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Assessment of Human Wildlife Conflict and Management Strategies in Basso Woreda, North Showa Ethiopia.

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ACRONYMS

CITIES	Convention on International Trade in Endangered Species
DA	Development Agents
DPPA	Disaster Presentations and Preparation Agency
FAO	Food and Agricultural Organization of the United Nations
FEG	Food Economy Group
FGD	Focus Group Discussion
IUCN	International Union for Conservation of Nature
NBSAP	National Biodiversity Strategies and Action Plans

ABSTRACT

Human-wildlife conflict exists in different forms all over the world and experienced more in developing countries. In Basso Woreda of North Shoa Zone wild animals compete for resources with the local community resulting in conflict with each other. Therefore, this study was conducted to investigate the current status of HWC and management strategy in the Woreda. Data were collected by semi-structured questionnaires from 120 farmers in eight villages found within four Kebeles. The majority (87%) of respondents reported crop raiding in their farms. Olive baboon (50.4%) and rodents (25.7%) were the most commonly cited crop raiders. Maize was the most raided crop (loss of 395 kg). The total monetary loss due to crop raiding during the growth season of the study period was 5253.00 Birr. Common jackal, common buzzard, spotted hyena, and leopard were responsible for depredation of domestic animals in the studied villages with common jackals being the most commonly involved in the attacks (53%). A total of 191 domestic animals including sheep, goat, and chicken were depredated between 2016 - early 2017. Sheep were the most frequent targets of depredation (n=79, 41%). The total monetary loss due to depredation of domestic animals was 57,600.00 Birr. Guarding, changing framing system, chasing, fencing, scarecrow and smoking were practiced by the farmers as mechanisms of protection against crop raiders. Guarding (52.3%) was by far the most commonly practiced preventive method. Where as smoking and chasing were the least preventive methods used by respondents in the village of Chiraro Debre and Abogedel.

Keywords: Basso Woreda, Crop raiding, Human-wildlife conflict, livestock depredation,

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1. INTRODUCTION

Human-wildlife conflict (HWC) is defined as any 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). While humans and wildlife have co-existed for millennia, the frequency of conflicts involving problem animals has grown in recent decades, mainly because of the exponential increase in human populations and consequential expansion of human activities (Woodroffe 2000; Woodroffe et al., 2005), expansion of wildlife distributions (Breitenmoser 1998; Zedrosser et al., 2001; Bisi,and Kurki ,2005), as well as a frequent inability of institutions that are meant to mediate such conflicts to respond effectively (Anthony et al., 2007).

The investigation of problem animals and their control is important for a number of reasons. Firstly, attitudes towards protected areas (PAs) are often influenced by perceived or real damage caused by wildlife (Els 1995; de Boer and Baquete 1998; Hill 2004; Anthony et al., 2007). Natural resource management is in many ways a form of conflict management (Warner 2000). Increased competition for natural resources among multiple stakeholders with diverse interests is occurring worldwide within the current trends of globalization (Castro,and Nielsen, 2003). Ecosystems and habitats are fast becoming human dominated, which means that more species, including primates, are forced to exploit new human resources to survive (Strum, 2010).

Competition for space between humans and wildlife is prevalent worldwide (Hoffman, 2011). Nowadays HWC exists in one form or another all over the world as wildlife requirements encroach on those of human populations and involve several animal species (IUCN, 2005; Lamarque *et al*., 2009). Despite the fact that all continents and countries, whether developed or not are affected by HWC, developing countries are altogether more vulnerable than developed nations (Fairet *et al*., 2012).

Secondly, wildlife damage represents a very real and tangible threat to livelihoods in terms of personal injury, crop and livestock losses, and property damage (Hackel,1999).Thirdly, active persecution by humans based on wild predator threats to livestock has been identified as an important factor in observed

carnivore declines (Musa 2009).Finally, HWC is potentially socially degrading, creating and reflecting larger conflicts of value and class and other interests. Especially in poorer countries and countries in transition, such conflicts have the potential to undermine human security and further weaken the effectiveness and legitimacy of state institutions.

Ethiopia is a large and ecologically diverse country with unique environmental conditions (Afework Bekele et al., 2011; Melaku Tefera, 2011). However, since many years ago, the natural vegetation of the country has been destroyed by human and natural factors and converted into agricultural and pastoral land. Moreover, its vegetation has been deforested for various purposes (Demeke Datiko and Afework Bekele, 2011). As a result, wild animal resources of the country are now largely restricted to a few protected areas (Tewodros Kumsa and Afework Bekele, 2008).

The forest area of Basso Woreda in North Shoa is under great threat due to increasing of population,urbanization development,increasing of demand for agriculture. these cause over exploitation which forces wild animals to compete with human beings for their resources and resulted in conflict between them. There are some major driving forces that increase pressures on forests in North Shoa. Nevertheless, in Ethiopia, only few studies were carried out on HWC in some specific regions of the country (Tewodros Kumsa and Afework Bekele, 2008). The same is true for Basso Woreda, North Showa Zone.

Therefore, this study was conducted in view of bridging this gap and come up with baseline data on HWC at Basso Woreda farming villages. The study attempted to gather information on crop loss, livestock depredation and HWC prevention methods at the study area. The result of the study is believed to provide information to planners, researchers, extension workers, for planning of mitigation measures.

1.1. OBJECTIVE OF THE STUDY

1.1.1. GENERAL OBJECTIVE

The general objective of this research was to assess HWC in Basso Woreda, North Shoa.

1.1.2. SPECIFIC OBJECTIVES

The specific objectives of this study were to:

- identify major crop raiding and domestic animals depredating animals
- gather information on the magnitude of crop and domestic animal loss caused by wild animals
- estimate the monetary loss incurred due to crop raiding and depredation of domestic animals
- identify methods used by the local people to minimize damage caused by wild animals.

2. LITRATURE REVIEW

2.1. Concept and definition of conflict

Human-wildlife conflict is a term commonly used by conservationists to describe friction between wild animals and people (Roy and Sah, 2012). Human-wildlife conflict can be defined by a complex mix of characteristics which include instances of crop raiding, wildlife-livestock disease transmission, livestock depredation, destruction of property by wildlife and killing of wildlife by people and vice versa (Madden, 2006). There has always been HWC and most societies have developed reasonably successful strategies to deal with it and, problems arise when these are constrained. However, with diminishing habitat and increasing human populations, local perception of HWC incidents and the way in which these are dealt with are critical in terms of conserving those species deemed important or threatened. Madden (2004) point out that HWC is usually derived from groups of people holding different values Local people versus protected area authorities, or protection of species that are highly valued at a global scale but have little or even negative value at a local scale. It is therefore, from nearly every perspective more of a human than a wildlife problem.

The term ‘pest’ is typically defined as any animal that consumes crops during any stage of the agricultural cycle, from planting to post-harvest storage (Plumper and Reynoldes(1994). cited in Naught on Treves and Treves, 2005). Crop raiding is the act of entering into a cultivated area by an animal which results in the consumption and/or destruction of domesticated plant life with in the designated region (Priston, 2009; Colonna, 2011). In the developed world potentially dangerous mega fauna have

largely been exterminated as a result of the spread of agriculture, growth of human populations and increased urbanization. In much of Europe, for example, species such as wolves that once roamed widely across the continent have been eradicated along with the habitat in which they lived; tiny remnant populations cling on in a very few remote, sparsely populated areas. In Britain, the last wild wolf – the island's only large carnivore – is believed to have been killed in 1743. And even in 2005, the Norwegian government approved the killing of five of the country's twenty remaining wolves to protect sheep (Kirby, 2005*).*

In Africa, large numbers of big mammals, including several hundred thousand wild elephants and more than 20,000 lions, still roam freely, particularly in rangeland areas. The pastoralist people who live in these regions, and the agro pastoralists and other settled small and large-scale farmers and their families who live around their peripheries, all have to cope with the consequences: damage to and destruction of crops, livestock predation, competition for grazing and water, increased risk of some livestock diseases, various inconveniences – such as loss of sleep due to protecting crops at night – and even direct threats to human life Ontario Ministry of Natural Resources (OMNR) 2008; FAO, 2010).

2.2.Nature of HWC

Human-wildlife conflicts vary according to geography, land use patterns, human behavior, and the habitat and behavior of wildlife species or individual animals within the species (Ontario Ministry of Natural Resources, 2008; FAO, 2010). Human-wildlife conflict takes place mainly in three forms: crop destruction, killing of domestic animals and human death and injuries.

Crop raiding

Crop raiding is not a new phenomenon and it has most likely been occurring since humans started practicing agriculture (Blair, 2008; Datta-Roy et al., 2009; Joseline, 2010). It is one of the most prevalent forms of HWC particularly severe around forest and protected areas (Lamarque et al., 2009; Priston, 2009). The primary causes were the ineffective land-use planning policies including protected area creation and management coupled with the increase of inhabitants around these areas (Eyebe et al., 2012).

Attacks on domestic animals

People lose their crops, livestock, property and sometimes their lives (Patil, 2011). Human-carnivore conflict figures among the HWC patterns in many parts of Africa (Lamarque et al., 2009). They are more frequent in the savannah and grasslands where pastoralism remains the main source of livelihood for many people (Madden, 2004; Datta-Roy et al., 2009; Eyebe et al., 2012).

Human death, injuries and damage to property

Though not frequent as the two principal types of HWC, crop destruction and livestock predation (Patil, 2011), human death and injuries are sometimes recorded (Datta-Roy et al., 2009). For example in Cameroon wildlife species responsible for human deaths and injuries include elephants, buffalo, lions and hippopotamus (Lamarque et al., 2009; Eyebe et al., 2012).

2.3. ATTITUDE OF LOCAL PEOPLE TOWARDS WILD ANIMALS

In many parts of Africa and Asia, large mammalian herbivores cause crop loss. The extent of damage is almost insignificant when it is considered at the global level as compared to the damage caused by invertebrates and rodents. Among the common agricultural pests like primates, rodents, birds and insects the damage caused by elephants is often far greater (Hoare, 2000). This is because elephant raids are unpredictable and can cause more damage per raid. Almost all countries in Africa reported problems with elephant crop raiding(Yalden,1984). Local people living in and around protected areas and at the edge of forest, who are unable to control the crop losses caused by wild herbivores, are likely to develop negative attitude and those who do not affected by crop raiders get benefit from the wildlife develop positive attitude towards pest herbivores.

One fundamental influence on perceptions of local people towards primates is the general cultural attitude. Levels of tolerance, acceptance and even demand for interactions vary with cultural context (Biquand et al., 1992). Cultural perceptions towards primates vary enormously and have shifted over time. Historically primates were sacred as guardians of human settlements, as spirits of ancestors, or as an embodiment of sexuality, wisdom and fortune in some areas (Cormier, 2002).

No single factor or cause explains HWC across the globe (Naught on-Treves and Treves, 2005). According to Lamarque et al. (2009) the following are the main causes of HWC.

The main cause of HWC worldwide is the competition between growing human populations and wildlife

for the same declining living spaces and resources (Madden, 2008; Kumara et al., 2012). The transformation of forests, savannah and other ecosystems into agrarian areas or urban agglomerates as a consequence of the increasing demand for land, food production, energy and raw materials, has led to a dramatic decrease in wildlife habitats (Sillero-Zubiri and Switzer, 2001; Lamarque et al .,2009; Eyebe et al .,2012). Since 1950, most of the increasing demand for food in the developed world has been met through intensified agriculture and husbandry rather than increased production (Joseline, 2010). So far, the increase in production in sub-Saharan Africa cannot be secured by greater productivity because technical progress does not match the rate of demographic increase. Continued expansion of agriculture and husbandry areas will have various impacts on habitats and biodiversity: at this stage, rural development in sub-Saharan Africa inevitably involves accelerated transformation of natural landscapes at the expense of wilderness that sustains biodiversity and finally resulted in HWC (Madden, 2008; FAO, 2010).

Drought, floods, civil unrest, natural disasters or war disrupt the normal production and distribution of food, resulting in famines. This phenomenon is on the increase; the number of food emergencies in Africa each year has almost tripled since the 1980s. Across sub-Saharan Africa, one in three people are undernourished. These factors drive the continuing migration of rural people into areas where resources could be obtained, and which are frequently occupied by wildlife. The resultant occupation of the habitat of wild animals by humans leads to conflict (Madden, 2008; Lamarque et al., 2009; Joseline, 2010).

The major causes of HWC could be attributed to many factors ranging from wild animal population increase to human population increase (Edward and Frank, 2012). Although there is a general concern over declining wild animal populations, particularly in tropical ecosystems, some species may actually be increasing in numbers. For example, increasing reports of crop raiding by elephants in Africa may reflect the recovery of population numbers since the CITIES' ban on ivory trade and the subsequent decline in poaching. Similarly, more people means more cultivated land and, hence a greater interface between people and wildlife. The world population is predicted to grow by over 50% in the next fifty years, from six billion in 2000 to over nine billion in 2050 and the increment in both wildlife and human population create competitions on fixed natural resource which leads to conflict (Sillero-Zubiri and Switzer, 2001).

A set of global trends has contributed to the rise of HWC world-wide. This can be due to human population growth, land use transformation, species habitat loss, degradation and fragmentation, growing interest in ecotourism and increasing access to nature reserves (Hill, 2000; Joseline, 2010).

A common consequence of human occupation of wildlife habitat is the development of negative perceptions of wildlife. Human-carnivore conflicts have intensified in most African countries in recent decades. This is due to exponential human population growth and economic activities. Several factors can contribute to the modification of the quantity or quality of wildlife habitats. Droughts, bush fires, climatic changes and other unpredictable natural hazards can contribute to a decrease in suitable wild animals' habitat and therefore affect the occurrence and extent of HWC. Similarly, the seasonal modification of habitats due to rainfall can also have an impact on HWC. One of the main consequences of the loss of habitats is the decrease in natural resources available for wildlife. The destruction of natural vegetation and in some cases the total disappearance of buffer zones force herbivore species to feed in cultivated fields. This phenomenon is on the increase because the growth rate of cultivated areas is high at the edge of protected areas and forest areas. (Sillero-Zubiri and Switzer, 2001).

Human activities such as husbandry, agriculture, fishing, the development of infrastructure or even of tourism or wildlife protection itself, can dramatically modify wildlife habitats either directly or indirectly (Kate, 2012). For instance, in Kenya, the fencing of farms to keep wild animals away has created physical barriers for migratory species. Conflicts can arise when migratory species such as zebras and wildebeest, which had previously migrated without any hindrance, destroy fences and crops to reclaim their traditional routes from dispersal areas to the parks. Baboons have been eradicated from some areas of South Africa and Zimbabwe, particularly where they interfered with commercial agriculture. Because of this, the extent of the current distribution range of baboons is largely restricted to areas that are not used for commercial cropping and horticulture. Baboons are now concentrated in areas where subsistence agriculture is practiced, where they can raid crops grown by subsistence farmers (Lamarque et al., 2009).

2.4. IMPACT OF HWC ON HUMANS AND ANIMALS

Wild animals can have very significant impacts upon humans directly or indirectly. These impacts range from clear-cut economic hardship to less tangible effects such as increased opportunity costs and decreased quality of life. Living alongside of wild animals can incur a variety of additional costs aside from the direct impact of depredation. As people have to invest more heavily in strategies such as livestock herding, guarding and predator control which need additional cost (Dickman, 2008). The consequences of HWC are more serious in the tropics and in developing countries where livestock holdings and agriculture are an important part of rural people's livelihoods and incomes (Lamarque et al., 2009).

Similarly, HWC is an increasingly significant obstacle to the conservation of wildlife (Madden, 2008). Human beings can be developing a range of options for attempting to lessen conflict with wildlife. The options includes reducing the likelihood of attacks through livestock guarding dogs, electric fencing, improved construction of livestock enclosures, toxic collars, disruptive stimuli and other aversive techniques. All these can have substantial impacts on the wild animal populations concerned (Dickman, 2008; Eyebe et al., 2012).

2.5. MANAGEMENT OF HWC

No single management strategy can prevent all crop raiding. The goal of management should not only be to reduce the levels of crop raiding but also to raise the tolerance level of crop raiding by lessening its impact to farmers (Sillero-Zubiri and Switzer, 2001). No solution will work without site-specific knowledge of what is possible, practical, or acceptable in any particular area. Unfortunately HWC situations are often complex so are unlikely to be resolved quickly and cannot be solved solely by technical means. Human- wildlife conflict can be managed through a variety of approaches. Prevention strategies endeavor to avoid the conflict occurring in the first place and take action towards addressing its root causes (Hill et al., 2002). Protection strategies are implemented when the conflict is certain to happen or has already occurred. Mitigation strategies attempt to reduce the level of impact and lessen the problem (FAO, 2010).

According to Hill et al. (2002) conflict resolution/management methods have the following possible goals: reducing the amount of crop losses to wildlife; improving local people's attitudes and perceptions towards protected areas and their wildlife; helping affected farmers to improve agricultural production; increasing the amount of crops being harvested locally through improved local yields and reducing levels of poaching.

Once the individual goals have been established and the availability of the necessary resources determined, then discussion with the communities can be important. Communities living around forest areas are different from those in other areas as they often receive a disproportionate amount of interest from the conservation and development contributor. This can influence people's expectations with respect to who should take responsibility for developing, implementing and/or maintaining any control scheme. Thus, it is very important that farmers be involved in the process of developing new solutions from the beginning (Hill et al., 2002; Treves, 2007). Not only does this foster a sense of commitment and involvement amongst them, but it is also vital that they be involved from the beginning. Because they understand how the situation affects them and what kinds of interventions are likely to be acceptable and feasible within the local culture (Parkhurst, 2006).

According to Hill et al. (2002) the most viable options to reduce crop loss were increasing vigilance by farmers. This has been shown to make a considerable difference in the amount of crops lost, increasing farmer tolerance for a pest species and lost crops and increasing the ability of farmers to repel crop raiders using existing local methods. This has a number of obvious benefits, if these methods do not make a considerable impact on crop loss, and larger impact interventions such as electric fencing, lethal control of pest animals or moving farmers from the conflict zone can be considered (Treves, 2007). Many traditional repelling techniques are fairly effective if formalized, but are labor intensive. But where an animal can be repelled adequately using conventional methods it seems in appropriate, and certainly not particularly cost effective, to try to introduce more expensive techniques requiring greater technological input or backup (Conover, 2002).

Before developing and implementing an intervention, a number of points need to be addressed. The reasons for the conflict must be considered, information needs to be gathered about the type of conflict issue, farmers' perceptions of the situation and perhaps their expectations as regards a potential intervention program. A decision should be made regarding the deterrence or removal of the crop pest and finally, farmers need to be involved to ensure their support for and acceptance of the intervention (Hill et al., 2002). Another approach that has been used successfully to manage HWC involves changing the perceptions of people experiencing the damage, thus, increasing their willingness to tolerate damage (Conover, 2002; Treves, 2007). This can be accomplished by enhancing an individual's appreciation for wildlife and its non-tangible benefit. Agricultural producers already are receptive to this argument and appreciate the wildlife on their farms to enhance wildlife habitat and their tolerance for some wildlife damage. This tolerance can be enhanced by providing economic incentives (Messmer, 2009).

3.Materials and Methods

3.1.Description of the Study Area

3.1.1.Location

The study was carried out in Basso Woreda located in North Shoa Zone of Amhara National Regional State, about 130 km North East of Addis Ababa in the zonal capital Debre Berhan. Geographically, it is located between 8^0 15’ N - 8^0 48’ N and 35^0 30' E - 37^0 30' E (Basso Woreda Administrative Office 2006). Basso is bordered by Moja ena wedara wereda in the North, Ankober wereda in the East, Anggolela ena tera wereda in the south and Oromia National Regional State in the West (Fig.1). The total area of Basso Woreda is 1,230 km^2. The administrative center of Basso is Debre Berhan.

Figure 1. Map of Basso Woreda with boundaries of Kebeles (Source: Basso Woreda Administration Office, 2016)

3.1.2. SOCIO ECONOMIC AND DEMOGRAPHIC FEATURES

The total population of Basso Woreda was 134,592. Of the total, 68,911 were males and 65,681 were females Basso Woreda Administrative Office(BWAO,2016).

3.1.3.Vegetation and Wildlife

Most of the forests were planted by the framers themselves and some of them were planted by the current and previous government. There is no wildlife conservation area in Basso Woreda and its surrounding. However, leopard, baboons, grivet monkey, hyena, Ethiopian wolf, rodents, civets are known to occur.

3.1.4.Climate

The study area is characterized by a humid, subtropical climate, with annual rainfall ranging from 1600 mm to 2000 mm, and relatively high cloud cover. The peak rainfall occurs between June and September, which is long rainy season of the district and short rainy season between March and April. The temperature variation throughout the year is low. The mean minimum and maximum annual temperature of the study area is 10.1^0C and 22^0C respectively (Basso Wereda Agricultural Office, 2006 E.C.).

3.1.Methods

3.2.1.sampling

Out of 31 Kebeles found in Basso Woreda, four Kebeles namely Metkoriya, Woynye, Birbirsa and Goshe Bado were purposively selected for this study as the these Kebeles represent the highest case scenarios in HWC by using information from Basso Woreda administration office. In the second stage, each village found in the selected Kebeles was categorized in to two groups based on their proximity towards to forest edge as near (from ½ to 1km) and far (above 2km). Following this, two village from each category were selected purposively. The total villages from each Kebele were two i.e. one village from the Near and the other from the Far distance category.

Following this households' sample frame was established by collecting complete landholders list record from their respective administration office. The sample frame was all household head living in the eight villages of the four Kebeles. The total number of house hold heads living in the four Kebeles were 4915. Two percent (n= 120) of the total household heads were selected from the four Kebeles and eight villages (Table 1)

Table 1 .Distribution of selected respondents according to kebeles,villages and distance from forest eadge

Kebele	Villages	No of respondents			Percentage
		Near to forest edge (0.5- 1km)	Far from forest edge (2 km)	Total	
Metkoriya	Muticherkos	23	0	23	19.2
	Abamote	0	21	21	17.5
Birbirsa	Weyraamba	17	0	17	14.2
	Tidamba	0	15	15	12.5
Goshe	Kumamba	12	0	12	10
	chimbire	0	12	12	10
Woynye	Chiraro Debr	11	0	11	9.2
	Abogedel	0	9	9	7.5
Total		**63**	**57**	**120**	**100**

3.2.2.Data collection period

Data was collected between November 2016 and January 2017. This period was the final growth stage of crops where they are most susceptible for damage by wild animals. Most of the crop was harvested during this time.

3.2.3.Data collection method

Household survey method where a semi- structured interview was employed with closed and open-ended questions. The method helps to get information from respondents regarding demographic data , crops grown, acreage, damage caused to crops and livestock, species of wild animals responsible for damage, type of crop most affected, prevention measures practiced, attitudes of local communities towards wild animals, and management techniques (Appendix I). The interviews were conducted within the respondents' home ground

Crop loss was estimated by using the following formula:

Crop loss = Damaged plot (m^2) X Expected yield(Kg / m^2)

Data Analysis

Data were analyzed using descriptive statistic in the form of percentage, frequency and tables were used to summarize and present the data.

4. RESULTS

4.1.Background of respondents

The majority of respondents (85.5%) were males. Similarly most of them were married (85%). A little more than 50% of the respondents attended formal education while the remaining were illiterates or with reading skills acquired without attending formal education. Most respondents (45%) had family size of 5-7 (Table 2).

Table 2. Background of the respondents

Category		Number of respondents	Percentage (%)
Sex	M	103	85.8
	F	17	14.2
Marital status	Married	102	85
	Single	10	8.3
	Divorced	5	4.2
	Widowed	3	2.5
Educational background	Illiteracy	11	9.2
	Read only with out formal education	47	39.1
	1-4 grade	33	27.5
	5-10 grade	26	21.7
	Above grade 10	3	2.5
Family size	1-3 family size	18	15
	3-5 family size	42	35
	5-7 family size	54	45
	more than 7 family size	6	5

4.2.Types of crops cultivated in the study area

Maize (93%) and teff (91%) were the most widely cultivated crops. Wheat and potato were the other types of crops cultivated in the area (Table 3.)

Table 3. Number and percentage of respondents who cultivate major crops in the study areas in 2016 cropping year (N=120)

Crop Types	No of Respondents	Percentage
Maize	112	93.3
Teff	110	91.7
Wheat	87	72.5
Potato	70	58.3

4.3.Income sources of households

The majority (70%) of respondents depend on mixed farming (crop production, cattle rearing and bee farming) as source of their livelihood. Others depend on crop production (16%), crop production supplemented with other activities including small businesses and daily labor (10.8%) and livestock (2.5%) alone (Table 4).

Table 4. Livelihood sources of respondents

Source of livelihood	No of respondents	Percentage
Mixed farming	84	70
Crop production	20	16.7
Crop production and other income	13	10.8
Livestock	3	2.5
Total	**120**	**100**

4.4.Human Wildlife conflict

Crop raiding

Out of the 120 respondents, 105 (87.5%) reported that they faced crop raiding. Crop raiding occurred most commonly in Muticherkos village (19.16%) followed by Aba mote (13.33%) and Weyra amba (12.5%). Abo gedel was the village with the least frequency of occurrence of crop raiding (5.83%) (Table 5).

Table 5. Percentages of crop raiding

Villages	**Yes**	**No**
Muticherkos*	23 (19.16**%**)	0
Aba mote	16 (13.33%)	5 (4.16**%**)
Weyra amba*	15 (12.5**%)**	2(1.66%)
Tid amba	14 (11.66%)	1 (0.83**%)**
Kum amba*	12 (10**%)**	0
Chimbre	9 (7.5%)	3(2.5**%)**
Chiraro debr*	9 (7.5**%**)	2(1.66%)
Abo gedel	7 (5.83%)	2 (1.66%**)**

***Villages located near the forest edge**

Anubis baboon (47.6%) and rodents (24.7%) were the most commonly cited crop raiders while other unknown animals were the least (6.6%) (Table 6).

Table 6. Lists of wild animals involved in crop raiding revealed by respondents

Villages	**Rodents (Unidentified species)**	**Olive baboon (*Papio anubis*)**	**Grivet Monkey (*Chlorocebus aethiops*)**	**Porcupine**	**Other unknown Animals**
Muticherkos*	5	10	2	3	3
Aba mote	5	7	1	3	0
Weyra amba*	2	10	1	1	1
Tid amba	5	4	2	2	1
Kum amba*	2	6	2	1	1
Chimbre	3	4	1	1	0
Chiraro debr*	2	5	1	0	1
Abo gedel	2	4	1	0	0
Total	**26(24.7%)**	**50(47.6%)**	**11(10.4%**	**11(10.4%)**	**7(6.6%)**

The highest crop loss occurred in Muticherkos village (180 kg) followed by Ku mamba (101 kg) while Abo gedel experienced the least crop loss (39 kg). Among the cultivated crops, maize was the most attacked (395 kg) and potato was the least (50 kg). The overall crop loss from the five villages was 645 kg equivalent to 5253.00 Birr in the local market during the study period (Table 7).

Table 7.Estimated crop loss and monetary loss due to crop raiding in the study villages in 2008E.C

Villages	**Maize(kg)**	**Teff(kg)**	**Wheat(kg)**	**Potato(kg)**	**Total**
Muticherkos*	85	36	46	13	180
Aba mote	25	10	12	2	49
Weyra amba*	72	15	35	10	132
Tid amba	38	8	11	6	63
Kum amba*	63	10	20	8	101
Chimbre	30	5	5	4	44
Chiraro debr*	55	12	16	4	87
Abo gedel	27	4	5	3	39
Total	**395**	**100**	**150**	**50**	**645**
Estimated unit price (ETB)	**6.19**	**11.9**	**9**	**5.3**	**32.39**
Total Monetary loss	**2448**	**1190**	**1350**	**265**	**5253.00**

Depredation

Four species of wild animals were reported to cause depredation of livestock and poultry in the eight villages. Of these, common jackal was reported by most of the respondents (53%) while others unknown animal were the least commonly reported animal (2.5%) Livestock depredation was most frequent in Muti cherkos, Aba mote and Weyra amba villages and less frequent in Abo gedel and Chimbre (Table8).

Table 8. List of wild animals involved in livestock depredation and the frequency of attacks reported in each of the eight villages

Villages	**Common jackal (*Canis aureus*)**	**Common buzzard (*Buteo buteo*)**	**Leopard (*Panthera pardus*)**	**Spotted hyena (*Crocuta crocuta*)**	Others unknown animal
Muti chekos	11	8	1	2	1
Aba mote	9	8	2	2	0
Weyra amba	8	5	0	3	1
Tid amba	6	5	1	3	0
Kum amba	6	3	1	2	0
Chimbre	5	4	1	2	0
Chiraro debr	7	3	0	0	1
Abo gedel	4	3	0	2	0
Total	**56 (53%)**	**39 (37%)**	**6 (5.7%)**	**16 (13.3%)**	3(2.5%)

A total of 191 domestic animals were depredated from the eight villages. Sheep were the most frequently attacked domestic animals (79) compared to goats (48) and chicken (64). because the respondents own more population of sheep. The highest number of domestic animal loss due to depredation was reported from Kum amba and Chiraro debr (30 each) and the lowest attack was reported from Tid amba (12). The overall monetary loss due to depredation in all of the eight villages was 57, 600.00 Birr (Table 9).

Table 9. Number of domestic animals lost due to depredation and the estimated monetary loss in the eight villages at the study area (2016-2017)

Villages	**Sheep**	**Goat**	**Poultry**	**Total**
Muti chekos	14	8	7	29
Aba mote	13	5	7	25
Weyra amba	8	8	6	22
Tid amba	5	3	4	12
Kum amba	9	6	15	30
Chimbre	10	6	11	27
Chiraro debr	15	8	7	30
Abo gedel	5	4	7	16
Total	**79**	**48**	**64**	**191**
Estimated Unit Price (ETB)	**1200**	**1000**	**150**	**2350**
Total Monetary Loss	**94, 800**	**48,000**	**9,600**	**57,600.00**

4.5.Methods of prevention of HWC

Respondents used different methods to prevent crop raiding (Table 10). Guarding was the most commonly used method (52.3%). Other methods included changing farming systems(13.3%), scarecrow(13.3%), fencing(12%), smoking(1.9%) and chasing(6.7%). Smoking is the least commonly practiced method.

Table 10. Types and frequency of usage of methods practiced to prevent HWC in the eight villages at the study area.

Villages	**Guarding**	**Change farming system**	**Scare crow**	**Fencing**	**Smoking**	**Chasing**
Muti cherkos	17	2	2	2	0	0
Aba mote	8	1	3	2	0	2
Weyra amba	5	3	2	4	0	1
Tid amba	7	1	3	1	0	2
Kum amba	7	2	2	1	0	0
Chimbre	4	2	1	1	0	1
Chiraro debr	4	2	1	1	1	0
Abo gedel	3	1	0	1	1	1
Total	**55 (52.3%)**	**14 (13.3%)**	**14 (13.3%)**	**13 (12%)**	**2 (1.9%)**	**7 (6.7%**

5. DISCUSSION

In the eight surveyed villages, maize, teff and potato were the major crops grown and they were the most important crops cultivated by many farmers in the cropping year of 2016. However, farmers to some extent cultivate sorghum and wheat during the main cropping calendar. The major economic activities of the sampled house holds in the study area were mixed farming, crop production, livestock keeping, and other sources. About 70% of the respondents earn their income from mixed agriculture (crop farming, animal rearing and bee farming). The remaining depend only on crop farming and and depend on both crop farming and other income sources like daily labor works and livestock keeping. Whereas in other parts of the country, for example, the southern part of Ethiopia farmers are mostly involved in cash crop farming like coffee farming, enset and different spices (45%) and crop farming (35%) (Habtamu Dembalke, 2016).

Of the total respondents interviewed, about reported that there was problem of crop raiding. Maize was the most severely raided crop in the study area while the damage caused on potato was the least severe. The main reason was that maize crop whether ripe or dried, it was the most frequently eaten crop by crop raiders (Warren, 2008).

From the findings of Gimbo Woreda 121(100%), indicated that maize was the most attacked by crop raiders while sorghum was the second most affected crop but other crops such as haricot bean, teff, and enset, were the least damaged (Habtamu Dembalke, 2016). Maize was damage by baboon, and vervet monkey which attack it through all of its growth stages - seedling, flowering and maturation. Similarly, in Chebera Churchura National Park, Konta, 80% of the respondents claimed that maize was the most susceptible crop to crop raiders, followed by Banana (63%), teff (46%) sorghum (45%), and potato (42%). Whereas wheat (33%) was the least susceptible crop to be damage by wild animals because the seeds of wheat are very small (Gizachew Girma,2016).

Olive baboon, rodents, grivet monkey and porcupines cause crop raiding in different degrees in the present study. Olive baboons and rodents ranked at the top in the magnitude of damage caused to crops. The reason why olive baboon can be the top raider of crops might be due to its high population size around cultivated areas.

Common jackal, common buzzard, spotted hyena and leopard were responsible for depredation of domestic animals. Common jackal and common buzzard caused most of the attacks on domestic animals. The most predators on chickens during the present study were common buzzards whereas goat and sheep were predated by common jackal. Out of the total 191 domestic animals depredated by wild carnivores, 79 (41%) were sheep. The total monetary loss incurred due to depredation was 57,600.00 Birr. The high rate of attack on sheep can be explained by the fact that most respondents own high number of sheep compared to goats. In the study conducted at Chebera Churchura National Park, loss of domestic animals was not reported (Gizachew Girma, 2016).

During the present study respondents used different methods to defend crop raider from their crop that include guarding, change farming system, scarecrow, fencing, chasing, and smoking. Guarding was by far the most widely practiced preventive method. The same wirh that of Gimbo Wereda farmers also used different traditional methods to prevent their crops from crop raiders and the highest method was guarding and the list method was by digging trenches around the farm land(Habrtamu Dembalke,2016) farmers protected their crops mostly by guarding and the least practice method was using chemicals(Gizachew Girma, 2016).

6. SUMMARY AND RECOMMENDATIONS

6.1. Summary

Crop raiding is widely prevalent (87%) in the Baso Woreda farming Kebeles and villages. The study revealed that four types of crops, maize, teff, wheat and potato are produced in the studied villages. Anubis baboon and rodents are the main causes of crop loss that could amount to 5253.00 Birr per growth season. Maize was the most severely attacked crop. Depredation of domestic animals was also prevalent in Basso Woreda villages and Kebeles. Sheep were the most commonly attacked domestic animals. Common jackals, common buzzard, spotted hyena, and leopard were the carnivores responsible for depredation while common jackals were involved in most of the attacks. A variety of traditional preventive methods were used by the local farmers against crop raiders with guarding being the most commonly practiced method. Other methods included changing of farming system, scarecrow, fencing, smoking and chasing.

6.2.Recomendations

Based on the results of the present study, the following recommendations are suggested to minimize the problem of HWC:

- ✓ To minimize the crop damage farmers of the study area should cooperate with each other. because it is one of the best way to reduce the chance of invading of the crop by wild animals in all directions and also important for protecting their crops by adjusting plans and programs.
- ✓ Buffer zones should be demarcated between farms and natural habitats.
- ✓ Farmers should reinforce their protection methods.
- ✓ The Government and other concerned bodies should provide technical and other necessary support to minimize HWC.

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APPENDIX

APPENDIX I: SEMI- STRUCTURED SURVEY QUESTIONNAIRE FOR FORMAL INTERVIEW

Households survey on Assessment of Human-wild animals conflict status and its management strategy in basso wereda, north showa**.**

1. General information
2. Household code number_____ Name of interviewer_____ sign _____Date of interview day _____ month _____ year _____
3. Name of household head_____
4. Sex 1) Male 2) Female
5. wereda_____
6. Keble's _____
7. Marital status 1) married 2) single 3) divorced 4) widowed
8. Level of education 1) illiterate 2) Read only 3) 1-4 grade 4) 5-9 grade 6) grade 10 and above
9. Family composition of the Respondents 1) 1-3 2) 3-5 3)5-7 4) more than 7
10. What is the nature of your land security from wild animal pest? 1) secured2) not secured3) others specify
11. How much is the distance of your cultivation land from forest edge? 1) Near 2) medium 3) far
12. What are your livelihood activities? (multiple choice is possible) 1) Crop production2) Livestock keeping3) mixed Farming (Farming and livestock keeping) 4) Crop production and other income 5) other (mention)
13. What type of crops you grow in your farm land 2016/2017? Put in order to know which one is the most 1) maize 2) Tiff 3) sorghum 4) wheat 5) barely 6) potato 7) others
14. Do wild animals cause damage to your crops? Yes/ No**.**
15. What is the cause for the happening of HWC in your area?

1.....2.....
.....

16. Which pest wild animals are more responsible for crop damage? 1) Columbus monkey, 2) Grivet Monkey, 3) Olive Baboon 4) wild pig, 5) Warthog 6) Porcupine 7) others
17. Which wild animals are more responsible for crop damage during day time? ---------
18. Which pest wild animals are more responsible for crop damage during night time? ----------
    ----
19. If yes for Q .18 above in what time more cause damage? 1) night2) day 3) both day and night 4) others
20. Which type of crop is more attacked by pest wild animals? 1) Maize 2) Teff 3) sorghum 4) wheat 5) barely 6) potato 7) no damage in general
21. Which type of crop is least attacked by pest wild animals?1) Maize 2) Teff 3) sorghum 4) wheat 5) barely 6) potato7) no damage in general
22. At which stage pest wild animals more attack crops 1) seedling 2) early maturation 3) matured 4) others
23. In what season do you experience the most wildlife damage? 1. Dry season 2. Wet season 3.others specifies----------
24. What do you feel on the population of wildlife in the natural forest in your surrounding? 1) Increasing 2) decreasing 3) No idea
25. What solution you put to manage the existing conflict in your area? ----------
26. What control measures have been taken to safeguard your crops from pests?

    1.....

    2.....

    3.....

27. Which of the techniques are most effective?

    1.....

2.....

28. . Which of the techniques are least effective?

.....

.....

29. What you suggest to reduce the effect of crop damage by wild animals?

....

..... …….....

30. Do you have livestock? If yes, type and number of livestock: Cattle----------goat---------- sheep----------horse----------Donkey---------Mule---------- other----------

31. Which animals are the most problematic in terms of livestock predation?

1…….

2…….

3……..

4……..

32. Have you lost any livestock to wild animals in the past three years? Yes/No

33. Have you lost any small ruminant to wild animals in the past three years? Yes/No

34. Have you lost any chickens to wild animals in the past three years? Yes/No

35. If yes for Q 31 to 33 above please put type and numbers of domestic animals you lost in the last three years

Cattle----------

Goat (1) Adult male-------- (2) Adult female------- (3) Young -------

Sheep (1) Adult male--------- (2) Adult female-------- (3) Young -------

Hen (chicken) ----------

Horse----------Donkey---------Mule---------- other----------

APPENDIX II. CHECK LISTS FOR FOCUS GROUP DISCUSSION (FARMERS)

Discus in the following points in context to your farm plot or locality

1. Is there any Human wild animals' conflict in your area?
2. Which pest wild animals is more cause crop damage?
3. What is the main deriving cause of HWC in your area?
4. In which season the crop damage is serious and what is the reason behind?
5. How farmers protect pest wild animals from their property and how much it is effective?
6. Is there any organization participate on solving the problem of crop raiding pest wild animals?
7. Is there a shortage of farm land in your area; if yes how solve the problem?
8. Is habitat of wild animals is fragmented due to human and natural causes in your area?
9. Is there any protected forest area in your residence?
10. Is there the option of expanding farm land from forest boundary to overcome shortage of farm land?
11. Is there any Human wild animals' conflict in your area?
12. Which pest wild animals is more cause crop damage?
13. What is the main deriving cause of HWC in your area?
14. In which season the crop damage is serious and what is the reason behind?
15. How farmers protect pest wild animals from their property and how much it is effective?
16. Is there any organization participate on solving the problem of crop raiding pest wild animals?
17. Is there a shortage of farm land in your area; if yes how solve the problem?
18. Is habitat of wild animals is fragmented due to human and natural causes in your area?
19. Is there any protected forest area in your residence?
20. Is there the option of expanding farm land from forest boundary to overcome shortage of farm land?

APPENDIX III .CHECK LISTS FOR KEY INFORMANT INTERVIEW (DEVELOPMENT AGENT'S, WOREDA MOA EXPERTS, AND BETTER-INFORMED FARMERS)

1. Name _____ Date _____Sign _____
2. Education status _____ your profession_____
3. How long have you stayed in the area? _____
4. What efforts have done by government, NGO, community and specially wereda office with regard to Human wild animals' conflict?
5. How do you perceive about the following in your wereda in general and the study area in particular?
    a. The major factors causing Human wild animals conflict
    b. The perception of farmers towards forest degradation problems and Human wild animals conflict
    c. The consequences of Human wild animals conflict on : environment ,social, economic aspects
6. Which types of crop do you think that most prone to pest wild animals damage in your area and? Why?
7. What are the major factors that cause Human wild animals conflict in the study area /wereda?
8. How do you see the participation and attitude of local communities in wild animal's conservation in particular and natural resource management in general?
9. Why farmers are in your area face Human wild animals' conflict?
10. What are the gaps between farmers and development actors in addressing Human wild animals' conflict?
11. What general option do you have to improve the current efforts towards solving Human wild animals' conflict?

APPENDIX TABLE 1.LISTS OF WILD ANIMALS FOUND IN THE STUDY AREA AS REVEALED BY RESPONDENTS.

Common Name		**Scientific Name**	**No. Responses**
Olive Baboon		*Papio anubis*	120
Eagle		undefined	120
Grivet Monkey		*Chlorocebus aethiops*	120
Warthog		*Phacochoerus africanus*	100
Common Jackal		*Canis aureuse*	80
Leopard		*Panthera Pardus*	75
Spotted Hyaena		*Crocuta Crocuta*	74
wolf		Canis simensis	68
Blue monkey		*Cercopithecus mitis*	50

APPENDIX V CROP DAMAGING ANIMALS, CROP TYPE AND STAGE DAMAGED, TIME AND SITE SEEN DAMAGING CROPS

Damaging animals	Type of crop	Stage of crop damaged	Time they often seen in the crop field	Sampled site
Olive Baboon	Maize Teff Sorghum	seedling, steam, crop grain	day	in all sites
Rat	Maize Teff Sorghum	tassel, grain crop grain tassel, grain	All time	in all sites
Warthog	Maize Teff Sorghum	all parts seedling &grain seedling	night occasionally early in the morning	in all sites
Grivet Monkey	Maize Sorghum	seedling, crop tassel, grain crop	day night	in all sites in all sites