

Farmers' perceptions of the impacts of human–wildlife conflict on their livelihood and natural resource management efforts in Cheha Woreda of Guraghe Zone, Ethiopia

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Abstract: There are several livelihood improvement and natural resource management campaigns being undertaken in Ethiopia. In Cheha Woreda District of Guraghe Zone, a research team from the Ethiopian Institute of Agricultural Research, Holetta Research Center, is undertaking a watershed-level intervention to improve sustainable land management practices among resident agrarian families. In 2011, a household survey was conducted to assess farmers' perceptions of human–wildlife conflicts (HWC) and the effects of these conflicts on land management in Cheha Woreda. One-hundred randomly selected households in the Cheha Woreda were asked to identify any wild or domestic animals that cause damage to their crops. Additionally, respondents were asked to gauge the extent of the damages; the direct and indirect social, economic, and environmental impacts; and the overall trends in the area's wildlife populations. In addition to the household survey, 3 focus group discussions were held to capture farmers' perceptions. The findings show that Grivet monkeys (*Cercopithecus aethiops*), crested porcupines (*Hystrix cristata*), apes (*Papio* spp.), antelopes (*Gazella* spp.), warthogs (*Phacochoerus* sp.), and wild pigs (*Sus* sp.) were the major crop raiders in the area, while spotted hyenas (*Crocuta crocuta*), foxes (*Vulpes* sp.), eagles (Accipitridae) and Ethiopian ratels or honey badgers (*Mellivora capensis*) were the most common livestock predators. More than 90% of the households reported that they faced damages to their property by these species. Additionally, about 55% of the respondents reported a high severity of crop damage, with monkeys alleged to be the greatest culprits. Respondents perceived that HWC have resulted in significant vegetation removal, shifts in crop production, food shortages, and poverty in the study area. Eighty-eight percent of farmers reported believing that wild animals significantly contributed to the shortages of food for their family. The farmers were aware of several locally used management options, which they suggested could be used to reduce the negative impacts of the conflicts. We conclude that HWC and farmers' perceptions of HWC in the Cheha Woreda have had and continue to have significant impacts on the social, economic, and environmental well-being of the area. Hence, different management options must be adopted to mediate the effects and minimize future conflicts.

Key words: crop raiders, Ethiopia, human–wildlife conflicts, livelihood, perception, natural resources, predators

HUMAN–WILDLIFE CONFLICTS (HWC) are generally more intense in the tropics and in developing countries, where livestock rearing and agriculture are important aspects of rural people's livelihoods and income (Else 1991, Treves et al. 2006, Eniang et al. 2011). For these reasons, the threats of HWC in developing countries extend beyond the concerns over wildlife conservation that are widespread in the western countries. Often, HWC affects subsistence farmers' ability to feed their families. Property damage caused by wildlife, including destruction of agricultural crops, grain stores, water installation, fencing, and

pipes, can impose significant economic costs (Muruthi 2005, Eniang et al. 2011). Fuentes (2006) reported that competition for food between human and nonhuman primates can have significant impact on both agricultural yields and human nutritional status. Human–wildlife conflicts also can result in negative social impacts, causing children to miss school and adults to miss work to guard fields. They also cause community members to both lose sleep due to overnight guard duties and suffer from the fear of crop damage; at their most severe, HWC can result in human fatalities (Hoare 1992, Treves et al. 2006, Muruthi 2005).

Such conflicts may also bring about shifts in production when farmers stop producing crops that are frequently injured or destroyed by wild animals.

The negative impacts of HWC on environment and wildlife conservation activities include the clearing of vegetation on private land to reduce the habitat of nuisance wildlife, resulting in lower wildlife numbers (Treves et al. 2006). A report about wildlife populations in Kenya estimated that the wildlife populations had declined by 50% from 1978 to 1998 (Okello 2009).

Moreover, HWC must be viewed in the context of the human–human conflicts that generally accompany it. As Madden (2004) writes, conflicts among human actors about management of wildlife are often cultural and socioeconomic, pitting people with different values and beliefs, as well as different levels of need and agency, against one another.

When considering the actual and perceived impacts of HWC on farmers' lives and livelihoods, these factors are paramount. Humans' reactions to HWC have as much to do with perceptions of risk and lack of control as they do with the actual damage done (Madden 2004). Community members' perceptions of HWC do not rely solely on the facts of the damage done by wildlife but on a host of social, political, cultural, economic, and ecological factors (Dickman 2008). Hence, community members' perceptions of and reactions to HWC often are of more practical importance to designing interventions than empirically measuring the impacts of such conflicts. Proposed solutions or mitigation strategies must be aligned with community members' perceptions of and attitudes toward wildlife and HWC (Hill 2004, Lee and Priston 2005, Dickman 2008).

In Cheha Woreda, Guraghe Zone of Ethiopia, farmers reported significant crop and other damages resulting from HWC. To contribute to future effective intervention plans that would be acceptable to farmers, we assess farmers' perceptions of the damage, their attitudes toward wildlife, and their knowledge of existing cultural practices to minimize wildlife-related crop damage.

Cheha farmers are affected by food shortages and undernourishment for several reasons,

including shortage of land, unreliable weather, low crops yield as a result of low soil fertility, lack of improved varieties, and damage by different pests. Among wildlife that damage farmers' crops are monkeys (*Cercopithecus aethiops*) and apes (*Papio* spp.). Primates are major agricultural pests in the area because of their agility and intelligence (Sprague and Iwasaki 2006). Consequently, some of the Cheha farmers expressed frustration and an unwillingness to adopt new crop technologies until a solution is found for these pests.

Conflicts between humans and wildlife are reported to be increasing over time in Cheha Woreda. The area is covered with tree and shrub species that are the remnants of the old-growth forests of years past, and there is a worry that farmers will choose to further clear this vegetation (intensifying deforestation and biodiversity loss) to chase away the problem animals from the area. Although the impact of these wild animals may not be judged as significant by common standards, for communities with a subsistence economy like the farmers in Cheha Woreda, even small losses can be of economic importance and can generate negative attitudes toward wildlife and conservation in general (Eniang et al. 2011).

To our knowledge, there is no documented information about HWC from this part of the country. Therefore, this study is an original contribution to the existing literature in several ways. First, it generates information about the type of the major problematic wildlife, perceived extent of their damages, perception of population change, and proportion of farmers suffering from the conflicts. Secondly, the study identifies the direct and indirect economic, environmental, and social impacts as a result of the HWC in the area, as perceived by the farmers. Thirdly, it shares farmers' knowledge about the management and control options for reducing wildlife damage. Additionally, management options, best experiences and lessons practiced are documented so that the farmers in the other areas (directly or through the assistance of local experts) may adopt better methods to manage the conflicts.

Methods

This study was conducted in 3 of the total 42 peasant associations (PA) of Cheha Woreda



Figure 1. Typical view of study area (Girar-Dakuna peasant association) showing the vegetation covers and enset (*Ensete ventricosum*) field around homestead of households during the dry season.

(woreda is the Ethiopian equivalent to a U.S. county), Guraghe Zone of Southern Nations, Nationalities, and Peoples Regional State (SNNPRS), Ethiopia. The Woreda capital, Imdibir town, is located about 180 km from Addis Ababa and 30 km from the present zonal capital of Wolkite. *Imdibir* means mother-forest and is the combination of 2 words in the Guraghe language, *Im* = mother and *dibir* = forest. This name indicates that the area was once covered by forests. Around Imdibir, there are also places locally known as Girar Dibir (*Acacia* [*Acacia* spp.] forest) and Yawre Dibir (forest of wildlife; Molla and Feleke 1996).

Land is a scarce resource among the Guraghe people. The landholdings for high, middle, and low-income households are about 0.75, 0.5, and 0.25 ha, respectively (Holeta Agricultural Research Center 2011). For most subsistence farmers, enset (*Ensete ventricosum*, also called false banana) fields, together with a small amount of grazing land, is the only farmland available around a homestead (Figure 1). A small group of households that own more land cultivate teff (*Eragrostis teff*), barley, and wheat. Because of the small size of landholdings, farmers do not have separate plots for particular crops. Consequently, each farming activity is performed for all the crops on the same field.

The Woreda is known for its enset-based farming system in which both perennial and annual crops are grown. In addition to enset, most of the other crops grown are perennial, such as chat (*Chata edulis*), coffee (*Coffea arabica*),

mango (*Mandifera indica*), avocado (*Persea americana*), lemon (*Citrus orientifolia*), and orange (*Citrus sinensis*). These perennial trees and shrubs are important for natural resource management and mitigation of climate change in the area. The annual crops are grown in the Woreda during 2 rainy seasons: the main rainy season that lasts from June to September and the short rainy season that lasts from March to April. During the main rainy season, farmers grow barley, wheat, teff, and potatoes. During the short rainy season, they practice intercropping of maize, tomato, cabbage, and green peppers with immature enset and coffee. Planting eucalyptus (*Eucalyptus camaldulensis* and *E. globulus*) trees for cash income is also becoming common practice in the area (Holeta Agricultural Research Center 2011).

To select appropriate samples, we first held a discussion with experts of the Cheha Woreda Natural Resources and Agricultural Office about the situation of wildlife resources and associated problems in the area. Subsequently, other knowledgeable peoples about the area, including elders who had better knowledge and understanding of the dynamics of their area, were consulted. Based on this preliminary information from the stakeholders, we purposefully selected 3 accessible and representative peasant associations (PA), namely Dakuna and Girara, Yefeterek-Indebera, and Gassore from highland, mid-land highland, and lowland agro-ecologies, respectively. We selected 100 farmers from

the list of approximately 800 households that comprise the 3 PAs. We selected an equal number of farmers from each of the 3 PAs through systematic random sampling from the list of households, with a targeted sample size of 100. Out of the 100 selected and interviewed farmers, we obtained 89 valid responses.

In 2011, we conducted face-to-face interviews with the selected farmers to collect information about their attitudes toward wildlife and their perceptions of the extent of HWC in Cheha Woreda over the previous 5 years. Natural resource experts who can speak the local language conducted the interviews under close supervision using a semi-structured questionnaire. We asked each of the respondents: (1) whether the household had ever experienced damages to their crops or domestic animals by wildlife; (2) what type of wildlife they believed to be causing crop damage in their area and their perceived trends in their populations of wildlife in their area; (3) what was their perceived extent of crop or domestic animal damages; (4) what were the direct and indirect impacts on the natural resource management practices and livelihoods of the farming community; and (5) what suggestions of possible management options they could offer.

Additionally, we conducted 3 group discussions to enrich the household survey data. In this case, we roughly categorized the study area into 3 parts. We held interactive and participatory discussions based on the semi-structured questionnaire that was prepared for the face-to-face interview. In each group, 8 to 12 farmers volunteered to be included in the discussion. The focus-group discussions were held after the research team analyzed the individual farmer interview data and were used to verify and further contextualize the results of the individual interviews. We analyzed the data collected using descriptive statistics, such as frequency of count, mean, and percentages.

Results

Proportion of farmers facing damages

Most farmers (92%) in our study area reported that they had experienced damage to their property as a result of the actions of wild animals. The results from the focus group

discussions also suggested that nearly everyone in the study area experienced wildlife damages to their crops or domestic animals at least once in the last 5 years.

Crop-raiding and predatory wildlife, extent of damages, and trends in their populations

Crop raiders. Farmers in Cheha Woreda identified wild animals that threaten their crop production. They reported that, in order of importance, Grivet monkeys (*Cercopithecus aethiops*), crested porcupines (*Hystrix cristata*), apes (*Papio* spp.), antelopes (*Gazella* spp.), warthogs (*Phacochoerus* sp.), and wild pigs (*Sus* sp.) were the major wild animals that frequently damage their crops. Additionally, farmers noted that mice and birds also were significant threats to their crops. With regard to rating the extent of damage to their crops, about 55% of the farmers expressed having suffered a high severity of crop damage (37% perceiving large and 18% perceiving very large damages); 46% reported a low severity of damage, 32% of which reported small damage, and 14% reported very small damage (Table 1). Among the responses concerning trends in populations of crop-raiding animals, 68% of respondents perceived that the numbers of major crop raiders, particularly monkeys, porcupines, and apes, had increased over the previous 5 years (Table 2). During the focus group discussions, we also gathered similar reports that monkeys, porcupines, and wild pigs were the most problematic wild animals.

Predators. Unlike damage to crops, many households in the study area did not report experiencing loss of their domestic animals to predators. However, some farmers identified Ethiopian ratel or honey badgers (*Mellivora capensis*), spotted hyenas (*Crocuta crocuta*), foxes (*Vulpes* sp.), pythons (Pythonidae), and eagles (Accipitridae) as the major wildlife preying on their domestic animals (Table 3). The severity of the damage done by these animals was ranked as small by most respondents. Farmers believed that populations of honey badgers and hyenas had increased slightly, while the number of foxes, pythons, and eagles was perceived to be decreasing slightly from 2007 to 2011. The participants of the focus group discussions underlined that foxes are on the verge of disappearing.

Table 1. Farmers' opinion about the extent of damages by wildlife in Cheha Woreda, Ethiopia.

Wild animals	Number of positive response on extent of damages					Total number of response
	No damage	Very small	Small	Big	Very big	
Grivet monkeys (<i>Cercopithecus aethiops</i>)	0	6	15	9	34	64
Crested porcupines (<i>Hystrix cristata</i>)	0	3	13	32	0	48
Apes (<i>Papio</i> spp.)	0	1	5	29	4	39
Antelopes (<i>Gazella</i> spp.)	0	17	14	3	0	34
Wild pigs (<i>Sus</i> sp.)	0	1	13	3	0	17
Warthogs (<i>Phacochoerus</i> sp.)	0	2	11	5	0	18
Total	0	30	71	81	38	220
Percentage (%)	0	14	32	37	18	100

Table 2. Farmers' perceptions of the trends in population of different wildlife over the last 5 years in Cheha Woreda, Ethiopia.

Wild animal	Trends in population of the wildlife					Total number of farmers
	No change	Highly decreasing	Decreasing a little	Increasing a little	Highly increasing	
Monkeys	1	0	5	16	37	59
Porcupines	0	0	8	35	1	44
Apes	0	1	2	12	24	39
Antelopes	29	0	1	0	0	30
Warthogs	0	1	12	5	0	18
Wild pigs	0	0	7	10	0	17
Total	30	2	35	78	62	207 ^a

^a Indicates the total number of counts of all the responses of the farmers, i.e., 1 respondent may rate the changes in population of all the wild animals listed.

Direct and indirect impacts of HWC in Cheha Woreda

Environmental impacts. Farmers in Cheha Woreda have been using different options to try to reduce the damage to their crop and livestock by wild animals. One practice undertaken by some farmers was the clearing of local vegetation to make the area less habitable to wildlife. Our findings showed that nearly 47% of the respondents have undertaken some kind of vegetation clearing for this purpose (Figure 2). However, during the focus group discussions, some farmers claimed that they did not clear any vegetation as a result of the conflict.

Additionally, 65% of the farmers reported abandoning production of some crop types due to intolerable rates of damage done by wild

animals. Some of the crops that farmers gave up producing were: (1) fruit trees, such as avocado (*Persea Americana*), mango (*Mangifera* spp.), orange (*Citrus sinensis*), and banana (*Musa* spp.); (2) cereals, namely maize (*Zea mays*), wheat (*Triticum aestivum*), and barley (*Hordeum vulgare*) in some areas; (3) tuber crops (potatoes [*Solanum tuberosum*], sweet potatoes [*Ipomoea batatas*], and yams [*Dioscorea rotundata*]) and vegetables (cabbage [*Brassica* spp.]); and (4) pulses, such as beans (*Phaseolus* spp. and *Vicia baba*). Most (59%) of respondents reported that they eliminated all fruit trees on their farmland. Other farmers continued to grow fruit trees, but solely on or around their homesteads where the trees were more easily guarded. Additionally, >50% of farmers reported that they ceased production of cereals like maize, wheat, and barley. Vegetables and tuber crops were also

Table 3. Farmers' ($n = 85$) perceptions about the types, extent of damages, and changes in population of the predators in Cheha Woreda, Ethiopia.

Type of wild animals	Extent of damage	Trends in population over last 5 years
Ethiopian ratel (<i>Mellivora capensis</i>)	Small	Increasing a little
Spotted Hyena (<i>Crocuta crocuta</i>)	Small	Highly increasing
Fox (<i>Vulpes</i> sp.)	Small	Decreasing a little
Python (<i>Pythonidae</i>)	Very small	Decreasing a little
Eagle (<i>Accipitridae</i>)	Small	Decreasing a little

some of the most common crops being severely damaged by wild animals. Surprisingly, 40% respondents reported that they had stopped producing their main crop, enset, in areas where it is easily accessible to wild animals. This was especially true for some local varieties that relatively sweet and subject to high rates of depredation by wildlife. Some farmers predicted that potatoes, the newest crop variety introduced in the area, will be the next crop to be put out of production because of high levels of damage by wildlife.

Conversely, only 10% of farmers reported that they gave up keeping certain domestic

animals, such as goats (*Capra a. hiruc*), sheep (*Ovis aries*), or chickens (*Gallus domesticos*), due to fears of depredation. This suggests that the major source of conflict between humans and wild animals in Cheha Woreda is crop-raiding, rather than predator attacks on livestock.

Contribution of wild animals to food shortages. Most (88%) of farmers reported that the above-discussed wild animals significantly contributed to the shortage of food and the poverty in the area. A participant in 1 focus group discussion narrated: "They have made our living standard to be below that of other communities, the animals which came



Figure 2. Farmers clearing vegetation during field work in Girar-Dakuna peasant association (PA), Cheha Woreda, Ethiopia.

from other areas. They cleared all the bamboo [the roots are sweet to monkeys], and now they are clearing the other crops." According to the respondents, monkeys caused the most damage in the area.

Management options for HWC

Farmers in the study area suggested that several options were used to minimize or control damage to their crops. Most farmers (77%) used chasing and scaring, in which humans make gesturing, mimicking, or impersonating behavior as a way to frighten wild animals (Table 4). Some farmers also reported using watchdogs to scare or chase monkeys. Others made their children stay in the field to keep away monkeys. More than 70% of the farmers proposed using fences, and ridges and furrows to protect their crops, especially from such animals as porcupines. Some (17% and 10% respectively) of the farmers suggested that clearing vegetation and killing the animals were effective options (Table 4).

Discussion

Our findings from face-to-face interviews with farmers are consistent with the findings from our focus group discussions for all the variables, except for the question related to clearing of vegetation, in which some farmers in the focus group discussions did not agree. This consistency matches the results of Robinson (1993), who found that respondents are likely to discuss widely shared information in a one-on-one setting in the same way as in a group setting. Thus, our results indicate that the problem is widespread and important for the community in the study area.

We found that almost all of the farmers interviewed in the study area perceived that the degree to which wild animals are affecting their land has been increasing. The identified problematic animals included: (1) crop raiders (monkeys, porcupines, apes, antelopes, warthogs, wild pigs, mice, and birds) and (2) predators (honey badgers, hyenas, monkeys, foxes, pythons, and eagles). Our findings suggest that the wild animals in the study area are not as diversified as in other areas of Ethiopia and sub-Saharan Africa, and the

Table 4. Management options proposed by farmers ($n = 83$) to control or reduce crop raiding in Cheha Woreda, Ethiopia.

Proposed options	Frequency
Chasing and scaring, including gesturing, mimicking, or impersonating	64
Protecting crops with fences	60
Clearing of vegetation	14
Hunting and killing the wild animals	8
Establishing closed wild animal centers or parks	5
Other	3

animals in Cheha also are not threats to human life, as is the case elsewhere. Many households in the study area did not report experiencing the loss of their domestic animals to predators. The severity of the damage by predatory attacks was ranked as small on average. This underscores that the major source of conflict between humans and wild animals in Cheha Woreda is crop raiding, rather than predators attack on livestock. The perceived trend of changes in population of the wild animals in the Woreda was also correlated to the farmers' responses about the extent of damages. The farmers perceived that numbers of crop raiders, mainly monkeys, porcupines, and wild pigs were increasing over the years. However, a study conducted on Ethiopian parks indicated that the numbers of large endemic wild animals in the parks have been declining (Tefera 2011).

The consequences of HWC in Cheha Woreda are perceived to be vast. We identified the perceived direct and indirect economic, environmental, and social impacts. The damages to crops are most important factors affecting the livelihoods of the local community. Almost all farmers blamed wild animals for making significant contributions to the shortage of food, low living standards, and poverty in the area. Cheha Woreda is also known for its very fragmented and small landholdings, and only a small percentage of local farmers can adequately support their families. Most households receive a substantial percentage of their income from remittances sent by their children or relatives living in other cities or other countries (U.S. Agency for International Development 2005).

Most of farmers articulated that HWC in the

area has resulted in shifts in cultivation (to eucalyptus trees in some cases). They reported abandoning some important crops, including cereals, vegetables, tubers, and fruits that were frequently damaged by wild animals. Respondents also reported that they had stopped producing their main crop, enset, in some areas where it is highly accessible to wild animals. Farmers stressed that some local varieties are no longer being grown because they are relatively sweet and, therefore, attractive to hungry wildlife. Brandt et al. (1997) also supported the findings that porcupines and



Figure 3. Ridges and furrow around an enset field to protect it from porcupines.

wild pigs are the major pests of enset. Enset is regarded as a food security crop in this densely populated area because of its high productivity per unit area compared to cereals and because it serves as livestock feed during the dry season (Elias 2003). Though this crop tolerates drought, it is threatened by wildlife damage. The participants of the focus group discussions also supplemented the discussion by adding that unless there is a dog and a male in the family, it is impossible to tolerate the damage done by wild animals, particularly monkeys. This implies a local belief that female-headed households are perceived to be more vulnerable to wild animals than male-headed households. This could be due to the agility of the monkeys and their understanding that women and children may be less able to harm them.

The other consequence of HWC is that they threaten biodiversity and environmental and social sustainability in the area. Our findings showed that about half of the respondents undertook some kind of vegetation clearing to decrease habitat for wild animals. As a result of clear-cutting, soils become vulnerable to erosion, and households suffer from a lack of firewood and home construction materials. This also has an adverse effect on the environment and wild animals, in turn compounding the negative effects on the community. Tefera (2011) showed that some population of the endemic

wild animals in the Ethiopian parks (protected areas) are declining due to human interference; this can serve as a proxy to estimate how much wild animals in unprotected areas are being threatened.

Wild animals are also threatening the development of local human populations. Some farmers believed that >1 family member should be in the field at all times to guard against wild animals—monkeys during the day and porcupines and pigs during the night. As a result, children are kept home from school, and men and women are kept from more productive work or education. In general, HWC result in both humans and wildlife suffering losses, as the causes are related to interactions between the groups over demand for the same resources.

Farmers have been using different management options in the study area. Among these, chasing and scaring as a way to frighten wild animals was used by most farmers. Some farmers reported using dogs to scare or chase animals, especially monkeys. Most farmers suggested using fences, ridges, and furrows (Figure 3) to protect their crops. Similarly, Molla and Feleke (1996) reported that the subsistence farmer of Cheha Woreda build stone walls and use locally made traps to reduce raiding by wild pigs and porcupines. A small number of farmers also suggested clearing vegetation and killing the animals as appropriate options.

However, most of these management options were not suitable, environment friendly, or sustainable. According to Muruthi (2005), the suitability of a management option depends upon its effectiveness, cost, and acceptability to the human community. The most effective management options are those that incorporate "a full arsenal of conflict mitigation strategies and applications with flexibility to change as conditions change" (Madden 2004).

HWC have global effects similar to issues of sustainability, in which an action in 1 part of the world may have effects in other areas. Hence, the results of our study are important and can be useful in areas that have similar problems and where the problems are undetermined. We found that farmers' perceptions about wild animals can have other economic, social, and environmental consequences, such as shifts in cultivation, clearing of vegetation, and farmers' reluctance toward natural resource management and the adoption of new crop technologies.

Conclusions and management implications

In this study, we used household level data to assess farmers' perceptions of the effects of HWC in Cheha Woreda. We found that the perceived social, economic, and environmental impacts of this conflict were complex and multidimensional. We conclude that HWC are a potential barrier to effective, natural resource management and livelihood improvement efforts being undertaken in the area. The perceived extent of damage to crops and other direct and indirect impacts were found to be critical. We did not determine if the farmers' perceptions were accurate, but, as long as farmers perceive the effect to be substantial, we recommend the local government and development entities give more attention to further investigate the problems and mitigate the effects of these conflicts. Establishing additional protected areas where wild animals can live without threatening human populations, and vice versa, is 1 option. The severity of effects on both the local community and wild animals may be higher than local governments and development practitioners are aware.

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