Soyama-Wosha Soyama

The crop damage by baboon and Vervet monkey was due to the social organization and intelligence of the animal to recognize the absence of cane guards and then immediately rushes into the plantation fields forming different groups in different directions. This kind of social organization of vervet makes the damage incidence high because it is difficult to chase them away since they come to the plantation fields in

different directions in large numbers.

Similar result by [6] reported that in Uganda primates are dominant pests and responsible for over 70% of the damage events and 50% of the area damaged due to their intelligence, adaptability, wide dietary range, complex social organization and manipulative abilities.

Table 8. Enset loss (kg)/0.1ha by village and species

Species	Average Enset yield(kg)/0.1ha			Average Enset damage(kg)/0.1ha		
	Gotu	W/Soyama	Wethera	Gotu	W/Soyama	Wethera
baboon	400	600	450	60	90	60
Warthog	400	NR	450	40	NR	52
Bush pig	400	NR	450	30	NR	41
Porcupine	400	600	450	20	85	30
Vervet Monkey	400	600	450	10	75	25
Total	400	600	450	160	250	208
Total loss (%)				40.0	41.7	46.2

NR- not reported, W/Soyama-Wosha Soyama

According to [4], farms located within 300 meter of a forested boundary probably are exposed more for crop-raiding by Vervet monkeys. In the study area, Vervet monkey and Baboon were the top worst pests in Wosha Soyoma and Wethera villages this is because the plantation fields were in areas where there are plenty of trees which support Vervet

monkeys by providing shelter to escape from the crop guards. Further more in the study area, the people in the area do not have a trend to hunt vervet monkeys except chasing them away from their crops. This is because the people in Wondo Genet area neither eat Vervet monkey meat nor use their hide for different purposes. This has increased the crop damage in

the area. The presence of large trees has helped Vervet monkeys as an escaping site from guards. The respondents during interview said that Vervet monkeys cut the sugarcane stalk around the middle and chew it like humans. They also damage the stalk while they jump from one cane to another. According [3], crop losses by wild animals can be enormous both in the direct economic terms and through indirect costs on time and energy devoted to protection of crop damage. In the present study area, the farmers were observed spending considerable amount of time to prevent the crops damage both during the day and night time.

3.2.4. Pest Profiles

Table 9 summarizes the profile given by each village for all pests ranked in the top six. Ranking considered the combined affect of each animal on crop loss in both villages. Ranking identifies pest severity with (1) indicating the worst pest. Gotu ranked the baboon, Warthog, bush pig and porcupine in the same order as the top 4 worst pests in its site while Wosha Soyama ranked Mole rat, Vervet monkey, baboon and porcupine as the top 4 worst pests. Furthermore, in Wethera kechema village the top four worst wild pests in descending order were Warthog, porcupine & baboon, Vervet monkey and bush pig, Mole rat.

Table 9. Animal profiles listed in order of pest severity

Animal	Site	Site rank	Crops-age/part	Time of day	Frequency
Bush pig	Gotu	3	maize- all parts, sugar cane	Night	1X/week
	Wethera	3	maize- all parts root crops like Enset false banana, sugar cane	Night*2	Every 3 days
Vervet monkey	Gotu	5			
	W/soyama	2			
Olive baboon	Wethera	3	maize- cob, new shoots, planted seeds, sugar cane, fruit- banana, mango, papaya	5am(before humans wake) to 6pm; Present all day.	Every day
	Gotu	1			
	W/soyama	3			
Warthog	Wethera	2			
	Gotu	2	maize- all parts, sugar cane	Night	2X/week
Porcupine	Wethera	1	maize- all parts, sugar cane	Night*2	Every 2 days
	Gotu	4			
Mole rat	W/soyama	2	maize- cob only, all tubers, roots of all crops, bananas		
	Wethera	2			
	Gotu	6	root and tuber crops	Night	Every night
	W/soyama	1			
	Wethera	4			

*2 depends- may start to come as early as 3pm or 5pm, W/Soyama-Wosha Soyama

3.2.5. Dominant Foragers by Crop and Village

Dominant foragers on each crop can be identified in Figure 2, 3 and 4. It summarizes the loss of sugar cane, maize and Enset crops for each village by crop and village types. In Gotu village sugar cane, maize and Enset were primarily dominated by the baboon followed by Warthog and

bush pig while in Wethera Kechema and Wosha Soyoma villages baboon followed by Porcupine and warthog, vervet monkey, bush pig and African civet were dominant foragers for maize crop. For Wosha Soyoma village the Mole rat was the worst pest for both sugar cane and Enset crops followed by Vervet monkey and porcupine.

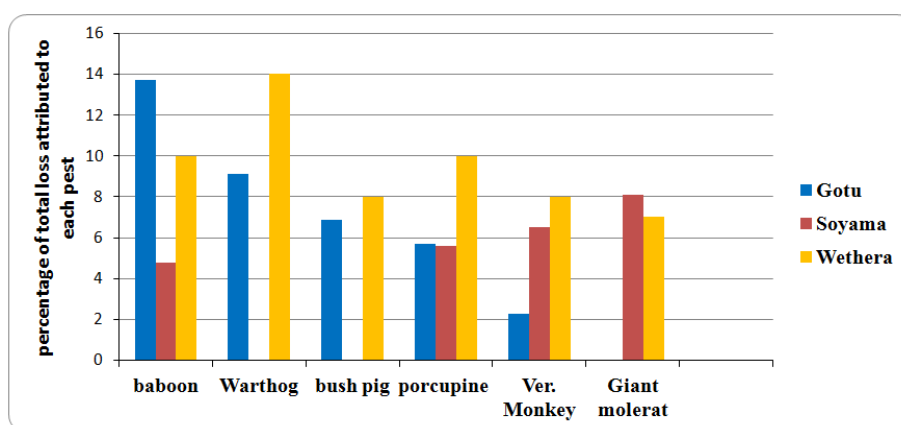


Figure 2. Loss Attributed to Pests for sugar cane

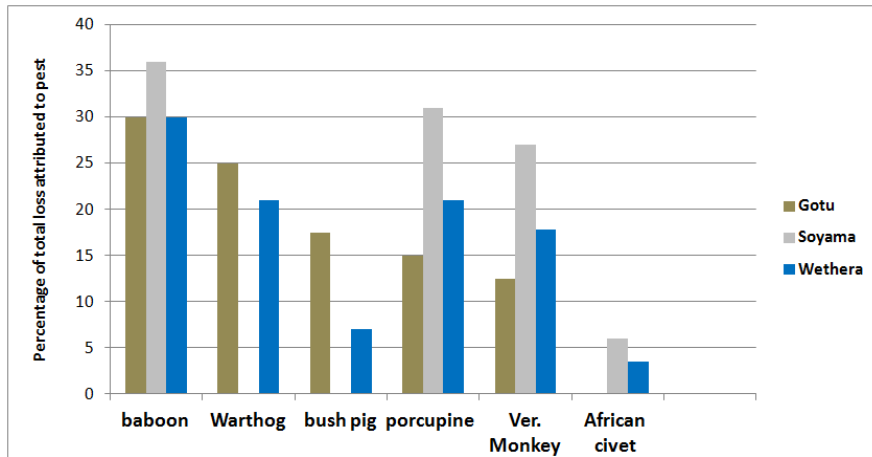


Figure 3. Loss Attributed to Pests for maize

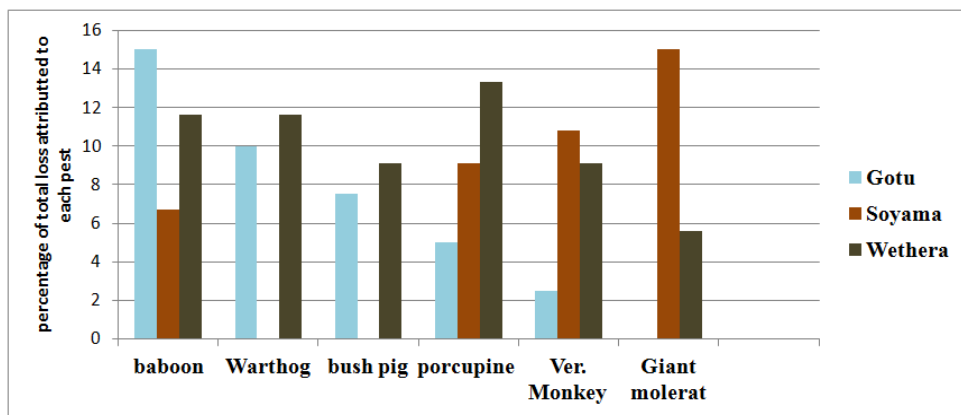


Figure 4. Loss Attributed to Pests for Enset

3.2.6. Livestock Depredation

In the study area, when asked about perception of people on livestock depredation, a very large number (90 %) of respondents said that livestock loss by carnivores was not as such a big problem. Hyena seemed to be a threat to livestock in the study area. White tailed Mongoose considered the leading predators to poultry production. 20% of the households were experiencing conflict with White tailed Mongoose and 6 chicken losses per house hold were observed in the study area.

3.2.7. Household’s Opinion on Causes and Workable Solutions to Human-Wildlife Conflicts

Selected respondents were also asked about their views on the causes of human-wildlife conflict, possible solutions to this problem, and reasons why wildlife should be protected. Their responses are tabulated in Table 10 and 11 below, which showed a need to educate farmers about the possible solutions to the problem of human-wildlife conflict, as well as potential benefits of effective wildlife conservation measures in the study area.

Table 10. Surveyed Household’s opinions on the causes of human-wildlife conflict

In the HH’s opinion, what are the causes of human-wildlife conflict?	Number of Responses	Percentage of Respondents
Don’t know	50	41.7
Human moved into animal habitat	15	12.5
Lack of food	25	20.8
Too many wild animals	30	25
Total	120	100

From the Table 10, above, it can be seen that the majority of surveyed respondents, 41.7 percent, responded that they did not know the basic causes of human-wildlife conflict, while 20.8 percent felt the cause was a lack of food for wild animals, and a further 25 percent felt the problem was simply that there were too many wild mammals, both basic misconceptions. Thus, in total, 87.5 percent of households

were unaware of actual root causes of human-wildlife conflict, such as humans occupying wildlife habitat, only 12.5 percent of survey respondents were able to cite accurate.

When asked to comment on a series of possible solutions to human-wildlife conflict, the following responses were given (Table 11):

Table 11. Surveyed Household's opinions on workable solutions to human-wildlife conflict

In the HH's opinion, which of the following are workable solutions to human-wildlife conflict?	Number of Responses	Percentage of Respondents
Don't know	40	33.3
Kill wild animals	45	37.5
Moving to a different place	5	4.2
Guarding	30	25
Total	120	100

As with the previous question concerning causes of wildlife conflict, the surveyed HHS most common response when asked about possible solutions to the human wildlife conflict was simply to kill problem wild animals, accounting for 37.5 percent of the total which is the worst solution and against wildlife conservation. The next popular solution expressed by 33.3 percent of survey respondents was that I don't know and the next 25% of the respondents felt that guarding was the appropriate solution against wild pests. Just 4.2 percent of survey respondents felt moving wildlife to a different place indicating their negative attitude towards wildlife conservation. Thus from the largely uninformed responses to the above two survey questions it can easily be concluded that there is an immediate need for a sweeping wildlife conservation education program to educate farmers living in Wondo Genet district about the purpose and benefits of wildlife conservation, the causes of human-wildlife conflict, and methods for reducing or eliminating various forms of this conflict.

3.2.8. Underlying Causes of Crop Raiding

Research findings showed that proximity to the forest reserve around Wondo Genet College of Forestry and Natural

Resources is the main reason leading to frequent crop raiding by wild animals, followed by increased habitat destruction, high population, lack of grazing land and inadequate help from government institutions are the most underlying causes of crop raiding in Wondo Genet district. In Wondo Genet district the rapid population growth has changed the life style resulting into destruction of habitats through encroachment for agriculture and human settlement. Habitats destruction is also through fragmentation of natural habitats, killing of animal species, cultivation and settlement near the forest reserve around Wondo Genet College of Forestry and Natural Resources. This has resulted in human-wildlife conflicts around Wondo Genet. This was in harmony with [5] who indicated that most natural wildlife buffer zones have led to competition for food, water, habitats, and space for both humans and wildlife hence resulting in a conflict for survival.

3.2.8.1. Guarding Strategies

Table 12 summarizes descriptions of guarding strategies used in the study areas. Efficacy within site is a ranking value, with (1) being the most effective strategy. Guarding in field was indicated to be the primary and most effective means of guarding against pests.

Table 12. Profile of Guarding Strategies

Preventive method	Description	Target animal	Efficiency
Guarding in field	at least one person is in the field guarding for 24 hours (day/night)	any	1
Perfume/ soaps	Place perfume and soaps in a plastic bag and hang from a stick. Mix soaps with water and spray around crops	Porcupine, Pig, night pests	Supplementary
Smoking	Burn wood and smoke around the crop	Any	Supplementary
Goat urine/ water	Goat urine /water is inserted in to the hole of pest	Mongoose	1

3.2.8.2. Guarding in Field

Scare tactic

In all study areas, a daytime pest is scared away from the plot by silently approaching the foraging animal and, when in close proximity, throwing objects, such as stones, sticks and spears at the pest. Women and children scare away an invading pest by shouting at the animal.

Evening in-field guarding is only carried out by men in all sites. Evening raiding pests are detected by sounds made while foraging. Shouting is mainly used to deter evening raiders due to poor visibility.

Problems encountered and difficulties with in-field guarding

In the study areas, guarding against baboons was listed as a problem encountered while guarding. Each site reported that guarding against baboons was unmanageable for women and children because the baboons are not afraid of them and therefore continue to raid. Farmers described accounts of

baboons dispersing themselves around plots followed by one or two baboons darting through the field to attract the farmers' attention. While the farmers are busy chasing the invading baboon, the other baboons dispersed around the boarder raid the crops.

Other difficulties listed include: 1) difficulty to guard during heavy rainfall and during illness; 2) pests adapt to new strategies in guarding within one week; 3) almost all of the strategies used (supplemental and primary) are ineffective in deterring pests; 4) When an animal is scared away with the "approach and scar" method, it merely moves to another spot in the same plot and continues to forage.

Perfume/ soaps

Small Perfume/ soaps were placed in a plastic bag and hang from a stick. The smell originating from the Perfume/ soaps gave the false feeling of the presence of human beings in the field which acted as a deterrent to the wild pig and porcupine. This method was only effective for few days.

3.2.9. Human Attacks

The present study indicated that spotted hyenas (*Crocuta crocuta*) was considered to threaten human beings although human deaths and injuries were less common in the study area. The respondents also indicated that people were fearful to spotted hyenas and other carnivores when they slept in makeshift huts in the field to prevent animals from damaging standing crops, and walking at night.

3.2.10. Bark Stripping

From the findings olive baboons were responsible for stripping bark from trees. Baboons raided for the inner bark of Avocado, Eucalyptus, Acacia and Cupressus. They bit into the bark, lifting and pulling it from the tree.

3.3. Human-Wildlife Conflict in WGCNFR

The study revealed that wild mammals caused human threat, destruction of property and taking food from kitchens both in home and staff lunch at Wondo Genet College (Table, 14). A majority of the residents of the Wondo Genet College of Forestry and Natural resources have expressed strong dissatisfaction over the presence of the baboons and monkey population in the campus. Due to their intolerable activities, people now view them as a vermin species rather than a species of conservation importance. The residents were even more apprehensive of increased degree of the conflict in the coming years as they speculate that the baboons and monkeys' population will not decrease. The study sought to know the waiting time of respondents within the campus.

Table 13. Number of years of residents within the College

Waiting in the campus	Frequency	Percent
1-2 years	5	16.7
3-5 years	10	33.3
>5 years	15	50
Total	30	100

3.3.1. Type of Conflict

The study sought to establish the type of conflicts that the residents encountered with wild animals.

Table 14. Type of conflict the residents of Wondo Genet College encountered by wild mammals

Type of conflict	Frequency	Percentage
Snatch food items from kitchens, tables & people's hands	20	63.3
Destruction of property	6	20
Human disruption	3	10
Human threat when walking night time	2	6.7
Total	30	100

From the findings, 63.3% of the residents indicated that they encountered with snatching of food items by baboons and monkeys, 20% of the respondents indicated that they encountered destruction of property, 10% of the respondents indicated that they encountered human disruption especially at the morning when they were in sleeping, 10% of the

respondents indicated that they encountered threats with nocturnal carnivores such as spotted hyenas when walking night time from their office to home.

3.3.2. Causes of Human-Wildlife Conflict in Wondo Genet College

1) Habitat destruction

Extensive cutting of forest trees and plantation of exotic tree species in place of natural food plants forced the monkeys and baboons to invade the staff lunch & home of residents in Wondo Genet College which provided a wide range of food items for them.

2) Food provisioning by the residents

Beside habitat destruction, food provisioning by local residents and students of the campus was also another cause of conflict. Offering of eatables whenever the monkeys/baboons visit the area attracts most of the monkeys in the area thus increasing the conflict.

3) Improper waste disposal

The improper disposal of wastes also account for the prevailing human-monkey conflict in the study area. Careless dumping of kitchen wastes and garbage in the open areas provides easy food for the monkeys, which resulted in their frequent visits to the campus premises.

3.3.3. Damages at Staff Lunch

Field observation and survey of selected staff responses showed that Vervet monkey and Olive baboons did damage in staff lunch. Most type of damages included destruction of property and taking food from kitchens, tables and out of people's hands. Development has greatly reduced the number of food tree species in the area. This is coupled with an increase in the birth rate compared to truly wild troops as human food and rubbish is readily available which requires considerably less expenditure of energy to access and the foods have a higher caloric value than wild forage. Vervet monkey behavior is also enhanced through the enticement of monkeys to approach people for photos through the offering of food.

3.3.4. Damages at Staff Home

The present study showed that the stuffs, who lived in Wondo Genet College, suffered from vervet monkeys and baboon because of their damage to properties, food from kitchen and disruption when they jump on roof of the house. Especially early in the morning they run here and there on the roof of house causing disturbance for sleeping. They also climbed on wire/rope where washed clothes were mounted for drying and made it to drop on the ground. In homes, typically food availability from open doors leading to the kitchen was the leading issue encouraging vervet monkey and baboon pest behaviors. Hence, windows and doors were closed the whole day which leads to insufficient fresh air to the family inside the house. Fungus had got opportunity to multiply on the roof of the house because of insufficient ventilation and this was a real health problem for many stuffs living there

4. Conclusion and Recommendation

This report provides strong evidence that in Wondo Genet district where the study was conducted, farmers perceived crop damage by wild animals as a great hindrance to their agricultural development, and crop losses varied from farmer to farmer depending on the amount of time invested to guard the fields. Guarding in the field was indicated to be the primary and most effective means of guarding against pests. During guarding the aim was to kill the animal using stone or other harmful instruments. This indicated that there is an immediate need for a sweeping wildlife conservation education program to educate farmers living in Wondo Genet district about the purpose and benefits of wildlife conservation, the causes of human-wildlife conflict, and methods for reducing or eliminating various forms of this conflict. The top 6 animals responsible for the most damage to crops were determined to be baboons, Warthog, bush pig, Vervet monkeys, Porcupine and Mole rat. The impact of the baboon followed by Warthog, bush pig and porcupine was strongest in Gotu and Wethera villages, while crop loss in Wosha Soyama was largely due to Mole rat followed by Vervet monkey and baboon. The study further revealed that Vervet monkeys and Olive baboons caused human disruption, destruction of property and taking food from kitchens both in home and staff lunch at Wondo Genet College of Forestry and Natural Resources.

Therefore, human-Wild life Conflict issues must be treated with concern, and placed in the context of local community and individual needs, as well as conservation objectives and those of the government and industry involved. Measures which might seem to be appropriate strategy to researchers might not necessarily be acceptable and practical to community or individual farmers. To establish measures which are sustainable and efficient may not be an overnight event, requiring adoption of a series of strategies. Interventions that can solve one type of conflict might not be applicable to others.

Intervention methods are therefore likely to be more successful if they are financially and technologically within the capacity of the people, organizations, institutions or bodies who will implement them. Farmers need to take responsibility for protecting their own crops, which requires assisting them to develop locally-appropriate schemes to successfully reduce loss.

Based on the obtained results of the present study and reviews of previous works, the following points are recommended for the rural villages of Wondo Genet district:

- Planting unpalatable plants such as sisal or hot pepper spray on the boarder line of the crops plantation will help minimize the animals that visit the plantation fields.
- Wondo Genet College of Forestry along with the community should work against deforestation because with increase in deforestation, vegetation in croplands will presumably become a major food resource for foraging animals.

- School of wildlife and Ecotourism in collaboration with other concerned sectors should educate the community around Wondo Genet regarding:
 - the purpose and benefits of wildlife conservation,
 - the causes of human-wildlife conflict, and
 - Methods for reducing or eliminating various forms of this conflict.

For Vervet monkey and baboon management in Wondo Genet College of Forestry and Natural resources, both short-term and long-term measures can be adopted to control the man-monkey/baboon conflict in the campus.

Short-term measures

- All catering staff should be aware that it is also their duty to deter by approved humane methods any monkey seen in the food preparation, serving and eating areas
- Waste from kitchens awaiting removal to external rubbish sites must be stored in monkey proof bins. This is also desirable to maintain proper kitchen hygiene.
- Meals, drinks and snacks served outside must be cleared away immediately after the guest has finished.
- Guests should not, under any circumstance, feed monkeys either directly by hand or by throwing food in their direction.
- Staff and guests must be discouraged from approaching monkeys.

Long-term measures

Long- term measures aim at removing the factors responsible for the monkey/baboon depredation and at creating ideal living conditions for the monkeys/baboons within the forests viz:

- 1) Ban on illegal encroachment of the forest lands.
- 2) Extensive cutting of trees and plantation of exotic tree species must be minimized.

Precautionary Measures

Besides these recommendations some precautions can also be adopted to minimize direct encounter with the monkeys/baboons.

- People must not let their children go out to play in the open if the monkeys are nearby.
- It is advisable to keep their doors and windows shut properly whenever the monkeys visit their localities.
- People should be warned not to cause any injury to an infant monkey, as mother monkeys are very aggressive.

Acknowledgments

I am very grateful to Research and Development office of Wondo Genet College of Forestry and Natural Resources for the financial support offered for this study. I would also like to acknowledge individual respondents from around Wondo Genet district for their patience and time they sacrificed, without them this research would have been short of what it contains. Last but not least, I am grateful to my research assistants, Zewuditu Zeleke and Fanaye Werara for the commitment shown during data collection for this study. Thank you all.

Acronyms

Ha	Hectare
HWC	Human-Wildlife conflict
SNNPR	Southern Nation Nationality Peoples Region
WGCNFR	Wondo Genet College of Forestry and Natural Resources

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