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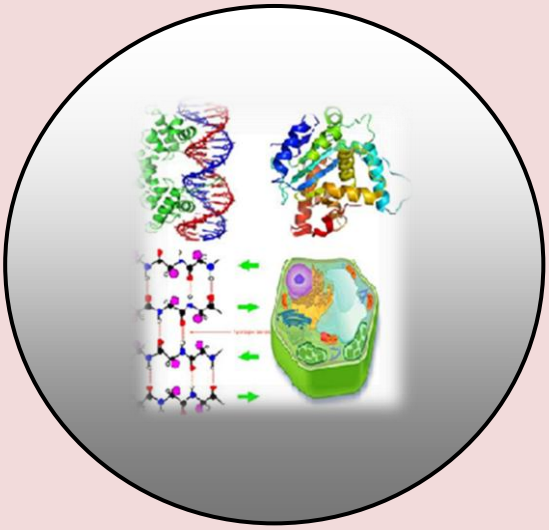

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Assessment of Human and Primates Conflicts in Limu Woreda, Bolale forest, East Wollega Zone, Western Ethiopia

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ABSTRACT

This study was conducted to assess human wildlife (primate) conflict in and around Bolale Forest, Limu Woreda district, and Western shoa zone. The study was carried out from September 2021 to March 2022. The main objective of the study was to identify the cause and effect of human wildlife conflicts, to estimate the loss of crops destroyed by primate and to estimate the population size of primate pest in the study sites. Data collection was conducted using structured questionnaire, direct observation and secondary sources. Field observation using line transect was used to estimate the population size of pest primates and to estimate the crop loss due to pest primates. The result of the respondents showed that about 66.1% and 12.4% existence of Human wildlife conflict manifested via crop damage and livestock predation respectively. The findings also showed that there was significantly different on the number of Anubis Baboon in dry and wet season ($p<0.05$).The response of respondents report that habitat disturbance, increased subsistence agriculture, deforestation as causes of Human wildlife conflict. Anubis Baboon, Vervet monkey, Wild pig, Warthog, Porcupine and Civet cat were identified as damage causing wild animals. Most raided crops were maize (Zea mays) in the production season. About 28.1% of maize was damaged by crop raiders from the total estimated maize plant. Respondents used guarding, making scarecrow, chasing and smoking to defend crop raiders. The present study identifies the major causes of Human wildlife conflict in the study area and manifested through crop damage and livestock predation, wild animals habitat disturbance and increased subsistence agriculture. Therefore, based on the finding of this study, it is recommended palatable and nutritive crops should not be grown near the forest edge, educate the local community about a benefit, wildlife conservation, conservation education is paramount and cooperatively keep their crop.

Keywords: Crop raider, Habitat disturbance, Human wildlife conflict and Primates.

INTRODUCTION

Human-wildlife conflict is defined as the interaction between humans and wildlife that adversely affects human social, economic, cultural life, wildlife conservation, or the environment. This happens when humans or wildlife adversely affect the other. Since the birth of mankind, there has been a conflict between humans and wildlife. They are found on all continents, both developed and developing countries (Lamarque et al., 2009). The relative impact of wildlife damage on agricultural production and sales income depends largely on land ownership and the economic dependence of people on rural activities (Messmer, 2000). However, in the tropics, where most of the indigenous people are self-sufficient farmers, primates are a very important pest insect. Primates are one of the crop-damaging pests, especially in protected areas of Africa and Asia, accounting for more than 70% of crop damage and 50% of the affected areas (Naughton-Treves, 1998).

Ethiopia is a vast and ecologically diverse country with unique environmental conditions (Afework Bekele et al., 2011). In addition, its vegetation has been logged for a variety of purposes (Demeke Datiko and Afework Bekele, 2011). As a result, the country's wildlife resources are now mostly confined to some protected areas (Tewodros Kumssa and Afework Bekele, 2008). Agricultural activity is increasing, leading to forest invasion, habitat destruction and even human-wildlife conflicts, resulting in more and more farmers losing crops to pests and problematic animals (Joseline, 2010).

Western Ethiopia is more experienced with rapid population growth, investment in forest areas, deforestation, drainage of wetlands for cultivated land, and use of forest edges for coffee plantations. They put pressure on land resources, reduce core wildlife habitat, eliminate corridors for migration, increase contact potential and potentially lead to peasant-wildlife conflicts (Quirin, 2005).

There are many different species of herbivores, primates and small mammals. These mammals cause serious damage to crops in different parts of the country (Demeke Datiko and Afework Bekele, 2010). However, in Ethiopia, little research has been done on human-wildlife conflicts in certain parts of the country (Tewodros Kumssa and Afework Bekele, 2008). This problem is especially acute at the Farmer West Show in the Limu district, where rainforests are left behind and primates live as the main fauna. They attack crops such as corn, beans, teff, wheat and barley, but prefer corn to other crops as they are the main crops grown in the study area. Therefore, this study is conducted to evaluate the conflict between humans and wildlife (primates) in Limu Woreda around the Limu Woreda, Bolale forest.

MATERIALS AND METHODS

Description of the Study Area

The present study was conducted in Western Ethiopia, East Wollega Zone, Limu Woreda. Limmu Wored is one of woredas in the Oromia Region of Ethiopia. Part of the Misraq (East) Welega Zone, Limmu is bordered on the south by an exclave of the Benishangul-Gumuz Region, on the southwest by Sasiga, on the west by the Benishangul-Gumuz Region, on the north by Ibantu, and on the east by Gida Kiremu. The 2007 national census reported a total population for this woreda of 72,483, of whom 36,181 were men and 36,302 were women; 4,170 or 5.75% of its population were urban dwellers.

Sample Size and Sample Design

Households with spawns in each village were selected for a structured questionnaire based on the distance of the farmland from the forest. The sampling frame was the entire head of household living in the two Keberes. After determining the total number of heads of household in each selected Kebere, the final step was to determine the total sample size of the heads of household. Based on the population correction factor of Cochran (1977), a total of 120 sample households were selected from the total population of the study area using the simple random sampling method.

Pilot Survey

Based on the information gathered during the preliminary survey, a pilot survey was conducted at the selected Keberes. The main purpose of the pilot survey was to evaluate the questionnaire to see if it was applicable and appropriate for the study area. It is also used to identify questions understood by respondents and to identify the duration and occurrence of human-wildlife-animal conflicts. In addition, it is used to identify the cause of HPC in the study area. The questionnaire was then revised and further developed based on the results of the pilot survey.

Data Collection

To achieve the objectives of this study, three complementary data collection methods were used in this study: household surveys, direct observation of damaged plants, and focus group discussions. Data collection was carried out between September 2021 and March 2022.

Assessment of Crop Damage by Primates

A total of four plots were used to estimate crop loss by primates, field visits, and direct observation of crop damage by wildlife. From all sites, arable land with an area of 20,000 m2 (2 hectares) near the Bolale Forest and equidistant from the edge of the forest was randomly selected. Five 4 x 4 m plots were randomly placed in the crop stands of four farmers at each site and observed three times a week to count 0.5 ha of crop damage for the four farmers at each site. And identify the species of the damaged plant. Corn saplings in all five plots were counted from the total area of the farm to estimate the total number of plants in the measurement.

RESULTS

Background Characteristics of the Respondents

The general information about the demographic data obtained from the respondents which include the gender, age and education level was identified before conducting the research. Figure.3 indicates gender of respondents where by 84% (100) of the responses were received from males while 16% (n=20) of the response were from females. As the age groups of respondents revealed that, majority of the respondents were mainly with ages between 15-35 years with 38 (31.41%), 36-45 years with 51 (42.15%), 46-55 years with 24 (19.83%) and above 56 years with 8 (6.61%). Respondent farmers for the administered questionnaire survey were in the maturity age and they had an experience in agricultural activities and also trained in the challenges and crop raiding activities (Figure 1).

Educational background of the respondents of the study area were 25 (20.66%) illiterate, 57 (47.11%) were able to read and write, 20 (16.53%) attended primary level (1-8) and 19 (15.70%) those who had attended secondary level (9-12). Education would have a great influence for the awareness of farmers regarding human wildlife conflict issues (Figures 1).

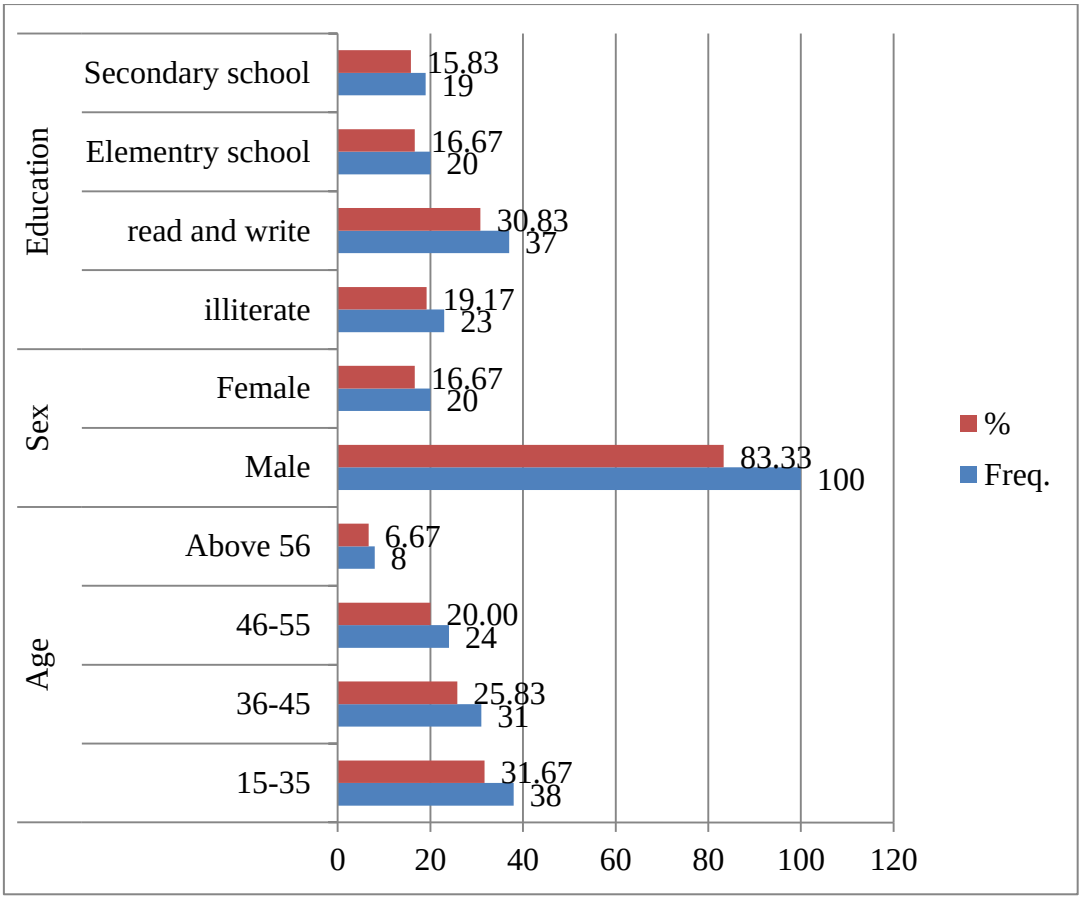

Figure 1. Socio-demographic characteristics of the respondents of the study area.

Economic activity and social interaction of the respondents

According to the response of the respondents, the possession of own farmland in their study area, among these 112 (93%) reported that they possess their own farmlands whereas 9 (7%) reported that they have no own farmlands (Figures 2). The results showed that the respondents own farmland with different size ranging from 0.5ha up to greater than 5 ha; 56 (46%) of the respondents owned 0.5-1ha, 36 (30%) of the respondents owned 2-3ha, 19 (16 %) of the respondents owned 4-5ha and 10 (8%) of the respondents owned greater than 5 ha farmland. From the total respondents 70% revealed as the damage of the crop was sever in wet season, 8% revealed that it was sever in dry season and 22% of the respondents that occur in both wet and dry season (Figure 2).

Table 1. Number and percentage of respondents who cultivate crops in the study area.

Type of crops	Number of respondents	Percentage
Maize	56	46.87
Wheat	18	14.87
Teff	34	28.09
Barley	10	8.27
Others	2	1.47

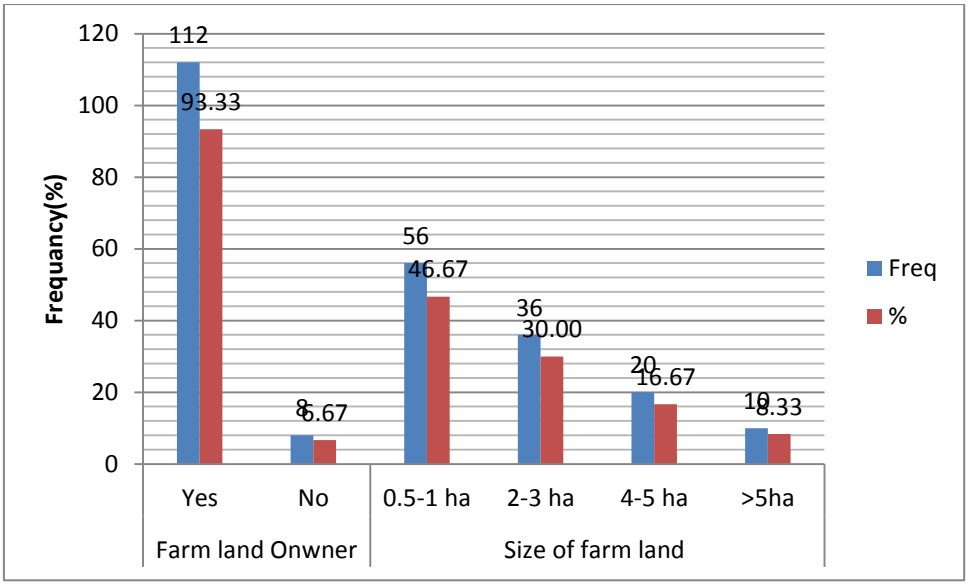

Figure 2. Farm land ownership of the respondents in the study area.

Agriculture was the main activity of people around the study area. The main crop grown during wet season from June to August. There is also crop grown during dry season from December to February based on type of crops. The crops include Maize and potatoes were grown in wetland areas. In the study areas: maize, wheat, barley, Teff and others cereal crops were the major crop grown and they were the most important cultivated by many farmers. Out of the total respondents cultivated maize were 46.87%, and followed by 28.09% cultivate Teff, 14.87% cultivate wheat, 8.27% cultivate barley and the remaining 2.47% produced other crops (Table 1).

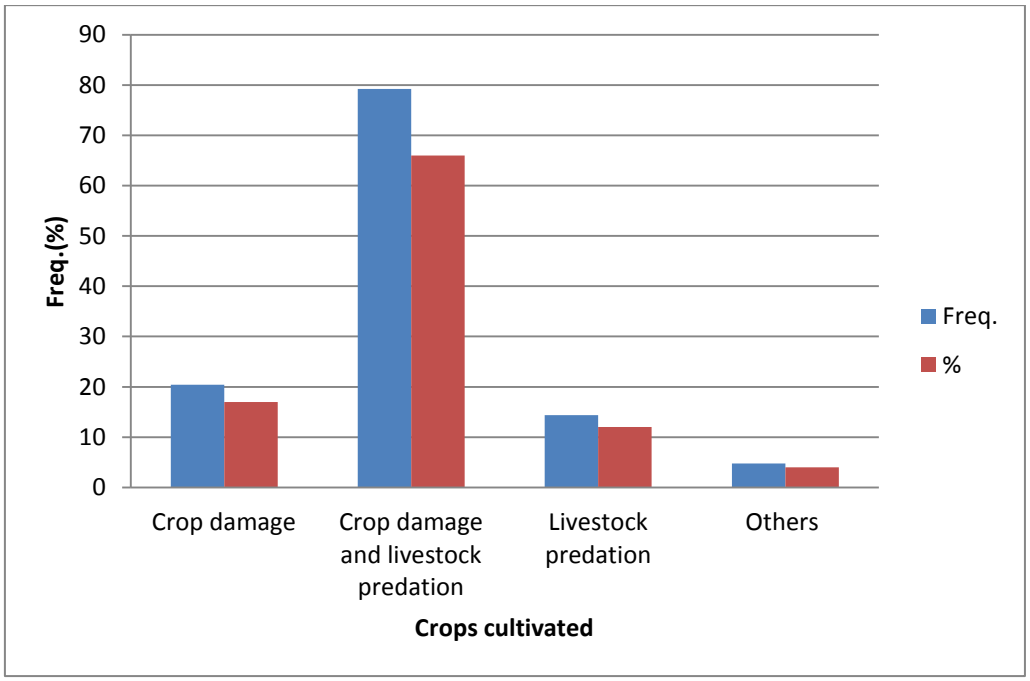

Figure 3. Number of respondents who cultivate crops in the study area.

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Type of crops most affected and extent of damage by wild animals

The response of respondents result showed that not all crops were equally affected by crop raiders. About 80.99% of the respondents claimed that maize was the most vulnerable crop to crop raiders followed by 55.37% wheat, and 50.41% barley. Teff was the least (46.28%) vulnerable crops to damage caused by wild animals (Figure 3). The majority of respondents replied that the tendency of crop damage is increasing from time to time. Moreover, most of the respondents replied that the extent of crop damage by wildlife was high (79.34%, n=96), medium (13.22%, n=16) and (7.44%, n=9) of the respondents considered the extent of crop damage by wildlife was low (Table 1.) In the study area, several type of crops were grown namely Maize, Teff, Wheat, Barley and others crops in the production season of 2021/2022. Anubis baboon, Vervet monkey, Wild pig, Warthog, Civet cat and Porcupine were observed when they damage crop directly and indirectly. Anubis baboon and Vervet monkey damaged crop during day time whereas Wild pig, warthog, Civet cat and porcupine damaged crop during night time (nocturnal). Anubis baboon was the most problematic wild animals for farmers around the study area. The study showed that food crops are the most raided by wild animals .Although wild animals affect crops, there is a variation in specific plant part eaten or the age of the crop when eaten. Anubis baboons feed on maize throughout its life cycle i.e. seedlings, flowering, harvesting and fruiting while vervet monkeys destroyed maize near maturation stage, Wild pig were observed causing damage on crops in all stages from the time of germination to the time of harvest whereas warthog affects crop early in the seedling and also porcupine mainly destroyed maize near maturation stage (Table 2).

Pest primate species most involved in crop raiding

Respondents listed 10 major wild animals in the study area. Respondents also listed only six wild animals cause crop damage: namely Anubis baboon, Vervet monkey, wild pig, warthog, Civet cat and porcupine (Tables 3).

Causes of Human Wildlife Conflict

The existence of Human wildlife conflict in all sites, 66.1% of them reported that there was both the problem of crop damage and livestock predation by wild animals, 17.4% of them reported that they face problem of wild animals causes crop damage only, 12.4% of them reported that they face problem of wild animals causes livestock predation only and 4.1% of them reported other's. Result of focused group discussion summarizes that the existence of human wildlife conflict in all sites.

Table 2. Crop damaging animals, crop type and stage damaged, and time as revealed by respondents.

Crop damaging Animals	Type of crops	Stage of crop damaged	Time of day
Anubis baboon	Maize Wheat Barley Teff	All parts Grain, matured Grain, flowering Grain	Day
Vervet monkey	Maize	Near maturation stages	Day
Wild pig	Maize	All parts	Night
Warthog	Maize	Flowering to harvesting	Night
Porcupine	Maize	Maize cobs	Night
Civet cat	Maize	Near maturation stage	Night

Table 3. Listed of wild animals found in the study area as revealed by respondents.

Local name	Common name	*Scientific name*	Number of respondents
Jaldeessa	Anubis baboon	*Papio anubis*	120
Qamalee	Vervet monkey	*Chlorocebus aethiops*	120
Weenni	Colobus monkey	*Colobus abyssinicus*	120
Xaddee	Crested porcupine	*Hystrix cristata*	68
Karkarroo	Warthog	*Phacochoerus africanus*	71
Xirinyii	Africana civet cat	*Civettictis civetta*	64
Booyyee	Wild pig	*Sus scrofa*	88
Qeeransa	Leopard	*Panthera pardus*	47
Leenca	Lion	*Panthera leo*	39
Waraabessa	Spotted Hyena	*Crocuta crocuta*	80

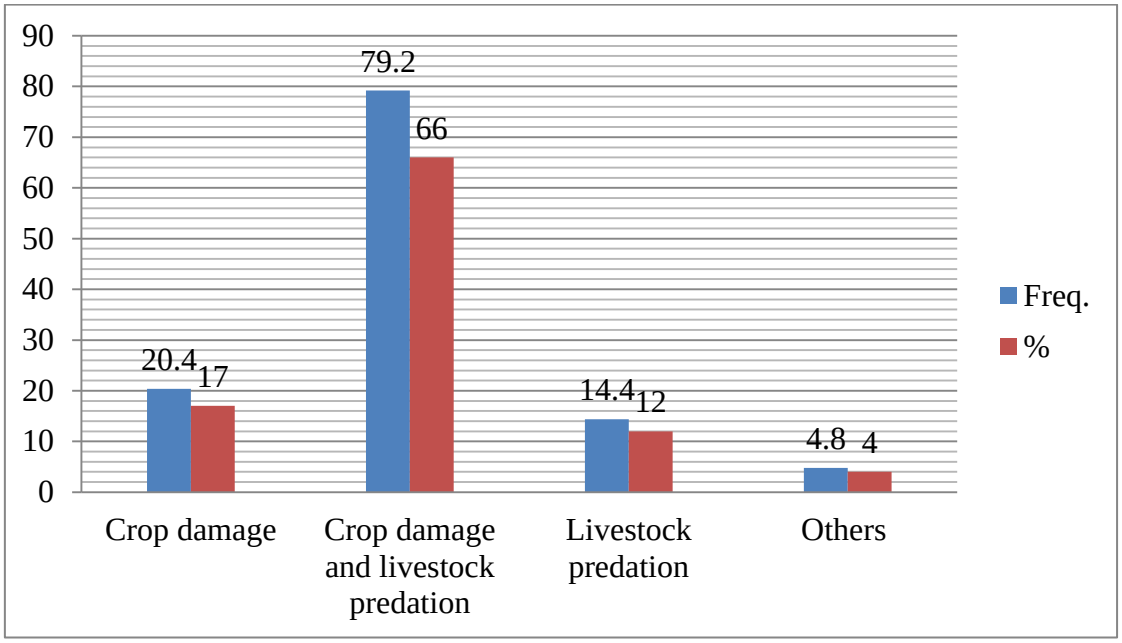

Figure 4. Percentage of respondents those faced different conflict by wild animals.

The discussion with FGD and interviewed households showed that the causes of human wild animal's conflict were expansion of subsistence agriculture around forest edge, wild animal's habitat disturbance, increment of wild animal's population and deforestation the contribution of all mentioned causes. The listed causes compared on the bases of reaction of respondent of the four villages. 64.5% of the respondents reported were disturbances of wild animals habitat and followed by 23.1%, 6.6% and 5.8% subsistence agriculture around forest edge, deforestation and increment of wild animal's population respectively were reported as main cause of Human wildlife conflicts.

Wild Animals involved in Crop Damage

The response of the respondents indicate that six wild animals were identified from the studies area, namely Anubis baboon, Vervet monkey, wild pig, warthog, Civet cat and crested porcupine were causes crop raiding in different degrees. Farmers ranked crop raiding wild animals from the one causing most damage to the one that cause the least damage. Anubis baboon was the most commonly reported crop raiders which cause more damage and ranked first. They damage crops early in the morning and evening when people are absent near farmlands. Respondents put Vervet monkey as second crop raiders and wild pig was the third crop raiders followed by crested porcupine, Warthog and Civet cat (Table 4).

Table 4. Lists of crop raiding wild animals and ranked based on the extent they damaged crops.

S.No.	Wild animals	Number of respondents	Rank of damage
1	Anubis Baboon	120	1
2	Vervet Monkey	104	2
3	Wild pig	72	3
4	Crested porcupine	57	4
5	Warthog	45	5
6	Africana civet cat	31	6

Depending on the response of the respondents, the distance from their farmland to the forest edge, 65.3% of the respondent's lives near the forest, 22.3% and 12.4% of the respondents not very far and far from the forest edge respectively. The majority of the respondents replied that the damage of crop was the highest to those living near the forest edge. This finding shows most of the respondents close to the forest and they conflict with pest primate in the forest.

Population Estimation of Crop Raiders

Six wild animals were identified as crop raiders during present study and include Anubis baboon, Vervet monkey, wild pig, warthog, Civet cat and porcupine in order of problem they caused in the study area. Only population of Anubis baboon and Vervet monkey were estimated during present study area.

Population Estimation of Anubis Baboon

A total of 150 Anubis baboons were counted in the entire sampled forest of the study area. The density of Anubis baboon population in sampled forest was 36 per km^2. A total of 4 and 5 troops of Anubis baboons were counted in sampled forest. On the average troop's size ranged from 30-65 individual. In this study area, there was 95 sub-adult male and female (63.33%), 23 (15.29%) of male and female and 22 (14.91 %) of juvenile were recorded.

Figure 5.Photographs showing Anubis baboons in the study area.

Population Estimation of Vervet Monkey

A total of 128 Vervet monkey were counted in the entire sampled forest area during the study period. The density of Vervet monkey in sampled forest was 12 vervet monkeys per km^2. A total of 3 and 4 troops of Vervet monkey were counted in Bolale Forest were. On the average, troop's size ranged from 28-50 individual. Totally in the study area, there was 92 sub-adult male and female (61.5%), 32 adult male and female (20.1%) and 28 the number of juvenile (18.86%) were recorded.

Figure 6. Photographs showing Vervet Monkey in the study area.

Traditional methods used by farmers to defend crop raiders from their crops

During the present study respondents used different methods to defend crop raider from their crop it's include making scarecrow, chasing, guarding and smoking. About 92 (76%) of respondents reported that as they guarded their crops throughout crop growing season, 13 (10.7%) of respondents chasing by dogs or stones are other methods used, 11 (9.1%) of respondents making scarecrow was also used to as supplementary and 5 (4.1%) of respondents were used smoking to repeal the crop raiders from their crop mostly in the night time. Guarding was the most and effective protective method to minimize the loss of their crop from crop raider (Figure 7).

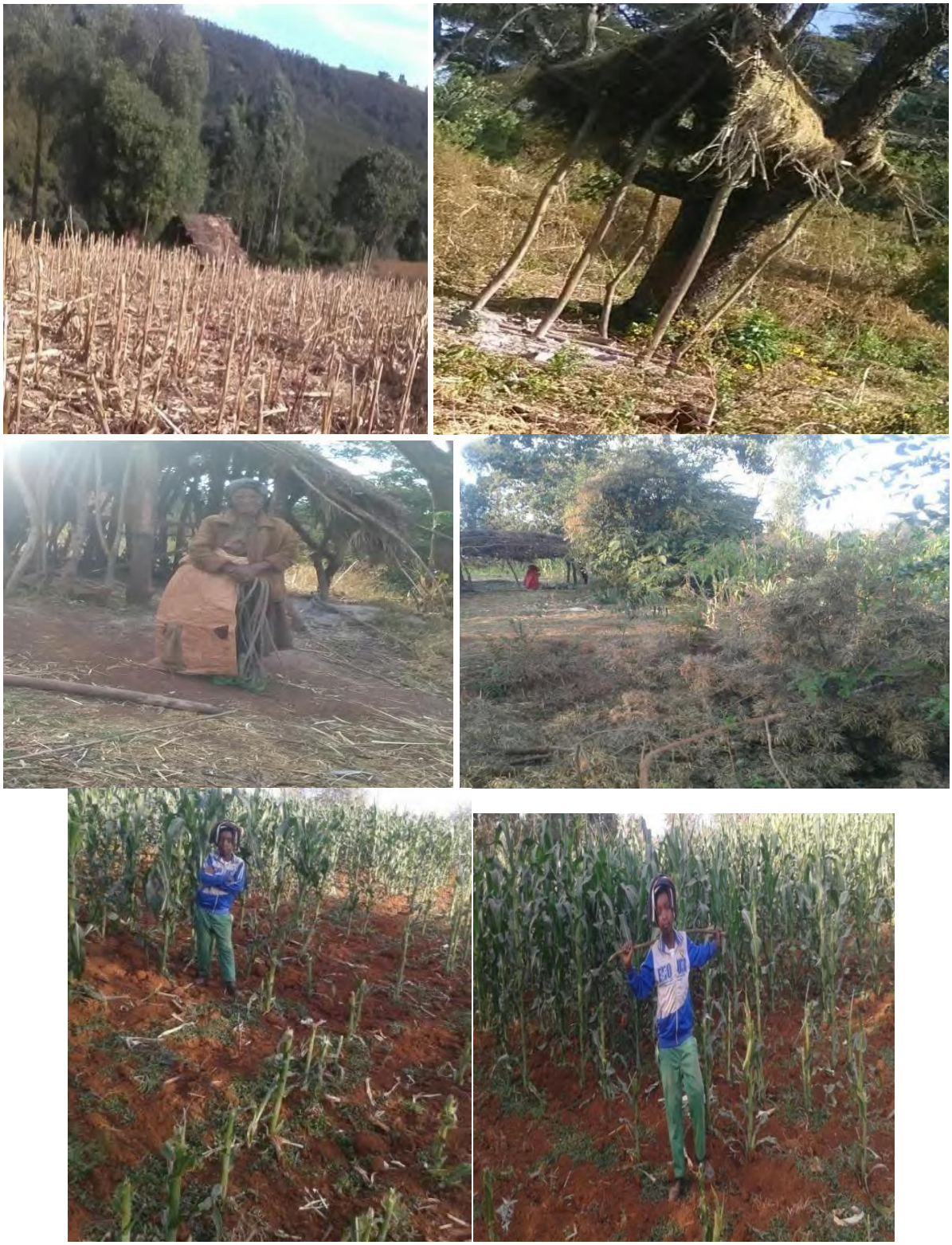

Figure 7. Different traditional methods to defend crop raider from crops (Survey, 2021).

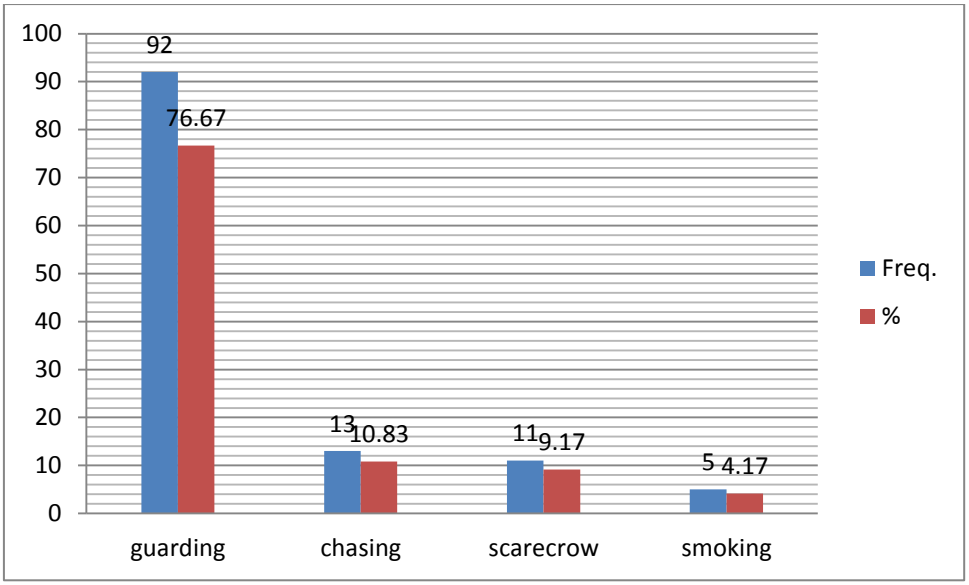

Figure 8. Percentage of respondents used different traditional methods.

Human population expansion and habitats shrinks, local people and wildlife are increasingly coming into conflict over living space, food and other economic resources. The results of this study have shown that there was a strong conflict between wild animals and farmers living in and around the bolale natural forest, Limu Wored district. Based on respondents list, six major wild animals namely, Anubis baboon, Vervet monkey, wild pig, warthog, Civet cat and crested porcupine were identified in the study area as they cause crop damage. Similar result was reported in different parts of Africa which revealed that wild animals posed major threat on crops (Hill, 1997; Rugunda, 2004).

Anubis baboon and Vervet monkey were the known wild primates. Primates are the most frequently identified crop raiding animals. Anubis baboon was the most commonly reported crop raiders and ranked first followed by Vervet monkeys. Similar result has been reported by Kate (2012) who reported that baboon were ranked number one crop raiders in Uganda; Tweheyo (2011) also reported that Anubis baboon was ranked as first and Vervet monkey as second crop raiders. The conflict between wild animals and farmer's around Bolale Forest involved crop raiding and livestock predation, majority of the respondents reported problems with wildlife.

All crops were not equally affected by crop raiders. Maize was the most vulnerable crop to crop raiders, because of easy handling of maize cobs than other crops. The result was agreed with finding of Warren (2008) who reported that maize was the most frequently eaten crop by crop raiding in West Africa. In particular maize seems to be targeted and damaged by Anubis baboons, vervet monkeys, wild pigs and porcupines. Based on the present findings, about 95% of the respondents reported the trend of crop damage by crop raiders was increased from time to time and about 5% of them said it is unknown. This result was similar with the study conducted by Leta Gobosho (2014) who reported that the trend of crop damage by crop raider in Gera district. The study showed that the analysis of data collected through direct observation have shown more or less the same result with that of structured questionnaire survey and the species observed damaging crops were the same as those species listed under questionnaire survey.

On the basis of samples taken for direct observation, out of the total expected yield; 28.1% was lost due to crop raiding by wild animals. This result showed that during direct observation, maize was damaged by Anubis baboon 16.96%, Vervet monkey 8.72% and other wild animals 2.42%. Therefore, the result of this study showed that there was strong conflict between them. Anubis baboon and Vervet monkey damaged crop during day time whereas wild pig, warthog, Civet cat and porcupine damaged crop during night time (nocturnal). Anubis baboon was causing damage on crops in all stages from the time of germination to the harvest whereas Vervet monkey affect crops at flowering stages. Many crops are damaged by crop raiders at specific stages of development, for example at germination, seedling, flowering, harvesting and fruiting stages. Regarding the variation of damage in the developmental stages of maize, the highest amount of damage was recorded during the ripened stage by Anubis baboon and during the flowering stage by Vervet monkey, the least amount were recorded during seedling stages by both pest primates in the study sites. This result was agreement with finding of Warren (2008) who reported that during seedling stage the farmland was clear and the guard can control the pest easily by watching them from farm distance in Nigeria. The result of the study shows that the causes of human wild animals‟ conflict were expansion of subsistence agriculture around forest edge, wild animals‟ habitat disturbance, deforestation and increment of wild animal's population. Habitat destruction is through fragmentation of natural habitats, cultivation and settlement near primate habitat. This has resulted in human wildlife conflicts around Bolale Forest. 64.5% of the respondents reported were habitat disturbance. This result was similar with Joseline (2010) who reported increased habitat disturbance as major causes of HWC in Uganda and Priston et al., (2012) who reported deforestation was the main causes of HWC in Indonesia. Regarding the major problematic predators in the all study sites, 56.45% of the respondents reported goat loss by Anubis baboon where as 43.55% of the respondents reported sheep loss by Baboon in the last two years. The study showed that farmers developed different strategies to defend crop raider from crop damage. Guarding was a most method used by large number of farmers in protecting their crop from damage by crop raiders and also guarding was common especially during the harvest season, during this time, farmers guard crops even during the morning and night time. This result agreed with the finding of Sillero-Zubiri and Swetzer (2001) in different parts of Africa. Also making scarecrow, chasing and smoking was common methods which were used in the study area.

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