

# Human-Wildlife Conflicts in and around Choffa Forest, Hawzien Woreda, Eastern Tigray, Northern Ethiopia: Implication for Conservation and Conflict Resolution

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**Abstract:** *The study was conducted to investigate the extent of human-wildlife conflict and to evaluate the attitude of local residents towards wildlife. Data were collected by means of face to face questionnaire interview, direct observation and focus group discussion. Responses were compared using nonparametric Kruskal Wallis test and chi-square test. High extent of human and wildlife conflict was recorded in the present study. 47.5% confirmed that both crop raiding and livestock damage was the major form of damage in the study area. Gelada baboons, rodents, Vervet Monkeys and Bird species were reported to be among the destructive wild animals in terms of crop loss. The level of damage in terms of crop loss showed no significant variation among villages ( $H=3.00$ ,  $df=3$ ,  $P>0.05$ ). Leopard, Spotted Hyena and Common jackal were common problematic wild animals in terms of livestock depredation. Domestic dog, Scarecrows, habitat disturbances, human guarding, displaying dead wild animal parts, poison, Trap, fencing, sound and killing were among the deterrent strategies practiced by the local communities. 50.83% of the total respondents had positive attitude towards wildlife while 42.08% of them had negative attitude towards wildlife. Generally, there was strong conflict between the wildlife and the people living surrounding the study site. Therefore, potential solution should undertake to solve the conflict.*

**Keywords:** Conflict, Choffa, Conservation, Crop loss, Livestock depredation, Wildlife

## 1. Introduction

Human-wildlife conflict is an interaction between humans and wildlife that results in negative impacts on human social, economic or cultural life, on the conservation of wildlife populations, or on the environment (WWF, 2005). Conflicts between humans and wildlife are the product of socio-economic and political landscapes and are controversial because the resources concerned have economic value and the species involved are often high profile and legally protected (Treves and Karanth, 2003; McGregor, 2005).

Human-wildlife conflict occurs when the needs and behavior of wildlife impact negatively on the goals of humans or when the goals of humans negatively impact the needs of wildlife. In particular, it includes cases where wildlife threatens, attacks, injures, or kills humans, as well as cases where wildlife threatens, attacks, injures, or destroys their livestock, crops or property, transmit diseases or disease causing parasites to livestock, and utilize the grazing resources meant for community livestock (Makindi *et al.*, 2014). The growing loss of habitat is also a major cause of increasing conflict between humans and wildlife (Kumar, 2012). Human-wildlife conflicts negatively impact for both humans and wildlife (Makindi *et al.*, 2014).

As a result, human-wildlife conflict is now recognized as a major issue in conservation (Shemweta and Kidegesho, 2000). The conflict that occurs between people and wildlife when animals raid their crops is becoming one of the largest

problems for conservation managers around the world (Hill *et al.*, 2002). Conflicts between people and wildlife currently rank among the most difficult problems that conservation managers face in Africa. Human-wildlife conflict is rapidly becoming one of the most important threats to the survival of many wildlife species (Madden, 2008). Human-wildlife conflict is more intensive in developing countries where livestock holdings and agriculture are important parts of rural people livelihoods and income (Eniang *et al.*, 2011).

Wildlife and other nature tourism is an important and fastest growing industry that has the best possibility for generating many new jobs worldwide (Rannersmann, 2003). Wildlife tourism provides essential revenue to a country or a region. For instance, it is featured component of Ethiopia's poverty reduction strategy that aims to combat poverty and encourage economic development. However, this is realized only when conflict between human and wildlife is solved and if the local people have positive attitude towards wildlife.

Human attitudes and values towards wildlife vary both among and within different sectors of the society (Messmer, 2000). Public understanding of the general environment and population related issues is critical for successful conservation efforts because conservationists face many challenges from local communities. Thus, understanding human attitudes and causes for human-wildlife conflict is critically important for the design of long-term conservation strategies.

Ethiopia endowed large number of National parks, wildlife sanctuaries and other protected areas. These areas harbour many wildlife including wild animals, plants and microorganisms which are very crucial in maintaining ecological structure and function. They also have great contribution in improving of economy of one nation by attracting local and international tourists (Shemwetta and Kideghesho, 2000). However, Ethiopian protected areas face significant challenges in meeting human and wildlife needs (Tessema *et al.*, 2010). Although it is possible to enhance the contribution of the wildlife sector towards poverty reduction strategy by maximizing the economic and social benefit to be derived from the wildlife resource, wildlife is diminishing from time to time due to human consequence.

Human-wildlife conflict is a significant problem in Africa and it has important consequences for local populations in terms of food security, safety and well-being, for the micro and macro economy, and also for wildlife conservation (Lamarque *et al.*, 2009). The same is true in Ethiopia (Muluken Mekuyie, 2014). Although some ecologists appraised the extent of human-wildlife conflict in some parts of Ethiopia, the level of human-

wildlife conflict in Tigray region is surprisingly limited. As a result conservation status of wildlife especially wild animals is not documented. Thus, this study aimed to investigate the extent of human-wildlife conflict and, to evaluate the attitude of local residents towards wildlife in and around Choffa forest.

## 2. Materials and Methods

### Study area

The study was conducted in and around Choffa forest, Eastern zone of Tigray, Northern Ethiopia in Hawzien Woreda. The study site is a closure area which includes Choffa, Andayohans, Fluyamba, Adihela, Mayteslim and Adigebrehyat. The closure area bounded by Debreabay, Debremizen and Simret Kebeles. The study site is found about 22 km north of Hawzien. Hawzien is located about 110 Km far away from the capital city of Tigray, Mekelle. Hawzien has a latitude and longitude of 13°58'N 39°26'E with an elevation of 2105 meters above sea level.



**Figure 1:** Overview of the study site (partially)

The study area consists of various wild animals including *Crocota crocuta*, *Procapra capensis*, *Canis aureus*, *Civettictis civetta*, *Xerus erythropus*, *Panthera pardus*, *Cercopithecus aethiops*, *Hystrix spp.*, numerous bird species such as sunbirds, little Cordon Bleu, Lammergeyers, Batteleur eagles and small mammals. The area also has an endemic genus, *Theropithecus*, and the world's only grazing primate and endemic to Ethiopia. Moreover, the study area includes various plant species such as *Acacia etbaica*, *Carissa spinarum*, *Croton macrostachyus*, *Dodonaea angustifolia*, *Euclea racemosa*, *Eucalyptus citriodora*, *Euphorbia candelabrum*, *Olea europaea*, *Euphorbia tirucalli*, *Ekebergia capensis*, *Ficus vasta*.

### Methods

Before the actual data collection pilot survey was conducted based on the information obtained from the preliminary survey to evaluate the questionnaire and to identify the period and areas of human-wildlife conflict. The numbers of villages/sites were decided based on the pilot survey purposefully based on the information gathered using the pilot

survey i.e. based on the distance from the forest, accessibility, having farmland towards the forest and the occurrence of human-wildlife conflict. Based on the criteria, Arena and Debretehay from western part of the forest and Gobodegat and Sakba from south part of the forest were selected.

### Data collection

Data were collected in between February 2015 up to April 2016 using the following data collection methods which were modified from Aharikundira and Tweheyo (2011); Mesele Yehune *et al.* (2009); Tewodros Kumssa and Afework Bekele (2013).

### Questionnaire survey

A set of semi-structured questionnaire was administered to household representatives in the four villages. The semi-structured questionnaire was administered to members of the household on a random manner based on first come first serve basis. Household representatives was included both females and males with various age groups. The sample population was consisted of local community members, local leaders and

development agents as key informants. Two hundred and forty households were selected by stratified random sampling from the four villages. The questionnaires were included both opened and closed response questions. The open-ended questions were helped to elicit more extensive information of some of the issues raised. For respondents who could not write, face-to-face interviews were done to acquire the needed information.

#### Direct observation

Field visits were made to view and record incidents of crop raiding to make an independent assessment of bite size. This tool was used to note the wild animals in the area, housing standards of the local people, crops grown, observe the extent of crop damage, and other observable features.

#### Focus Group Discussion

This method was used to gather information on how local communities perceived wildlife, respondents' level of wildlife tolerance, benefits derived from the wildlife and suggestions on how to check further conflicts. Two group discussions were conducted in each village. Selection of participants in the group discussion was included people who lived for long period of time or for a minimum period of ten years, the traditional rulers and their chiefs, elderly women above fifty years of age, who lived in the village all their lives and key

informants. Guide checklist was prepared for the focus group discussion. The information gathered was subsequently used to develop an interview questionnaire to gauge broader community perceptions of wildlife and wildlife conservation around the study area. Data collected was collated and summarized in the discussion in a narrative form.

The collected data were entered in to Microsoft Excel and analyzed by using MiniTAB 14 computer software programme. Nonparametric Kruskal Wallis test and tables chi-square were used for analysis of the collected data.

### 3. Results

#### Impacts of wildlife on farmers' crop and livestock

High extent of human and wildlife conflict was recorded in the present study. The nature of human wildlife conflict in the study area was from different sources. From the response of the interviewees and direct observation, destroy crop, kill or injure livestock, injure or kill people and disease transmission were main causes of conflict between human and wildlife. According to majority of the respondents (47.5%), both crop raiding and livestock damage was the major form of damage in the study area followed by crop loss (32.08%) (Fig. 2).

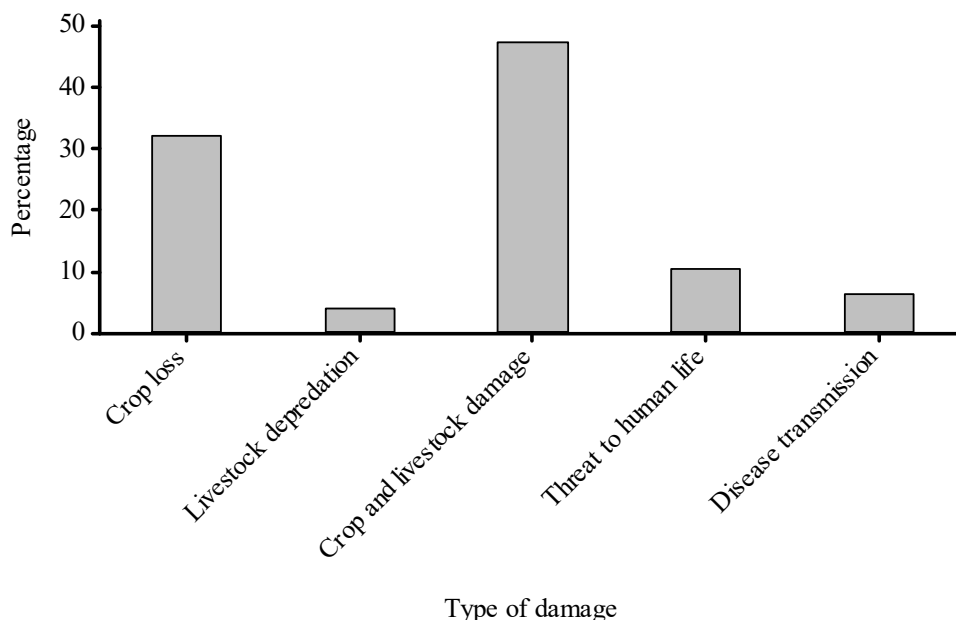


Figure 2 Extent of damage by wild animals exerted in the study area

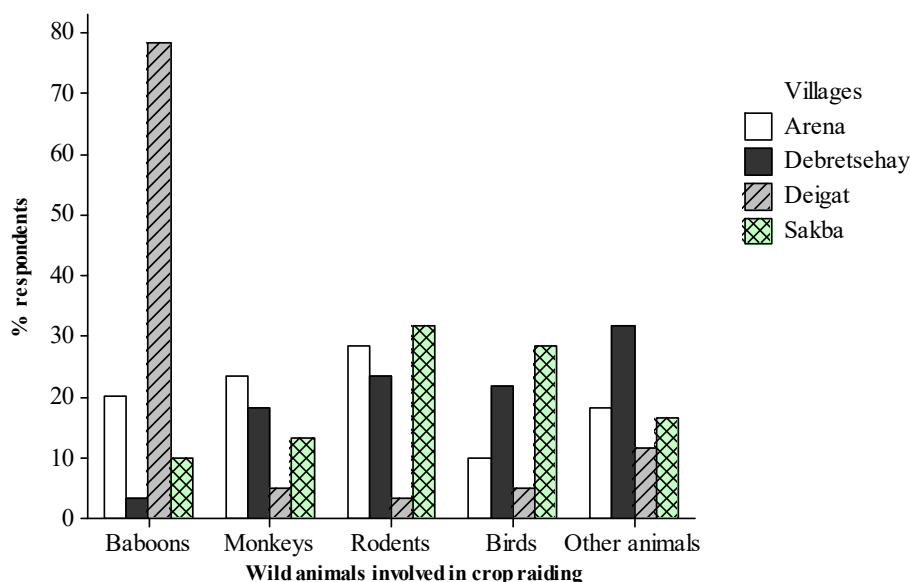
Respondents from the four villages reported that crop raiding by wild animals was common in and around their agricultural field. Gelada baboons (*Theropithecus gelada*) (78.33%) and rodents (28.33%) were reported to be the most destructive wild animals in terms of crop loss in Deigat and Arena villages respectively. Vervet Monkeys (*Cercopithecus aethiops*) and different bird species were described among the serious wild

animals in terms of crop loss in the villages. Other animals reported to crop raiding were Porcupines (*Hystrix cristata*), Rabbits (Genus: *Lepus*) Striped ground squirrel (*Xerus erythropus*) and Rock hyraxes (*Procavia capensis*) (Fig. 3).

Crops affected by wild animals were include *Eleusine coracana*, *Sorghum bicolor*, *Triticum aestivum*, *Zea mays*,

*Phaseolus vulgaris*, *Eragrostis teff*, and *Hordeum vulgare*. According to the response of the interviewees and personal observation, other than these crops a common food in the villages cactus is one of the most damaged domesticated crop plants by the wild animals especially by Baboons, Monkeys and birds. As a result, wild animals were caused economic loss in the study area. Based on the response of the respondent

from the four villages, 30,000 k.g of crop product was lost per year. Out of the total crop product lost, 11,700 k.g was reported only from Deigat village the village which dominated by Baboons. The level of damage interms of crop loss showed no significant variation among villages ( $H= 3.00$ ,  $df=3$ ,  $P>0.05$ ).



**Figure 3:** Wild animals involved in crop raiding in the four villages (Other animal includes Porcupine, Rabbit, Squirrel and Hyrax)

A total of three common problematic wild animals were reported interms of livestock depredation from the villages although their effect is differ from village to village. These animals were: Loepard (*Panthera pardus*), Spotted Hayena (*Crocota crocuta*) and Common jackal (*Canis aureus aureus*). Among the listed problematic wild animals, Leopards were considered the most serious animals (41.25%) followed by Common jackal (33.75%) in the villages (Fig. 4).

In general, according to the respondents from Arena village, 685 domestic animals were lost due to the wild animals in the last five years. Respondents from Debretehay, Deigat and Sakba reported losses of 458, 416 and 357 domestic animals respectively. The domestic animals attacked by the wild animals reported by the interviewees includes Cattle, Sheep, Goats, Chickens, Donkeys and Dogs.



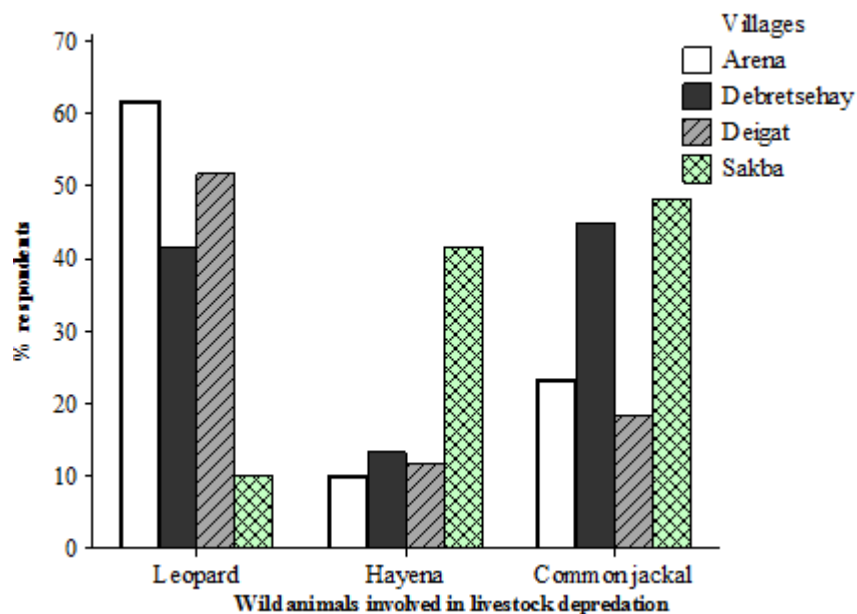


Figure 4 Common wild animals involved in livestock depredation in the four villages

### Deter strategies used by farmers to cope crop raiding and livestock depredation.

#### 1. Guard dogs

Domestic dogs were very important to avoid both crop raiding and livestock depredation wild animals. Domestic dogs tied around the farm to guard crop raiding wild animals including Rabbits and Squirrels. When the wild animal approaches to the crop, the dog barked and the wild animal go back to their habitat. Dogs are indicators when wild animals are approached to home and farm. At night time they barked repeatedly and lead to the farmer to check his vicinity and can prevent both his livestock and crops. Although dogs are depredated by Leopards and Hayena in the study area, they give warning to the household by their barking.

#### 2. Scarecrows and mounting dirty clothes and plastics on wood materials

Scarecrows are crude effigies of persons, were mounted on farms to fright crop raiding wild animals such as birds, Rabbits and Squirrels. Mounting plastics on wooden branches is tying of any clothes or plastics on wooden to scare crop raiding animals such as birds, Rabbits, Squirrels and porcupines. Wild animals frightened both from the image and sound of the plastics.

#### 3. Constant guarding by human

Most respondents guard their crop from the beginning (sowing) to the end by separate one person mainly child to protect the crop permanently. They reported that this method was very effective to deter crop raiding animals. However, it is difficult for those household who have less number of children.

#### 4. Habitat disturbances

Habitat disturbance is destruction of the home of the wild animals. Humans kill or chase wild animals by digging,

cutting, sealing by stones and smoking their natural habitat. This method is a main cause to decrease or to extinct of wild animals.

#### 5. Displaying dead wild animal parts

Parts of dead wild animals were displayed in or around the farm. Therefore, this is a warning to the alive of the wild animals come to the crop. When the animals come to the farm they observe their social group body and they feel frightened by thinking the same is true for them.

#### 6. Poison

Poison is directly applied to kill wild animals visiting the farm areas. The poison prepared by mixing with attractive foods i.e. foods having high smell. This is common for rodents. However, some respondents from Deigat village confirmed that White baboons are killed and extinct by poison around their village. Hamadryas baboons were seeing around Arena and Deigat in the last five years. But in the current time they are not visible around the forest.

#### 7. Other methods

Other methods were practiced in the study area to deter wild animals that caused both crop raiding and livestock depredation other than described in the above. Trap, fencing, sound from different sources and killing by following them were among the deter mechanisms used by the farmers in the study area.

### Knowledge and perception of farmers towards wildlife and wildlife conservation

More than half of questionnaire respondents (50.83%) had a positive attitude towards wildlife found in the forest. In contrast, 42.08% of the respondents had negative attitude towards wildlife.

There was significant difference in the attitude towards the wildlife among village residents ( $\chi^2 = 44.38$ ,  $df = 6$ ,  $P < 0.05$ ). Majority respondents from Debretehay (56.67%) and Sakba (80%) had positive attitude towards wildlife although most respondents from Arena (50%) and Deigat (68.33%) had negative view towards wildlife (Table 1).

**Table 1:** Attitude of the respondents towards wildlife

Villages	n	Positive attitude (%)	Negative attitude (%)	Neutral (%)
Arena	60	40	50	10
Debretehay	60	56.67	31.67	11.67
Deigat	60	26.67	68.33	5
Sakba	60	80	18.33	1.67
Total	240	50.83	42.08	7.08

Attraction to tourists, source of food, enjoyment by viewing wildlife, being amongst creatures of God and ecological balance were responses of respondents when asked about reasons for their positive views towards wildlife. Of the total respondents from four villages, about 37.5% of them believed that wildlife used as attraction to tourists and they are a means of source of income to the country if they are conserved properly. Very few (3.33%) respondents from Arena noted that dung of Hyraxes used as a fertilizer.

When they asked regarding their negative view towards wildlife, they reported that wildlife were main causes for losing of their crop, damaging of their livestock and injuring their life. From the interview, one child was killed by Leopard from Arena village. Of the total respondents, 10.83% of them were noted that Baboons cause physical injury to humans especially children who participate in guarding of crops and livestock. Physical injury by baboons was common in Deigat village. Few of them (9.17%) believed that wildlife transmit disease to humans. These results affect the local people's attitude towards wildlife. Consequently, respondents who had negative attitude towards wildlife want to extinct the wildlife from their surrounding and from the forest as they asked what their general recommendation and suggestion about the wildlife in and around the forest.

#### **Possible solutions to mitigate Human wildlife conflict**

The present study showed that human wildlife conflict is apparent in the study area. The conflict becomes the main threats to the continued survival of wild animal species in the area. Not only threats for wild animals but also the conflict causes high impact in economic loss of the people around the study area. Therefore, human-wildlife conflicts are negative and impacts negatively on both human and wildlife as highlighted in this study. It is also a serious obstacle to wildlife conservationists. Based on these reasons, mitigation strategies are very essential to reduce the level of impact and lessen the problem. Accordingly, possible mitigate possibilities for peaceful co-existence between human and wildlife are presented as follows:

- Campaign awareness creation and organize training program to the local communities

- Identifying clear border between the closure area and the land owned by the residents
- Laws and legislation
- Enhance crop and livestock protection measures
- Develop employment opportunities in and around the closure area
- Involvement of local communities in any conservation practices of wildlife

#### **4. Discussion**

The result of the present study has clearly shown that there was a strong conflict between wild animals and farmers living around the closure area especially in Arena and Deigat villages. The main grounds for the presence of strong human wildlife conflict in the present study were includes crop loss, livestock damage, threat to human life and disease transmission. Similar sources for Human wildlife were reported from Tsavo Conservation Area, Kenya. Injure or kill people, eat or destroy crops on the farms, kill or injure livestock, transmit diseases or disease causing parasites to livestock, and utilize the grazing resources meant for community livestock were reported as main causes of nature of Human wildlife conflicts (Makindi *et al.*, 2014). Different causes for human wildlife conflict were reported from different parts of Africa. For instance, animal death, loss of human life, crop damage, damage to property, injuries to people and wildlife, encroachment of forest areas for agriculture, developmental activities, and livestock grazing are some key reasons for increment of the conflict in countries such as Kenya, Namibia, Mozambique, Zambia and Nigeria (Ladan, 2014).

The current study showed that crops such as Finger millet (*Eleusine coracana*), Sorghum (*Sorghum bicolor*), Wheat (*Triticum aestivum*), Maize (*Zea mays*), Bean (*Phaseolus vulgaris*) and Barley (*Hordeum vulgare*) were raided by wild animals. Study conducted in Rwandan Forest Fragment indicated that maize, potato, beans, cabbage, sweet potato and tomato were raided by wild animals (Guinness & Taylor, 2014).

A research conducted around Bwindi Impenetrable National Park of Uganda showed that Baboons, Bush pigs and Rodents were identified as destructive animals, mainly feeding commonly on maize, sweet potatoes and sorghum (Aharikundira and Tweheyo, 2011). Similar finding with the current study was observed in Filinga Range of Gashaka Gumti National Park of Nigeria. Monkeys, Baboons, Birds and Rodents were listed among wild animals that attack crops including Maize, Cassava, Rice and Banana (Eniang *et al.*, 2011). In addition to the above listed crop raider, other animals including Porcupine, Rabbit, Squerrel and Hyrax were involved in crop destruction in the present study. Respondents from Tigray region, Northern Ethiopia reported that hyraxes was raided crops around the study area (Teklay Girmay *et al.*, 2015).

During the present investigation, three species of wild animals were identified as problematic animals in livestock depredation. These animals were caused loss of domestic animals. Leopard, Spotted Hyena and Common jackal were the identified predators in the present study area. This is in line with Mesele Yihune *et al.* (2009) that reported Leopard, Spotted Hyena and Common jackal were the major predators for domestic animals in and around Simien Mountains National park of Ethiopia. They were responsible for loss of Sheep, Goats, Oxen, Cows, Donkeys and Mules. Livestock loss such as Goat, sheep, cattle and Donkey by wild animal predators were recorded from Senkele Swayne's Hartebeest Sanctuary, Ethiopia (Tewodros Kumssa and Afework Bekele, 2013). Study on Prey of Peri-urban Spotted Hyena (*Crocuta crocuta*) in Southeastern Tigray, Northern Ethiopia showed that Spotted hyenas were sources of conflict with livestock owning people and had great economic importance due to domestic animal depredation (Gidey Yirga and Hans Bauer, 2010). Eight problematic wild animals in terms of domestic animal loss were identified in Chebera Churchura National Park southwestern part of Ethiopia (Demeke Datiko and Afework Bekele, 2013). Among those hazardous wild animals three of them i.e. Leopard, Jackal, and hyena were same with the present finding.

In the current study, villagers were used visual deterrents, auditory deterrents, traps, physical barriers, poisoning and human permanent guarding to protect their crops and livestock from wildlife damage. Selection of the different strategies depends on the type of species, behavior of species and size of species. Frightening bodily movements, mounting plastic papers, scarecrows and displaying dead animal parts were visual deterrents that reported by the residents in the present study. Similar methods were reported from Kenya Nyeri district (Musyoki, 2014). Auditory deterrents including shouting from different sources, throwing objects, Mounting plastic papers and guard dogs were identified by the communities to minimize damage of crop and livestock by wildlife. Musyoki (2014) was identified more auditory deterrents other than the above listed including beating on objects, guard donkey, blowing a whistle and shotgun.

Numerous controlling methods for wildlife damage were identified in Gashaka Gumti National Park, Nigeria which was similar with the current findings. The methods were Guarding, scare crows, fencing, trenches, and killing of destructive wildlife species irrespective of its conservation significance. The most effective strategy the local communities used in preventing crop damage was guarding (100%), which is time consuming (Eniang *et al.*, 2011). Similarly, the communities in the present study reported that permanent Guarding by adults is the most effective strategy to control both crop and livestock from wildlife when asked the most effective deter strategy among practiced by the local people.

Study conducted in Rwandan forest fragment reported that guarding was the effective control mechanism (Guinness and Taylor, 2014) which is similar with the current result. Treves (2007) identified methods to mitigate Human wildlife conflict

which were similar with the present findings. Barriers (fences, trenches, walls, buffer zones, etc.), guards (human or animal), changing the type, timing or location of human activities, repellents (chemical, auditory or visual aversive stimuli), and removal of wildlife (capture, killing, and sterilization) were among the techniques identified by Treves (2007).

Poisoning, habitat disturbance and killing wildlife by following them were also identified techniques in the current study by the local communities to protect their crops and livestock from wildlife. This is an indication for respondents little awareness towards wildlife and wildlife conservation. Study carried out in Southeastern Tigray, Northern Ethiopia indicated that burning of habitat, Killing and poisoning were mitigating strategies against livestock depredation (Gidey Yirga and Hans Bauer, 2010). Study in Tanzania showed that 9 animal species are believed to have gone local extinct in Lake Manyara National Park due to habitat destruction, overexploitation, introduction of exotic species and pollution. Of these factors habitat destruction was the leading cause (Shemwetta and Kideghesho, 2000).

Most (50.83%) respondents had positive attitude towards wildlife. Most of the respondents believed that if rules are observed, wildlife will be beneficial to communities. Previous study conducted in highlands of Tigray found most people had positive attitude towards a large carnivore called Leopard (Gidey Yirga *et al.*, 2011). Study on assessment of community perceptions in and around four Ethiopian protected areas revealed that local residents generally held positive attitudes towards wildlife and nearby protected areas. Reasons given by the local residents positive attitude towards wildlife included its attraction to tourists, hunting opportunities during drought, enjoyment derived from viewing wildlife and its value for future generations (Tessema *et al.*, 2010) which were similar with the present reasons for positive attitude towards wildlife in the present study area. Dawit Mamo *et al.* (2012) reported most respondents had positive attitude towards elephant conservation in Kafta-sheharo National park, Tigray, Ethiopia.

Although more than half of the respondents had positive attitude towards wildlife, good proportion (42.08%) of the respondents had negative attitude towards wildlife. Loss of crops and livestock by wildlife, threat to human life and disease transmission were the main reasons for their negative. Loss of livestock by wild animals cause negative attitude of communities towards wild animals in Chebera Churchura National Park, Ethiopia (Demeke Datiko and Afework Bekele, 2013). Shemwetta and Kideghesho (2000) reported negative attitude of local people towards wildlife due to liability of the wildlife on local people. The view was provoked due to damage local people's crops and other properties, livestock depredation, and risk posed to people's lives through disease transmission and attacks by wild animals.

Study on Knowledge, attitude and practices of peasants towards hyraxes in two church forests in Tigray Region, Northern Ethiopia showed that most respondents from one church forest had negative attitude towards the hyrax species

and most respondents from the other church forest had positive attitude (Teklay Girmay *et al.*, 2015). The difference attitude among different communities may be depend on education level, level of exposure to damage by wildlife and culture. According to Røskoft *et al.* (2003) culture, education, economies, status, exposure to an event are factors that can be influence attitudes of communities towards wildlife. In the current study, killing of one child by Leopard and physical injury to humans especially children by baboons were reported in Arena and Deigat villages respectively. These situations may develop the negative attitude of communities towards wildlife.

According to the current result, Human wildlife conflict was serious in the study area. As highlighted in this study the main reasons for the creation of strong human wildlife conflict in the present study were includes crop loss, livestock damage, threat to human life and disease transmission. As a result, local communities disliked wildlife inhabit around their surroundings. This has a great negative impact in conservation of the wildlife. Therefore, determination of possible solutions to mitigate Human wildlife conflict in the study area is mandatory for peaceful coexistence of human and wildlife.

We suggested that improving crop and livestock protection measures is one most viable method of human wildlife conflict resolution. Use of audio-visual deterrents for crops, promote construction of proper sheds for livestock, intensifying human vigilance, fencing, dog guarding, scarecrows, mounting of plastic materials on wooden sticks and efficient livestock management practices are among the recommended crop and livestock protection measures without affect the existence of wildlife. This mitigation strategy was supported by Demeke Datiko and Afework Bekele (2013). They concluded that improving the technique of livestock protection such as keeping the livestock in an enclosure during the night might minimize predation risk. Active guarding by famers and members of their families was found to be the sole mode of protection from crop raiding (Guinness and Taylor, 2014).

The presence of clear laws and policies regarding in preventing any type of hunting, destruction of wildlife habitat, entering of livestock to the forest, collection of fire wood from the forest will help to alleviate a conflict between human and wildlife conflict. Madden (2008) was given details the role of appropriate law and policy in mitigating of human-wildlife conflict.

## 5. Conclusion and Recommendations

The results of the current study has a great role in mitigation of human and wildlife conflict in the study area in particular and in the region in general as it provides the current extent of human and wildlife conflict and assess community perception towards the wildlife and wildlife conservation. The study indicates that the conflict between human and wildlife in the study area have been getting worse over time. High degree of conflict in the study area was due to overlapping of needs of human and wildlife. In the current study wildlife attacks

human's crop, livestock, crop and livestock and life. Gelada baboons (*Theropithecus gelada*), rodents, Vervet Monkeys (*Cercopithecus aethiops*) and various bird species were described among the serious wild animals interms of crop loss in the villages. Leopard (*Panthera pardus*), Spotted Hayena (*Crocota crocuta*) and Common jackal (*Canis aureus aureus*) were common problematic wild animals interms of livestock depredation from the villages although their effect is differ from village to village. Domestic dog, Scarecrows, habitat disturbances, human guarding, displaying dead wild animal parts, poison, Trap, fencing, sound and killing were among deter strategies used by the communities to cope crop raiding and livestock depredation.

Although most interviewees had positive attitude towards wildlife, near close to half of the respondents had negative attitude. The conflict becomes the main threats to the continued survival of wild animal species in the area. Not only threats for wild animals but also it cause high impact in economic loss of the people around the study area. Therefore, this study will help in improving tourism sector, conservation biodiversity and reducing economic loss by wildlife.

As high extent of human wildlife conflict is recorded in the current study, possible conflict mitigation strategy should be taken in short period of time. As the study area harbors endemic wildlife i.e. Gelada baboon, we recommend to promote the area into wildlife sanctuary. A close and systematic collaboration between Ethiopian Wildlife Conservation Authority (EWCA) and the regional state offices is vital way for biodiversity conservation to be successful.

## 6. Acknowledgements

We thank Adigrat University for the financial support and to the local people around the study area for the cooperation and help they have rendered during the period of field work. We are also grateful to Worku Gebremedhin for her assistance during the field work.

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