

**Human-Wildlife conflict in Human dominated landscapes in the surrounding Kebeles of  
Alage ATVET College, Central Rift Valley of Ethiopia**

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**ABSTRACT**

*The study is aimed to investigate the nature and extent, and assess perception of local community towards wildlife. A total of 140 household heads were selected randomly from nine survey villages using structured and semi-structured questionnaire for interviews. Focus group discussion, key informant interview and personal observation were held used to achieve the study objectives. Data were analyzed using descriptive statistics and responses compared using Chi-square test (2 tailed), one-way ANOVA and Pearson correlation coefficient. Besides, Likert scale statements were used to assess the attitudes of local people towards wildlife conservation. About 47.1% of sampled respondents thought that they experienced livestock predation whereas 57(40.7%) of the respondents faced both crop damage and livestock predation problems. A total of 932.43TLU livestock and 218 Dogs losses reported by households due to predators over the last five years. Thus, large numbers (848.6TLU livestock and 218 Dogs) of attack was happened due to Spotted Hyena (*Crocuta crocuta*). The frequency of livestock predation ( $F = 8.157$ ,  $df = 8$ ,  $P < 0.05$ ) and type of predators involved ( $\chi^2 = 79.719$ ,  $df = 8$ ,  $p < 0.05$ ) were significantly differ across study villages. Nearly half, 69(49.3%) of respondents ranked Warthog (*Phacochoerus africanus*) as primary crop raider. Whilst majority of the respondents 115(82.1%) perceived Maize was frequently and severely damaged cereal crop. Most 80 (57.1%) respondents used different methods simultaneously to minimize damage caused by wild animals. Nearly half, (48.6%) of respondents had negative and strong negative attitude towards wildlife conservation. Level of education and amount of money imposed as penalty for illegal grazing were the most important factors affecting the local community attitudes towards wildlife conservation. Improve livestock husbandry, use appropriate guarding methods, education and make the community the actor of conservation would be vital to enhance the peaceful co-existence between human and wildlife in the study area.*

**Key words/phrases:** Attitude; Crop raiding; Human attack; Livestock predation; Traditional hunting

## INTRODUCTION

The existence of Human wildlife conflict goes back since time immemorial (Amare, 2015; Anand and Radhakrishna, 2017). HWC occurs when the needs and behaviors' of wildlife affected human life negatively and vice versa (Yihune *et al.*, 2009). Currently, it is widespread and complex challenge conservationists around the world are facing (Muluken, 2014; Acha and Temesgen, 2015). It is a serious problem whose livelihood is dependent on agriculture and livestock production (Kumssa and Bekele, 2014; Girmay and Teshome, 2017; Teshome *et al.*, 2017), and those peoples living in and nearby wildlife habitats (Gebeyehu and Bekele, 2009; Tufa *et al.*, 2018). Its impacts ranges from crop raiding to livestock predation and human attack to other intangible social costs (FAO, 2015). Rapid growing of human population in developing countries and requirement more land for settlement and agriculture lead to Loss, degradation and fragmentation of habitats inhabited by wild animals (Acha and Temesgen, 2015; Berihun *et al.*, 2016).

Wild animals involved in HWC ranging from smaller wild animals (red locust) and non-human primates to large herbivores caused vast damage on local people crops and properties, and large mammalian carnivores caused livestock depredation and threat to human life (FAO, 2009; Tufa *et al.*, 2018).

Due to the radical declined of the natural resources coverages of the country in the past few decades (Ketema, 2017) wild animal resources of the country limited in restricted protected areas (Berihun *et al.*, 2016). This is particularly difficult for large carnivores which required wide home range (Lagendijk and Gusset, 2008). This forced wild animals to spend some part of their life cycle on human dominated landscapes which are highly vulnerable for anthropogenic

activities (Watson, 2010). Close proximity often creates conflict between human and wildlife for competitions for shared and limited resource (Acha and Temesgen, 2015). HWC becomes a major threat for rural people to secure their household livelihood requirements (Mekuyie, 2014). As results local people develop negative feeling towards wildlife (Lagendijk and Gusset, 2008). This negative impact may lead clearing of vegetation to reducing nuisance wild animals and people stand antagonistic to conservation (Mojo *et al.*, 2014).

In the Central Rift Valley of Ethiopia in particular the low land parts the wild animal habitats have been burned to produce charcoal, sold in the market as to generate income (Biazen, 2014). The high deforestation has resulted in scarcity of resources for wild animals to fulfill their requirement of survival and production (Amare, 2015). The major conflicts happened outside the protected areas boundaries were due to segregation of wild animals to their farm lands or settlement areas (Makindi *et al.*, 2014). This results retaliatory killing (Tufa *et al.*, 2018) and aggravating disappearance of wildlife inhabited in human dominated areas (Masanja, 2014). This is not different in Alage where predators (Spotted Hyena (*Crocuta crocuta*) and Common Jackals (*Canus aureus*)), and crop raider (Warthog (*Phacochoerus africanus*), Olive Baboon (*Papio anubis*), and Vervet monkey (*Chlorocebus pygerythrus*)) were frequently seen. Therefore, this study conducted to investigate the magnitudes of HWC in the human dominated landscapes and to assess the perception of local community to wildlife conservation.

## **Methods**

### **Study Area**

Alage located in the Great East Africa Rift Valley, 217 km south-west of Addis Ababa. Situated very close to *Abijata* and *Shala* Lakes, National Park and west of Bulbula town at a distance of

32 Kms from Addis Ababa- Shashemene highway. Alage share its boundaries with Oromia Regional State (by Adami Tulu Judo Kombolicha and Arsi Negele districts) and Southern Nations Nationalities and Peoples Regional State (by Alaba special district). Geographically the study site is located in a range between 7° 35' 00" and 7° 37' 30"N latitude and 38° 25' 00" and 38° 27' 30"E longitudes (Fig. 1). The area is characterized by bimodal rainfall distribution with average annual rainfall ranges from 700 – 900mm and the average minimum and maximum temperature ranges between 6.8 °C and 34.5 °C, respectively. The total study area covered 29.46 km<sup>2</sup> and its majority areas is surrounded by Jido River in the north, east and north east directions and the river served as a main water sources of wild animals and livestock. The study area dominantly covered by acacia wooded grassland (55%) followed by opened grasslands (8.4%), and riverine and plantation forest (6.1%) (Derebe and Girma, 2020). Spotted Hyena (*Crocuta crocuta*), Common Jackals (*Canus aureus*), Mongoose (*A. paludinosus*) and Python, Warthog (*Phacochoerus africanus*), Olive Baboon (*Papio anubis*), Vervet monkey (*Chlorocebus pygerythrus*), Porcupine (*Hystrix cristata*), Antelope (*Gazella* spp.) and African civet (*Civettictis civetta*) are the most commonly cited wild animals in the study area (Derebe and Girma, 2020). Both crop production and livestock rearing are the major economic activities of the communities (Shiferaw *et al.*, 2016; Biazen, 2014).

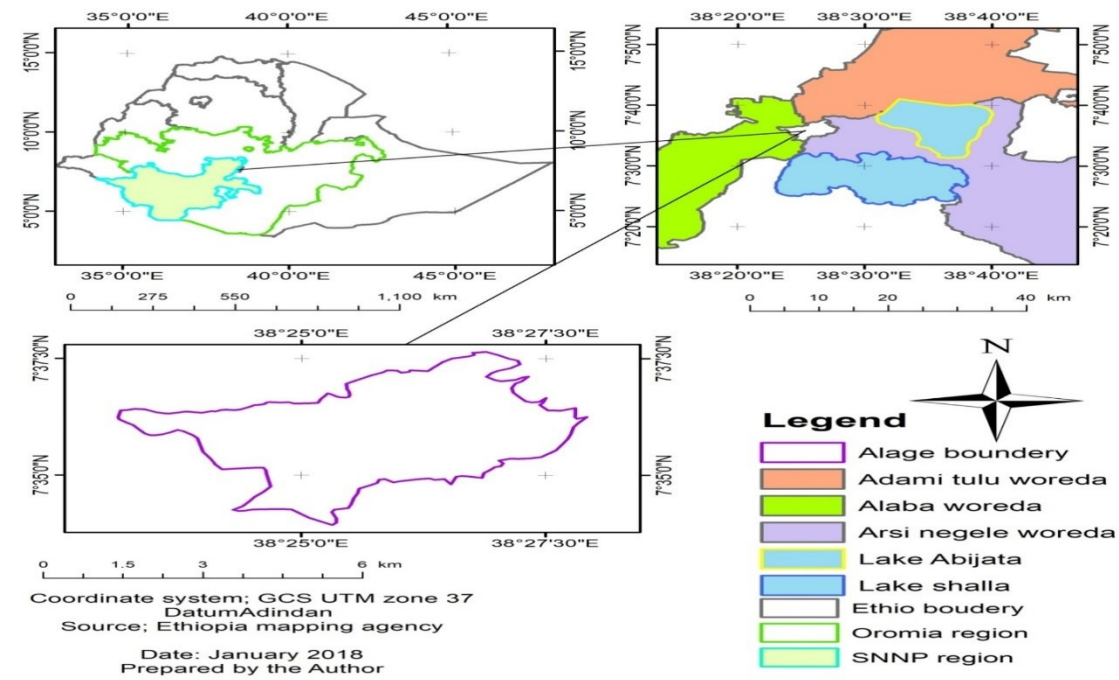


Figure 1: Location map of the study area

## Sampling Design

To make the study representative a total of three kebeles (one kebele from each district) were selected based on high occurrences of human wildlife conflict and proximity to the study area. Accordingly, Alege Gero kebele from Alaba special district, Naka from Adami Tulu Jido Kombolcha and Alege Delbtu kebeles from Arsi Negele districts. Then; villages from each kebele were stratified based on the distances category of near ( $<1\text{km}$ ), medium ( $1\text{-}5\text{ km}$ ) and far ( $> 5\text{ km}$ ) from the study area. Following this, one village from each distance categories was randomly selected. Then a total of 9 villages (3 villages from each study kebele) selected for the study. Therefore, Bora, Mansalega and Rogedia villages were selected from Alege Delbtu kebele, from Naka kebele Naka, Giro and Halaqee villages were selected and from Alege Gero kebele Gotu, Machefar and Huleteegna Gotu villages were selected at the estimated distance of Alege boundary near ( $< 1\text{ km}$ ), medium ( $1\text{-}5\text{ km}$ ) and far ( $> 5\text{km}$ ), respectively followed by Nibret *et al.*(2017). After getting the total number of households (HH) living in each neighboring kebeles, the sample size were determined using simplified formula developed by Yamane (1967) and Reviewed by Israel (2012) with precision levels ( $e$ ) of 8% and confidence Level is 95%.

$$n = \frac{N}{1 + N(e)^2}$$

Where n is the sample size, N is the population size, and e is the level of precision.

Thus, a total of 140 households were taken for the questionnaire interview by using the above formula. Sample sizes in each study kebele were determined based on their proportion to the total households in the three study kebeles (Table 1).

Table 1: Total number of households and sample were taken from each study kebele

Districts	Study kebeles	Total households	Sample households
Alaba special district	Alege Gero	242	25
Adami Tulu Jido Kombolcha district	Naka	368	38
Arsi Negele district	Alege Delbtu	749	77
	Total	1359	140

Source: Population and Housing census of Ethiopia (2007)

## Data Collection

### Pilot survey

Prior to data collection, the questionnaire was tested with 12 selected individuals, who were not included on the actual sample households living adjacent kebeles to the study area during the last one week of September, 2018. The purpose of the pilot survey was to check the clarity and sequences of the questionnaires. Based on the pilot survey, the questionnaire was revised to clarify any ambiguities and misunderstandings.

### Key informant interviews

A total of, 12 people were selected assisted by agricultural experts for the key informants' interview. Four key informants were selected from each of the three study kebeles. The participants of key informant were included community leaders, religion leaders as well as women. All questions for key informants were open ended. This was deliberately done to let the

interviewees to talk much about what they knew concerning on the area and the local communities.

Three focus group discussions were conducted (one from each study Kebele). The selection of the discussants was supported by the agricultural experts of each kebele and different age groups and both sex were involved. The minimum and maximum focus group size was 8 and 12, respectively. The discussion in both Alege delbtu and Naka kebeles were held by the local language, *Afan Oromo*, and the facilitators were agriculture experts of each kebele. Whereas, the focus group discussion in Alege Gero kebele was held by *Alabagna* with the assistant of kebele experts whose mother tongue were being *Alabagna*.

### **Questionnaire survey**

To gain people's attention and confidences as well as good information, the interviews were held in their homes (Holmern *et al.*, 2004) whose age is  $\geq 18$ . Each respondent for the study villages were selected randomly by following a pattern of skipping two households, and the third household interviewed (Mekuyie, 2014).

The questionnaire consisted of both closed ended and open ended questions. Before the interviews held the questions were translated to the local language; *Afaan Oromo* for Arsi ethnic group and *Alabigna* for Alaba ethnic group respondents, and the answers of the respondents were translated back to English. Six people (two for each kebele) who speak the local language fluently were well trained about how to approach and ask the households, and hired to assist the questionnaire interview. Regular monitoring was held by researcher.

### **Data Analysis**

The analysis was performed by using Statistical Package for Social Science version 20 for windows (IBM SPSS Inc, USA) software. Descriptive statistics were used to compute mean values, ranges, percentages, frequencies and other important information. Cross tabulation Chi-Square test, One Way ANOVA and Pearson Correlation was used to test variables accordingly.

The attitudinal data contained 10 Likert Scale statements. Each respondent responded to the 10 statements based on the five-point Likert Scale method ranging from Strongly Disagree to Strongly Agree. Simple Weightings (1 to 5) were assigned to the response categories. The maximum weight of 5 was given for ‘Strongly agree’ and the minimum 1 was assigned for Strongly Disagree. A weight of 2, 3 and 4 were given for the response categories of Disagree, Neither Agree nor Disagree and Agree respectively. Thus, if a respondent give 5 for all 10 statements, the maximum weight would be 50 whereas 10 would be the minimum weight when a respondent scores 1 for all 10 statements. Hence, the average of the sum scores of all 10 statements for each respondent would again range from 1 to 5. This gives another distribution of the data in which the mean and standard deviation is used to differentiate respondents according to their level of attitude towards the wildlife conservation. Higher average scores for statements indicate positive attitude while lower scores show negative attitude.

Respondents were classified according to their attitude as Positive, Neutral, Negative and Strong Negative. Following the procedure applied by Gebrelibanos and Assen (2013), the mean and standard deviation of the average marks (the average score of the 10 statements for each respondent) were used to classify respondents based on their attitude towards the wildlife conservation.

$$A = \text{Positive: Mean} + \text{Std. deviation} \leq A \leq \text{Max}$$

B = Neutral:  $\text{Mean} \leq B < \text{Mean} + \text{Std. deviation}$

C = Negative:  $\text{Mean} - \text{Std. deviation} \leq C < \text{Mean}$

D = Strong Negative:  $\text{Min} \leq D < \text{Mean} - \text{Std. deviation}$

Cronbach's alpha reliability coefficient was calculated to check the internal consistency of the Likert Scale statements. The value of the Cronbach's alpha reliability coefficient was 0.837 which indicates good internal consistency of the Likert Scale statements. Cronbach's alpha reliability coefficient normally ranges between 0 and 1. The closer the Cronbach's alpha reliability coefficient is to 1, the greater the reliability of the items in the scale. This determined by following the rule of thumb (Gliem and Gliem, 2003).

## **RESULTS**

### **Socio-economic Characteristics of the Respondents**

The majority, 108(77.1%) of the households earned their annual sources of income from both livestock rearing and crop productions. Forestry, 25(17.9%) and trading, 6(4.3%) also served as a supplementary income sources of HH. The average landholding size (both farm and grazing lands) of the household was 2.44 ha with a maximum and minimum land holding size of 6 ha and landless, respectively. There was no significant ( $\chi^2 = 5.343$ ,  $p = .069$ ) difference land holding size along the study villages. The overall average numbers of livestock holding per household were  $19.564 \pm 1.119$  TLU with a minimum of 2.72 TLU and maximum 76.6 TLU numbers of livestock per household, while the average number of dogs holding per household was  $1.89 \pm .18$  with a ranges between 0 - 8 dogs in a household.

Nearly half of, 66(47.1%) the households reported livestock predation as a major cause of HWC while 57(40.7%) households perceived both crop damage and livestock predation problems. Yet, some 13(9.3%) respondents reported that it was not a problem (Table 2). Type of conflict the community experienced were statistically significant ( $\chi^2 = 101.287$ ,  $df = 8$ ,  $P < 0.05$ ) along the surveyed villages

Table 2: Types of human wildlife conflict among the study villages

Villages	N = Number of respondents	Type of damage			
		Crop damage and Livestock predation (%)	Crop damage (%)	Livestock Predation (%)	No-conflict (%)
Boraa	26	21(80.8)	1(3.8)	4(15.4)	0
Mansalega	26	20(77)	1(3.8)	5(19.2)	0
Rogedia	25	0	0	20(80)	5(20)
Gotu	8	6(75)	0	2(25)	0
Machefar	9	3(33.4)	1(11)	3(33.4)	2(22.2)
Huleteгна	8	0	0	4(50)	4(50)
Gotu	8	0	0	4(50)	4(50)
Naka	10	6(60)	0	4(40%)	0
Giro	13	1(7.7)	0	11(84.6)	1(7.7)
Halaqee	15	0	1(6.7)	13(86.6)	1(6.7)
Total	140	57(40.7)	4(2.9)	66(47.1)	13(9.3)

In total, 932.43TLU livestock and 218 dogs' predation incidences were reported by survey respondents over the last five years. Thus, Cattle (*Bos taurus*) (495 LTU) was predominantly predated livestock followed by dogs (218), whereas the least predation incident was reported on poultry 9.63 LTU (Table 3). Hyena was responsible for all cattle, dogs, donkeys, horses and mules losses (Fig. 2). Among Villages the large numbers of livestock predation incidences were reported in Giro (279.71) followed by Halaqee (258.23) whereas few (2.48) predation incidences were reported from Machefar (Table 3). In average  $6.376 \pm .625$  TLU livestock and  $1.343 \pm .253$  numbers of Dogs' loss per household reported in the last five years. The frequency of livestock

predation was significantly different among the surveyed villages ( $F=8.157$ ,  $df=8$ ,  $P < 0.05$ ), yet distances have no association on the frequency of livestock predation incident in the present study.

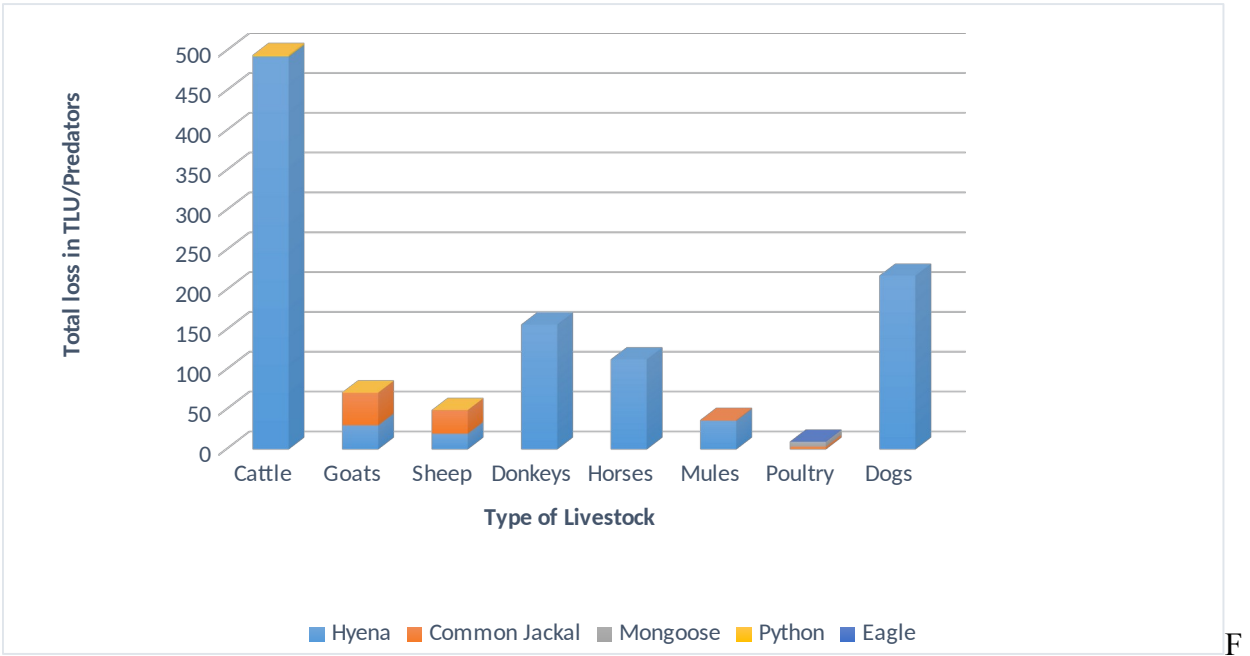


figure 2: Total number of livestock and dogs losses per predator type over the last five years

According to respondents, a total of 16 human attacked incidence were reported in the last five years. Of these, 13 physical injuries and 3 human fatal deaths. 10 human injuries happened due to Snake biting, the rest three injuries due to Spotted Hyena, Python and Warthog. In case of human death, Spotted Hyena killed two people, whereas Python was responsible for the death of one person in the study area. The number of human attack incidents reported were statistically significant ( $\chi^2 = 44.056$ ,  $df = 8$ ,  $p < 0.05$ ) across the surveyed villages.

Table 3: Number of livestock and dogs depredated per village over the last five years; based on respondents reported (C= Cattle, G = Goats, SH = Sheep, DO = Donkeys, H = Horses, M = Mule, P = Poultry, D = Dog)

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Number of livestock and dog depredated in the last five years

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Villages	C	G	SH	DO	H	M	P	D
Boraa	115	11.8	6.5	23.1	24	7	0.32	3*
Mansalega	77	15.2	9.5	25.9	17	7	1.84	-
Rogedia	43	10.9	8.1	15.4	1	-	1.14	5*
Gotu	1	2.2	-	6.3	1	-	0.51	2*
Machefar	1	1	0.3	-	-	-	0.18	-
Huleteгна								
Gotu	4	1.2	0.2	-	-	-	0.04	-
Naka	48	5.2	5.2	20.3	29	9	1.16	45*
Giro	100	11	9.4	33.6	23	8	2.71	92*
Halaqee	106	13.1	10.2	32.2	18	6	1.73	71*
Total losses	495	71.6	49.4	156.8	113	37	9.63	218*

Note: \* means the number is not in TLU,

Regarding to crop raiding, 69(49.3%) respondents' reported warthog as a top most crop raider wild animal followed by vervet monkey 31(22.1%) (Table 4). Whereas, 115(82.1%) respondents ranked maize (*Zea mays*) as a primary and most commonly raided crop (Table 5). Types of wild animal involved ( $\chi^2 = 88.468$ ,  $df = 8$ ,  $p < 0.05$ ) and crop damaged by pests ( $\chi^2 = 70.108$ ,  $df = 8$ ,  $p < 0.05$ ) were significantly different among surveyed villages.

Table 4: Major crop raider identified (N = 140)

Crop Raiders	Frequency	Percentage
Warthog ( <i>Phacochoerus africanus</i> )	69	49.3
Vervet Monkey ( <i>Chlorocebus pygerythrus</i> )	31	22.1
Olive Baboon ( <i>Papio anubis</i> )	21	15
Porcupine ( <i>Hystrix cristata</i> )	10	7.2
Others	9	6.4
Total	140	100
Others (Antelope species, Squirrel, African Civet, Bird spp. And rodents)		

Table 5: The most frequently raided crops by wild animal pests (N = 140)

Type of Crops	Frequency	Percentage
Maize	115	82.1
Sorghum	12	8.6
Barley	7	5
Chile Paper	6	4.3
Total	140	100

Of the total, few (20%) of the respondents give their witness of existence of wild animal hunting to reduce damage encountered by wild animals (Fig. 3). Killing of wild animals for different reasons was statistically significant ( $\chi^2=48.425$ ,  $df= 8$ ,  $p< 0.05$ ) among surveyed villages.

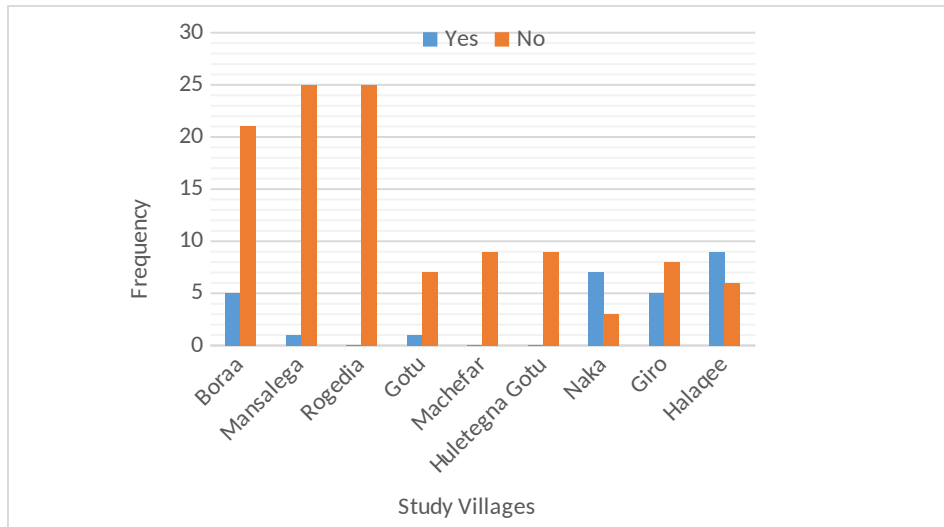


Figure 3: Retaliatory killing and traditional hunting among surveyed villages (N=140)

Majority, 80(57.14%) of respondents used guarding, chasing, fencing, smoking and scarecrow simultaneously to minimize damage caused by wild animals (Table 6). There was significant different ( $\chi^2 = 55.224$ ,  $df = 8$ ,  $P < 0.05$ ) among study villages using crop and livestock protection methods.

Table 6: Traditional methods the local people used to reduce wild animal damage (N=140)

Type of Traditional methods	Frequency	Percentage
Guarding and chasing	38	27.14
Fencing, smoking and scarecrow	2	1.43
Guarding, chasing, fencing, smoking and scarecrow	80	57.14
Killing problematic wild animals	20	14.29
Total	140	100

In case of livestock husbandry, 101(72.1%) of households kept their livestock outside home overnight. Of the remainder, 27.9% kept their livestock inside traditional enclosures (Fig. 4). Level of predation incident had not significant differences ( $\chi^2 = 6.963$ ,  $df = 4$ ,  $p > .05$ ) between households who kept their livestock inside and outside enclosures' during night times.

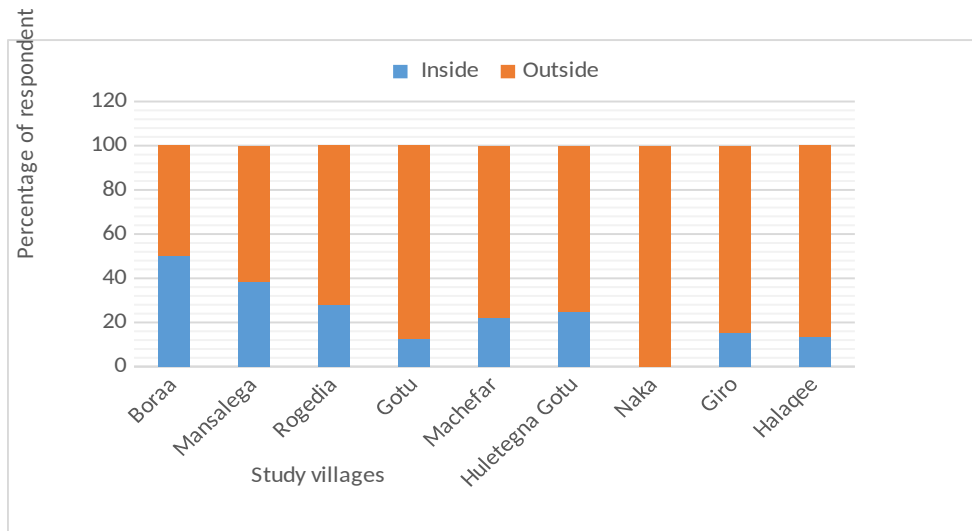


Figure 4: Way of keeping livestock overnight across the study villages (N = 140)

The local community utilized the natural resources for livestock grazing (46%) and as sources of firewood (46.4%) for their house (Table 7). livestock grazing ( $\chi^2 = 108.955$ ,  $df = 8$ ,  $P < 0.05$ ) and firewood collection ( $\chi^2 = 83.452$ ,  $df = 8$ ,  $P < 0.05$ ) among the surveyed villages were statistically significant. Both duration of grazing ( $r = -0.552$ ,  $p < 0.05$ ) and firewood collection ( $r = -0.705$ ,  $p < 0.05$ ) in the natural were negatively correlated along distance from the forest border.

Table 7: Utilizing the forest for grazing and firewood among surveyed villages

Villages(estimated distance in km)	N= Number of respondents				
	Grazing inside the forest			Firewood collection from the forest	
	N	YES (%)	NO (%)	YES (%)	NO (%)
Boraa (<1km)	26	100	0	100	0
Mansalega (1-5)	26	92	8	69	31
Rogedia (>5)	25	4	96	4	96
Gotu (<1)	8	62.5	37.5	87.5	12.5
Machefar (1-5)	9	0	100	11.1	88.9
Huleteгна Gotu (>5)	8	0	100	0	100
Naka (<1)	10	70	30	70	30
Giro(1-5)	13	8	92	30.8	69.2
Halagee(.5)	15	0	100	6.7	93.3

Total	140	46	54	46.4	53.6
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The average amount of money paid as penalty per household in the last five years in ETB was  $1,288.62 \pm 153.07$  (Fig. 5). The total amount of money paid as penalty was positively correlated with both duration of grazing ( $r = 0.502$ ,  $P < 0.05$ ) and total livestock owed ( $r = 0.486$ ,  $P < 0.05$ ), while negatively correlated with distance ( $r = -0.476$ ,  $P < 0.05$ ) along villages from the border of the study area.

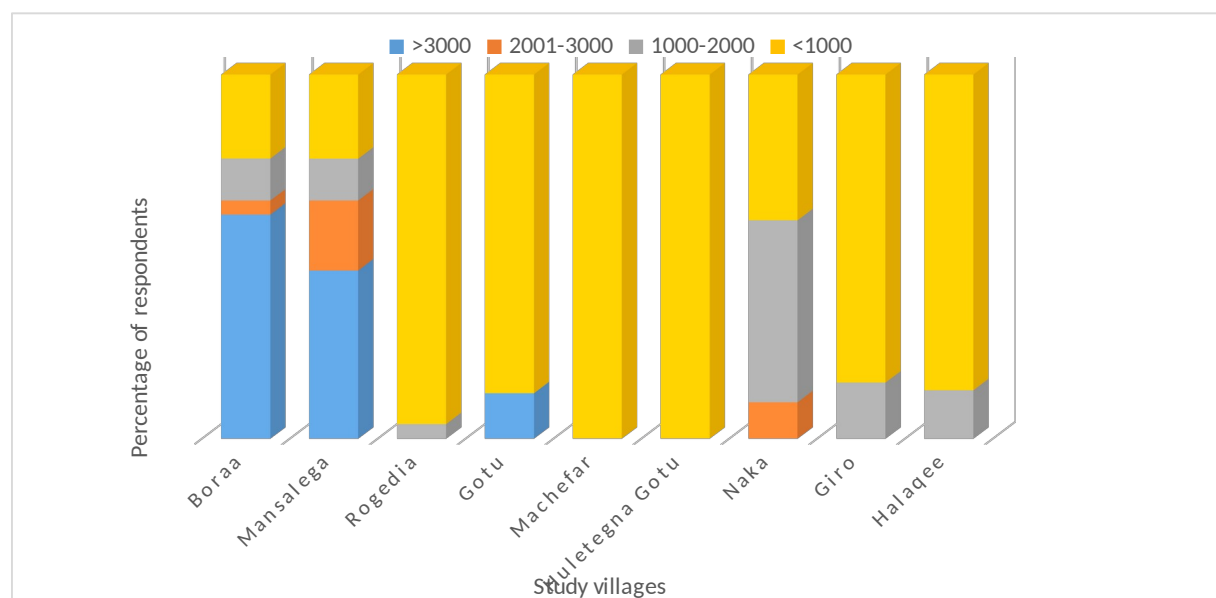


Figure 5: Money paid as penalty due to illegal grazing per villages in the last five years (ETB)

According to the present findings, few (24.3%) of the respondents had positive feeling while some (27.1%) respondents had neutral feeling. On the contrary, nearly half (48.6%) of the respondents had negative and strong negative feeling towards the conservation of wildlife (Table 8). Relatively uneducated people had high negative attitudes ( $\chi^2 = 37.585$ ,  $df = 4$ ,  $P < 0.05$ ) co-existence between wildlife. Besides, people who paid high penalty ( $\chi^2 = 20.888$ ,  $df = 3$ ,  $P < 0.05$ )

would be developed high negative attitudes towards co-existence as compared to who did not yet.

Table 8: Respondents' perception towards Wildlife conservation in nine villages

Attitude	Frequency	Percentage
Positive	34	24.3
Neutral	38	27.1
Negative	39	27.9
Strong Negative	29	20.7
Total	140	100

## DISCUSSIONS

The study showed that the local communities living in the surrounding of Alage faced livestock predation, crop raiding and human attack problem. So far livestock predation was the most pronounced problem respondents reported in the current study. Studies in different part of Ethiopian; local community in and around Choffa Forest, Eastern Tigray (Girmay and Teshome, 2017), in Kafta Sheraro National park (Berihun *et al.*, 2016) (Yirga *et al.*, 2012), in Gera district (Gobosho *et al.*, 2016), in Chebera-Churchura National Park (Datiko and Bekele, 2013) and elsewhere; in India (Habib *et al.*, 2015) and in Norway (Røskraft *et al.*, 2013) also reported similar findings.

Among predators hyena was the primary and most horrible predator reported by respondents followed by common jackal in the present study. Livestock predation by both predators happened regardless of the distances to the natural areas. This might be due to both hyena and common jackal inhabited in human dominated landscapes and poor livestock husbandry practices (Fig. 6) and depletion of natural prey are perhaps changes their behaviors' to livestock

predation (Tufa *et al.*, 2018; Yirga *et al.*, 2013). All predation problem reported on cattle, dogs, donkeys, horses and mules were due to hyena. Mekonen (2020) also reported similar findings. While common jackal were responsible on the majority predation incidence happened on goats and sheep in the present study. Similarly, Yihune *et al.* (2008) reported sheep loss outside the Park Simien Mountains National Park due to the occurrence of Ethiopian wolf outside the National Park.



Figure 6: Type of traditional enclosure used to keep livestock overnight.

Warthog, Olive baboon, Vervet monkey, Porcupine, and African civet were the major problematic crop pest reported by respondents based on the magnitudes of damage they encountered on their property. Similar studies in Zegie peninsula (Gebeyehu and Bekele, 2009), Wondo Genet district (Mekuyie, 2014) and in and around Choffa Forest, Hawzien Woreda, Eastern Tigray (Girmay and Teshome, 2017) in Dhera-Dilfaqr Block of Arsi Mountains National Park (Tufa *et al.*, 2018) also revealed disappointment of local people from crop raiders.

Among the crop type cultivated in growing season maize was sown by all households and cover large tract of lands from the total landholding size of each household's. As a result, Maize (*Zea mays*) and Sorghum (*Sorghum bicolor*) were the most vulnerable crop to crop raiders in the

study. The severity and vulnerability of crop being affected by wild animals was different based on the type of crop grown (Mekonen, 2020) and its' area coverage, and type of wild animal involved in crop raiding (Gobosho *et al.*, 2015 and Guinness and Taylor, 2014). There was high significant different negative correlation between crop damage event reported and distances of study villages with the habitat ( $r = -0.396$ ,  $p < 0.05$ ). Crop field near to the study area were highly vulnerable to crop raiders (Nibret *et al.*, 2017; Mekuyie, 2014). The possible reason could be the crop pest frequently visited the crop lands nearby their habitats.

In the present study, a total of 16 human attack incidents were reported by respondents over the last five years. Similarly, Acha and Temesgen (2015) reported a total of 23 human attack incidents during 2007-2011 in Chebera-Churchura National Park. Of the total attack incidents, Hyena was responsible for five human attacks. Karanth *et al.* (2012) also reported that from the total surveyed households, seven and one percent of the respondents were reported experience of injury and human death, respectively in central India protected areas.

Nearly all participants during focus group discussions understood many of wild animals killed as revenges' of crop damage and livestock predation (Fig. 7). Thought Antelope species, bird species (particularly both Guinea fowl and Francolin) and occasionally warthog were hunted for the purpose of their meats. Declined of wild animals population in Zegie Peninsula due to illegal hunting of problem wild animal as retaliation (Gebeyehu and Bekele, 2009), and poisoning as herbicides and pesticides controlled, and revenge killing of large carnivores used to reduce livestock-carnivore conflicts in Zimbabwe (Gandiwa, 2011). The result was also in agreement with Acha and Temesgen (2015) who reported killing of large carnivores for revenge livestock loss and human attacks is the principal method being used for carnivores' removal in

Chebera-Churchura National Park. Killing of *Hamadryas* baboon as a means of reducing crop damage were commonly practiced by nomadic pastoralists living nearby Awash National Park (Admassu *et al.*, 2014)



Figure 7: Wild animals killed as revenges' of crop damage, livestock predation and threat to human.

In the past time, traditional hunting in Oromo people had long histories and ancestral linkages. The local people involved in wild animal hunting had beyond the purpose of searching bush meat. Many of Oromo people particularly men had been involved in hunting for the purpose of obtaining hero ship from their clan. Young men learn practical skill of war-far and military organization through hunting large wild animals to become a junior warrior in war campaign (Jalata. 2012). Hunting big wild animals' especially large carnivores would be awarded heard of

cattle from their tribe and the hunter hero-ship would be celebrated by the community. His hero ship would be passed for the generation by painting the image/s of hunted animals on the tomb statue of the hunter while he passed away (Fig. 8). Similarly, Tessema *et al.* (2010) reported that “in past times tribesmen killed lion, buffalo, giraffe, elephant, and leopard to gain respect and attract wives, while village elders fondly recalled these traditions”.



Figure 8: Way of passing cultural hunting heroism to generation in Arsi ethnic group (Oromia Region)

HWC is the result of combined effect when human activities affect the wild animal habitat negatively while wild animals seen as threats for human life and property (Tufa *et al.*, 2018). For instance, most respondents from Boraa (61.5%), Mansalega (53.8%), and Naka (50%) villages perceived as major causes of human wildlife conflict revealed due to combine factors.

In near past the original habitat of the wild animals were given to investment and the remaining fragmented habitats couldn't enable to support the wild animals as long (Fig. 9). As a result, the wild animals were frequently out and cause crop damage nearby farmland and predating domestic animals. Inappropriate site selection for investment in Gera district, south western

Ethiopia (Gobosho *et al.*, 2016) and development of Sugar industry and small scale farming in habitats of Hamadryas baboon in Awash National Park (Admasu *et al.*, 2014) result direct contact and competition for resources between people and wildlife. The present findings also in line with Mekonen *et al.* (2017) who reported that deforestation, habitat loss, degradation and agricultural land expansion were the major threats to wildlife inhabited in Hareenna forest.

The study showed that none of the methods alone had hundred percent guarantee to protect livestock and crop from damage. As a result, farmers in the study area used different methods simultaneously. Similarly, the local communities in Gera district, Southwestern Ethiopia used guarding, chasing, fencing, scarecrow and smoking to reduce crop damage and livestock predation (Gobosho *et al.*, 2015). Farmers in Kenya also used different methods simultaneously for crop protection (Musyoki, 2014).

Regarding the responsibility of guarding crops and livestock, and chasing of both crop raiders and predators among the family members, majority (52.9%) of respondents reported the responsibility of guarding and chasing were taken by men followed by children (27.1%). Similarly, Guinness and Taylor (2014) reported that the major (54%) responsibility of crop guarding was taken by children around Gishwati Forest in Rwandan. Supplementary households in the study area used Dogs for both crop and livestock protection. The presence of Dog with children and women during guarding and chasing would be minimized their fearfulness and important indicator for the approaching of wild animal to the crop fields and grazing livestock. Similarly, Tufa *et al.* (2018) reported farmers living nearby Arsi Mountans National Park used Dogs to chasing livestock predators and guarding livestock from depredations.



Figure 9: Land cleared for investment

The study revealed that duration of grazing and firewood collections were negatively correlated from the distance of the study area. For instance; the closest villages Boraa (100 and 100%), Gotu (62.5 and 87.5%) and Naka (70 and 70%) utilized the area for grazing and firewood collection, respectively. On the contrary, respondents live in villages away from five km from the border of Alage had less dependent on the forest for grazing and firewood collection. Similar finding was reported by Nibret *et al.* (2017) the community living nearby Aba-Jemie forest utilized the forest for both grazing and firewood throughout the year. The present finding also in line with Gebeyehu and Bekele (2009) local community living in Zegie Peninsula utilized the forest as firewood for house consumption and market sale as a means of alternative sources of income for their households.

Local people develop positive or negative attitudes towards wildlife conservation due to different factors (Shi *et al.*, 2010). Accessing benefit and services, employment opportunities, low level of predation and crop damage influence people's attitude positively (Tessema *et al.*, 2010; Yirga *et al.*, 2011). Residents with formal education were more appreciated conservation

objectives (Karanth and Nepal, 2011; Shibia, 2010). In contrast, restriction of access wildlife resource, imposing punishments, high level of predation and crop damage, and lack of compensation programs for their losses influence perception of local community negatively (Gezahagn *et al.*, 2014) and their relation with the management staff would be bad (Tessema *et al.*, 2010). Similar studies elsewhere in the world, reported restriction of access to wildlife resources had significant effects on the attitudes and perception of local communities (Karanth and Nepal, 2011; Shibia, 2010; Shi *et al.*, 2010).

### **Conclusion and Recommendations**

Human attack, livestock predation and crop damage in one hand and revenge killing of wild animals in other hand were the key manifestation for the prevalence of intense HWC in the study area. Habitat destruction through inappropriate site selection for investment and subsistence farming, overgrazing and proximity were the major factors. Poor livestock husbandry attributed to the loss of large numbers of livestock by Spotted Hyena and Common jackal in the study area. Training and awareness program need to be given about the ecological, cultural, aesthetic and recreational values of wildlife rather imposing inappropriate penalties. Livestock husbandry need to be improved and livestock should not be left on pasture during night time and the livestock enclosure need be well built. Goals of investment should not being antagonistic to the conservation objectives. Further study should be essential to assess the actual abundance and diversity of fauna and flora species to propose the area as conservation site.

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