WOLKITEUNIVERSITY

COLLEGE OFAGRICULTUREANDNATURALRESOURCE

DEPARTMENT OF WILDLIFE AND ECOTOURISM MANAGEMENT

HUMAN WILDLIFE CONFLICT IN AND AROUND BORENA SAYINT WEREHIMENO NATIONAL PARK, SOUTH WOLLO, ETHIOPIA

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DECLARATION

The researcher conforms that the study in entitled with **"HUMAN WILDLIFE CONFLICT IN AND AROUND BORENA SAYINT WEREHIMENO NATIONAL PARK"** is my original work and is being submitted to Department of Wildlife and Ecotourism management, college of Agriculture and natural resource, Wolkite university in partial fulfillment for the award of BSc degree in wildlife and Ecotourism management. This research has not been submitted earlier to this and other institution.

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LIST OF ACRONYMS OR ABBREVIATIONS

ANRS …….. Amhara National Regional State

ASL ……. Above Sea Level

BSWNP……. …….. Borena Sayint Werehimeno National Park

ENMSA…… Ethiopian National Metrological Service Agency

FAOUN…… Food and Agricultural Organization of United Nation

HWC……..... Human Wildlife Conflict

IUCN ……..... International Union for Conservation of Nature

NP……National Park

WWF……..... Worldwide Fund for Nature

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ABSTRACT

The Study Was conducted to assess Human Wildlife Conflict in and Around Borena Sayint Werehimeno National Park, South Wollo, Ethiopia. Human-wildlife conflict occurs when the needs and behavior of wildlife impact negatively on humans or when humans negatively affect the needs of wildlife. Purposively 50 respondents select in three Kebeles was selected namely; Chirochorkos, Anferfra and Beja chilaga based on the presence of high Human wildlife conflict. The main Objective of the Study Was to Identify the Cause, Impact and Managements of Human wildlife conflict. Data were collected by means of face to face Questionnaires, Focus Group Discussion, Interview, Field Observation and Secondary Sources. The respondents confirmed that both crop raiding and livestock damage was the major cause of damage in the study area. The respondent's perceived that leopards and Common Jackal among the top livestock depredators while gelada baboon and Vervet monkey were perceived as notorious crop raiders. Most raided crops were about 30% of wheat and 24% of barley was damaged by crop raiders especially for gelada baboon and Vervet monkey. Most of the respondent using those traditional methods in which 34% of them used guarding and 4% of them used smoking which was the highest and lowest method used by respondents respectively. The present study identifies the major causes of Human wildlife conflict in the study area manifested that agricultural expansion, human settlement, deforestation, overgrazing, illegal grass collection and poaching. Generally, based on the finding of this study, recommended Stakeholders should voluntary relocation, create awareness the local community for the use of wildlife, palatable and nutritive crops should not be grown near the park edge.

Key words: **Borena Sayint Werehimeno National park: Human – wildlife conflict**, **crop raiding.**

1. INTRODUCTION

1.1. Background of the study

Human wildlife conflict is a well-known phenomenon throughout sub Saharan Africa. Human-wildlife conflict occurs when the needs and behavior of wildlife impact negatively on humans or when humans negatively affect the needs of wildlife. These conflicts may result when wildlife damage crops, threaten, kill or injure people and domestic animals (Sillero-Zubiri, and Switzer.,2001).

The conflicts between humans and wildlife are immense in both diversity and number. They involve categories like livestock predation, disease and crop raiding. HWC is the interaction between humans and wildlife that outcomes in negative impacts on human social, economic or cultural life, on the conservation of wildlife populations, or on the environment (WWF, 2005). These are as critical problems created by the growing rural population in and around wildlife habitats (Sukumar, 1989). Crop raiding is not a new phenomenon; it has most likely been occurring since humans first settled down and started practicing agriculture. Different crops are targeted by animals. In some areas, crop raiding by wild animals is a frequent cause of major conflict between wildlife and villagers. This is especially true in areas close to protected areas which harbor large populations of wildlife (Sukumar,1989). Human wildlife conflicts are the negative interaction between human and wildlife.

Human-wildlife conflict incidents are widespread but not evenly distribute because they are dependent on the proximity of wildlife. In addition, different species cause different types of damage at different times of the year. The damage caused has variable effects on the livelihood of households depending on their level of livelihood security at the time of the incident (Mulonga, Suich, and Murphy, 2003). One major cause of human-wildlife conflict is increasing human population adjacent to wildlife habitats. As human population increases and the demand for resources grow, the frequency and intensity of such conflicts increases (Newmark *et al.,* 1993). This can be manifested by increasing encroachment to wildlife habitats. As a result, the populations of those species which are unable to adapt to altered habitats may invade the marginal habitats or decline in number (New mark *et al.,* 1993). Increase in wildlife population in some areas can be considered as another cause of human-wildlife conflict. In the past, expansion of agriculture and plantation were the causes of wildlife damage. However, these

days, urban dwellers and other wildlife stakeholders such as investors are also involved in wildlife damage (Messmer.,2000).

Human-wildlife conflict occurs when the needs and behavior of wildlife impact negatively on humans and these conflicts may result when wildlife damage crops, threaten, kill or injure people and domestic animals (Sillero-Zubiri and Switzer, 2001). One of the major causes of human-wildlife conflict in the national park is crop raiding and livestock depredation due to crop raiding wild animals are gelada baboon, vervet monkey, stark hare, porcupine, colubos monkey and scared baboon and the livestock predation wild animals are leopard, common jackal and spotted hyena. Increasing human wildlife conflict as human population increases and the demand for resources grow the frequency and intensity of such conflicts increases. Crop raiding is not a new phenomenon; it has most likely been occurring since humans first settled down and started practicing agriculture. The damage caused has variable effects on the livelihood of households.

1.2. Statement of the Problem

There are many human wildlife conflicts in our country as well as in and around Borena Sayint Werehimeno national park which needs solutions, such as: deforestation, agricultural expansion, collection of fire wood, human settlement and overgrazing, but there is no empirical study done on issues pertaining to human wildlife conflict in the study area**.** Local communities do not enough benefit from wildlife resources and alienated from wildlife related economic enterprises such as the lucrative tourism industry, when local communities feel that both governments and conservation stakeholder value wildlife more than to their aspirations relation and opposition to conservation initiatives can be swift and uncompromising. The factors driving human wildlife conflict at the local level are, crop raiding and livestock depredation, however, and shaped in turn by numerous other factors, including laws and policies. In many cases, legal and policy measures particularly those involving land use planning and wildlife management contributes to this growing problem. Human wildlife conflicts undermine human welfare, health, safety and have economic and social cost (Ogada *et al*., 2003). In addition, crop raiding and livestock predation are perceived challenges faced by local communities. From this perspective, it is imperative to assess the human-wildlife conflict that occurs with local communities living adjacent to Borena Sayint Werehimeno national park.

1.3. Significance of the study

The significance of the study will be assessing to the driving force of human- wildlife conflict communities in and around BSWNP to maximize the understanding of people towards wildlife conservation and secondary source for another researcher. To plan appropriate conservation strategy, and indicates future researchers for those who was like to conduct researches on HWC. The data may be used as secondary data for researchers who working in the study area. Moreover, this study was serve as ideal or standard information for the current human wildlife conflict in and around Borena Sayint Werehimeno national park and able to give base line information for local community and researchers. The local community and other organizations are benefited from the study by getting how to conserved or managed the wildlife in additional to ensure positive coexistence between people and wild animal in the interest of human and environmental wellbeing.

1.4. Objectives of the study

1.4.1. General objective

- The general objective of the study was to assess human wildlife Conflict in and around Borena Sayint Werehimeno national park, South Wollo, Ethiopia

1.4.2. Specific objective

1. To identify the cause of human wildlife conflict
2. To identify the impacts of HWC in the study area
3. To examine HWC management in and around Borena Sayint Werehimeno national park

1.5. Research questions

1. What are the animal species mostly involved in HWC?
2. What is the main cause of human wildlife conflict in the study area?
3. What are the impacts of human wildlife conflict in the study area?

1.6. Scope and Limitation of the Study

In Ethiopia, there are many national parks, but this study was basically focused in Borena Sayint Werehimeno National Park. The Scope of the study more focus to assesses human Wildlife conflict in and around Borena Sayint Werehimeno National Park south Wollo zone, Ethiopia. This study was faced different challenges. It includes lack of enough source of information, lack of budget and full material, Lack of sufficient time to conduct the research, some respondents were not concentrate attention for the answer was the main limitation of the study.

2. LIRATURE REVIEW

2.1. Meaning of human-wildlife conflict

HWC is defined as Conflict between people and wildlife is exists in different forms all over the world and is experienced more in developing countries (Blair,2008). Various definitions about the term have been forwarded by different researchers and organizations working on the area. Human–wild animal conflict is defined by the World Wide Fund for Nature (WWF) as "any interaction between humans and wildlife that outcomes in negative impacts on human social, economic or cultural life, on the conservation of wildlife populations, or on the environment (WWF, 2005). However, when humans‟ action entered these systems, the natural phenomena become disturbed and came with humans in contact. No wild animal is inherently a „nuisance "or pest". However, when their habitats are increasingly altered or managed by humans, certain wild species or individual animals may cause a significant problem to humans' other animals or the environment and resulted in HWC (Mesele Yihune, Afework Bekele and Zelealem Tefera, 2008). Human-wild animals‟ conflict occurs as wildlife's requirements overlap with those of human populations, incurring expenses/damages to residents and wild animals (Madden, 2004), (IUCN , 2005).

2.2. The impacts of human-wildlife conflict

Humans obtain many goods and services from nature to sustain their demand for food, fuel, water, medicine and fiber. Development including construction of roads, dams and utilities support human beings to accomplish the daily activities. But, this activity weakens the long term sustainable development by propagating unintended environmental impacts (Nchanji.,1998). Development intended for simple industrial purposes often result in uncontrolled secondary human migration, illegal logging, and hunting and resource extraction in general.The greatest human vulnerability to environmental degradation is related to effects on water resources, health and land productivity. Water pollution mostly occurs in the industrialized countries and uses of high energy also contribute a lot to global climate change (Anonymous, 2001).

Human activities are creating human wildlife conflict with different wildlife such as: - Human - carnivore conflict arises for several reasons. For instance, carnivores' protein - rich diet, large home ranges draw them in to periodic struggle with humans that have similar needs, most of them inhabit areas close to the human habitations and many large carnivore species are

specialized for ungulate predation. Due to their large home ranges and diverse habitats, conservation of large carnivores is a challenging practice (Polisar, *et al.*, 2003). Conflict can have multiple suggestions ranging from fear evoked by the presence of the carnivore to fatal attacks on humans (Roskaft, *et al*, 2003). Even in the absence of attacks on humans, livestock depredation by carnivores can slow down the livelihoods of people and affect their economic condition (Ogada, *et al.*, 2003).

Human and wildlife have been in conflict because farming crops generally offer a rich food source for wildlife as well as for people. Large wild herbivores compete for fallow resources with livestock and can act as reservoirs of livestock diseases. Wildlife damage to agricultural crops is a serious concern affecting much of the world today (O'Connell-Rodwell, *et al*., 2000). Primates are one of the most frequently cited crop pests (Hill, Osborn and Plumptre, 2000), so primates and humans are always in potential conflict over crops. This conflict is particularly interesting in that it arises from a positive desire to contact monkeys and then people discover that the contact poses risks from bites, theft of non-provisioned food or more general health issues such as exposure to simian viruses (Else.,1991).

2.3. The impacts of crop raiding of wildlife

Wildlife destruction varies significantly from site to site and farmers have uneven capacity for preventing losses (Messmer., 2000). Farmers themselves are sometimes, the cause for crop loss because they continuously charge the vegetation structure of the land closer to the protected areas. This changed vegetation probably become attractive to wild herbivores Crop raiding is a serious problem as crop raiding wildlife can have a devastating impact on the standard of living of peasants whose entire survival is dependent on subsistence agriculture (Roe, Williams and Dalal-Clayton, 1997). For example, different research stated that the major crop raiding wildlife in and around Borena Sayint National Park on respondent's response Gelada baboon, Grivet monkey, hamadryad baboon, Rabbit and other wildlife damaged their crops in different ranks.

Human-wildlife conflict is an increasingly significant difficulty to the conservation of wildlife. (Madden., 2008). Human being can be developing a range of options for attempting to lessen conflict with wildlife. The options include reducing the livelihood of attacks through livestock guarding dogs, electric fencing, improved construction of livestock enclosure, toxic

collars, disruptive stimuli and other aversive techniques. All these can have substantial impacts on the wild-animal populations (Dickman, Macdonald and Macdonald, 2011). Development including construction of roads, dams and utilities support human beings to accomplish the daily activities. But, these activities weaken the long term sustainable development by propagating unintended environmental impacts. Development often results in uncontrolled secondary human migration, illegal logging, hunting and resource extraction (Anonymous. 2001).

2.4. Cause of Human Wildlife Conflict

As human populations expand into wild animal habitats, natural wildlife terrifies, is displaced. Reduction in the availability of natural prey/food sources leads to wild animals seeking alternate sources. Alternately, new resources created by humans draw wildlife resulting in conflict (young, 2012). Byproducts of human existence offer un-natural opportunity for wildlife in the form of food and sheltered interference and potentially destructive threat for both man and animals. Competition for food resources also occurs when humans attempt to harvest natural resources such as fish and grassland pasture. Another cause of conflict comes from conservation biased toward flagship or game species that often threatens other species of concern (Lamarque, *et al*, 2009).

2.5. Human Wildlife Conflict Management

No single management strategy can prevent all crop raiding and the goal of management should not only to be reducing the levels of crop raiding but also to raise the tolerance level of crop raiding by lessening its impact to farmers (Sillero-Zubiri, and Laurenson., 2001). No solution will work without site-specific knowledge of what is possible, practical, or acceptable in any particular area. Unfortunately, human-wildlife conflict 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, Osborn and Plumptre., 2000). The main difference between the options is the moment at which the measure is implemented. By definition, management techniques are only cost-effective if the cost of implementing the technique is less than the value of the damage, taking into account the fact that a short period of active management may have a continued effect, by instating longer-term protection of crops or herds (FAOUN., 2010). The various management possibilities are presented according to the characteristics of conflict whether they relate to

humans, production, animals and the environment, rather than according to their ability to prevent or mitigate damage (Lamarque, *et al*., 2009).

According (Hill, Osborn and Plumptre., 2000) 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 area and its 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. Those wise it is very important that farmers be involved in the process of developing new solutions from the beginning (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 intervention are likely to be acceptable and feasible with in the local culture, providing there is adequate representation from the different types of stakeholder involved (Parkhurst., 2006).

According to (Hill *et al*., 2000), 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). Another approach that has been used successfully to manage Human wildlife conflict involves changing the perceptions of people experiencing the damage, thus, increasing their willingness to tolerate damage (Treves, 2007). 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. MATERIAL AND METHODS

3.1. Description of the study area

Borena Sayint Werehimeno National Park (BSWNP) is found in Amhara National regional state (ANRS) South Wollo Zone and the Park is located in the north eastern part of Ethiopia about 600 km far from Addis Ababa, 200 km far from Dessie to the park office Borena Mekane selam and 18 km far from Head office Mekane selam, the capital of Borena Woreda and area covers 4325 km^2. The park is Established in 2001 E.C administered by ANRS and lies between $10^0 50' 45.4"$-$10^0 53' 58.3"$ latitude and $38^0 40' 28.4"$-$38^0 54"49"$ longitude. The park is bordered among three Woredas namely Borena to the south, Sayint to the north and Mehal Sayint (a newly established Woreda) to the east, Borena Woreda on south (with its seven Kebeles) and southwest (with its two Kebeles), Sayint on the north (with one Kebele) and Mehal sayint on the north (with its two Kebeles) and on the west with one Keble). Leg ambo Woreda is located bordering the two Woreda Borena and Sayint (Abate, Tamrat and Sebsebe, 2006).

The largest portion of the Park is found in Borena Woreda. BSWNP is a central high land area that is reach in biodiversity. It harbors various species of wild animals including mammals, birds, invertebrates, and amphibians. There are about more than 23 larger mammals, 77 bird species and rodents are concentrated in the national park. The larger endemic mammals found in the park are Ethiopian Wolf (*Canis simensis*), Menilik bushbuck (*Tragelaphus meneliki*), Gelada baboon (*Theropitheals gelada*), Strakes hare (*Lepus starckii*), Gray Tailed Rat (*Stenocephalomice griesicauda)*. Abyssinian Genet (*Geneta abyssinica*) has been recorded as endemic species for the park and the park have different endemic bird species are found such as; -white billed starling (*onychognathusalbirostris)*, Abyssinian wood peaker (*dendropieos abysinicuns*), thick billed raven (*corvus crassiostris*), Ankober Serin (*Serinus ankoberensis*), wattled ibis (*Bostrychia carunculata)* and others. In this national park more than 15 caves such as; - Alebachew cave, Yilas cave, Abdngu cave, Wef cave.

One of the most attractive features of Ethiopia is the diversity of this vegetation. Various parts of the country with varied topography, altitude and rain fall distribution have resulted in unique vegetation formation. The abundance and distribution of mammals depend up on the nature, structure and density of vegetation. BSWNP represents rich biodiversity with higher number of endemic species and attractive biophysical features. Even though the park is small in size, it has higher species diversity due to the characteristics of the most evergreen forest. The

study area, in general encompasses three vegetation zones, Afro alpine belt, sub afro alpine belt, afro Montana forest belt. BSWNP contains real representative of high land biodiversity in the country.

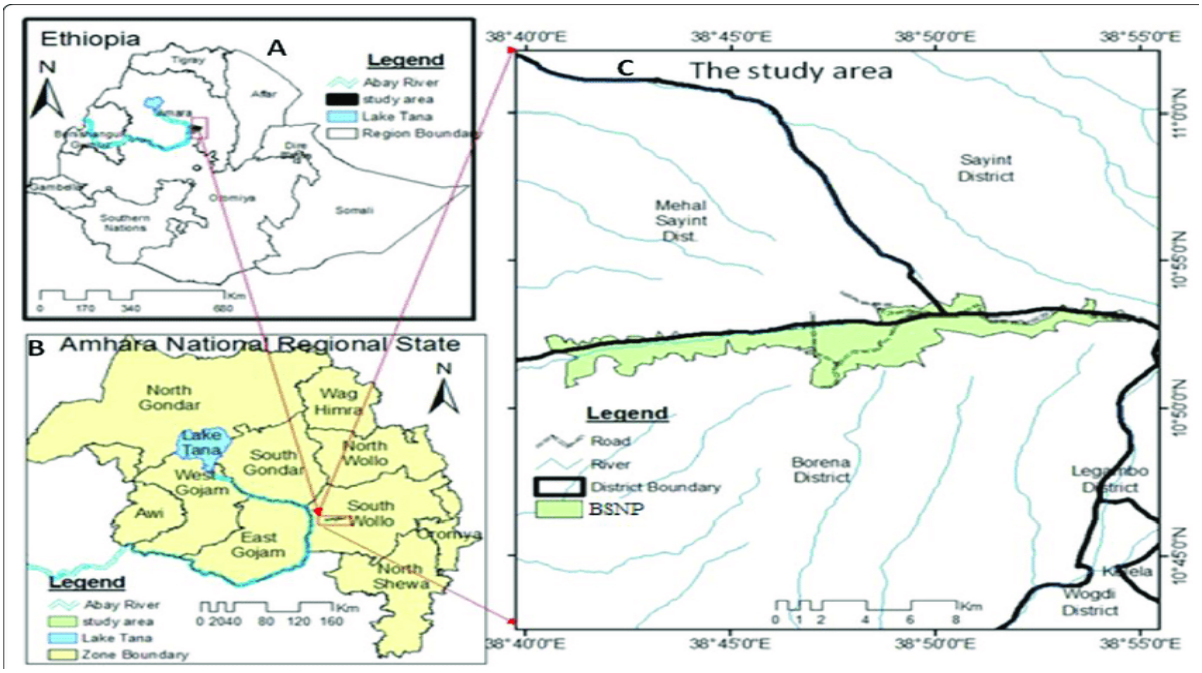

Figure: - 1. Location map of the study area (Source, BSWNP office, 2019)

The lower forest is dominated by podocarpus falcatus/ Ethiopian endemic Soft wood/ with juniper and Olea with increasing olinia as we go higher (BSWNP Leaflet). The upper forest is dominated by Repanea, Dombeya and Hagenia (Indigenous tree) moving in to the lower stratum of Erica arboreal and Hypericumreveltum near forest edge at 3000 masl (BSWNP leaflet). Above the forest edge there is a high altitude grass land dominated by festuca gelibertina /Guassa/ with scattered Giant lobelia (*Lobelia rhyncopetalum*) and red hot pokers *(Kniphofiafolisa*). BSWNP leaflet/ the climate of the central highland are characterized by tropical type. BSWNP has a wide range of attitude and therefore embraces Three climatic zone; Dega, Woina dega, and Wurch. The distribution of the rain fall in the area is characterized by bimodal rainy season from June to September and February to April (ENMSA, 2009). The average Temperature falls between 10^0c to 20^0c. The Park has different topographical features ranging from low land to highland mountains. The altitude ranges between 1900m to 3699 m

a.s.l. The park is generally characterized by rough topography with mountains, deep incised valleys, escarpments and plateaus.

3.2. Data Collection Methods

For this study was collected through primary and secondary methods. Primary data was collected from house hold using questionnaires, interview and observation. Secondary data will be collected from rural development Agricultural office reports, Internet, Newspaper, Magazine, staff worker.

3.2.1. Key informant interview

Key informant interviews were conducted with selected informants who will be depending on park resources. Interview was held with park scout, park manager and local community, Researcher to gather information in depth with face to face information

3.2.2. Questionnaires

The study was based on mainly park office and sample kebele household cross sectional survey using pre-test structure questioner organizing in logical order of presentation. The survey generated qualitative and quantitative data pertaining to demographic characteristics, aspects of participation, park resource use and dependence questionnaires.

3.2.3. Focus group discussion

In FGD, the researcher is just a facilitator and the respondents provide information. Focus groups therefore, provided an opportunity for the researcher to interact with the local community and gain relevant information about their knowledge, opinions, and attitudes regarding human-wildlife conflicts. Participants in the focus group discussion included local elder, park scout and the local people.

3.2.4. Field Observation

Researcher's field observation was employed to gather more information that might not be accessed through interpersonal communication and to cross check the information obtained from the questionnaire survey. Observable facts were gathered and recorded both using camera and by taking note on a notebook.

3.2.5. Secondary data collection

To make the research more reliable and to obtain an objective data which is got from primary data was supported by the secondary one. Then data which are gathered from both sources was taken for analysis and conclusions**.** Secondary data collection sources are data obtained from books, internet searches, libraries, journal, progress reports, Park office and articles.

3.3. Sampling size and sampling technique

For the purpose of this study, purposive sample techniques were employed to select the respondents and fill the questionnaires, FGD and interview of the key informant. Purposively three kebeles was selected namely; Chirocherkos, Anferfra and Beja chilaga based on the presence of high Human wildlife conflict. Those three kebeles have 1850 populations, so the Population Was Selected Currently Use and live the national Park, 50 Respondents was selected purposefully based on their extensive knowledge, experience, expertise, and involvement with in the study area.

The sampling size of the study was determined based on formula adapted from Israel (1962) as follows.

$$n=N/1+N\,(e)^2$$

WHERE; -

N=the total population

n= the required sample size

e = the precision level which is = ($\pm$ 10%)

Where confidence interval is 90% at p=+10 (maximum variability) which is = (±10%) $n=1850/1+1850(0.1)^2=95$

These numbers of households were difficult to supervise due to variety of factors including the cost of time and budget. So the researcher had limited to use the total of 50 samples purposefully between each stakeholder.

Table 1: indicate the total population and sample size determination of the study area

No	Name of Kebeles	Total population (N)	Sample size (n)
1	Anferfra	700	19
2	Chirochorkos	650	18
3	Beja chilaga	500	13

Accordingly, from the total population of three kebele namely: Anferfra, Chirochorkos, and Beja chilaga (1850) a total of 50 respondents were selected and the questionnaire was transferred. The respondent was selected purposively based on their ability, awareness, adjacent to an area and knowledge contributes to the overall research objectives.

3.4. Data analysis

The data was analyzed by using simple descriptive (qualitative) method and quantitative (numerical) method. The study was interpreting the data based on the survey questionnaire, interview and filed observation. The data was analyzed by using simple descriptive statistics such as mean percentage and the data was present on tables, charts, picture and percentage also further represented by using graphs and other diagram in order to analyses more information about our research study.

4. RESULT

4.1. Demographic characteristics of respondents

Table 2 shows that the demographic characteristics of the respondents by Sex, Age, and educational status. 80% and 20% of the respondents were male and female respectively and 30% of the respondents are found between 20-30 age groups which show that they are in an active age group and 40% of the respondents are found between 31-40 age groups, 24% of the respondents are found between 41-50 and the rest 6% of the respondents are found in >50 age groups. And also the education status 10% were illiterate, 30% were literate, 20% were diploma, and 40% were Bachelor Degree participated. Generally most of the demographic characteristics of the respondents are male.

Table 2: Distribution of respondent demographic characteristic

Demographic character	category	No of respondent	Percent (%)
Sex	Male	40	80
	female	10	20
Age	20-30	15	30
	31-40	20	40
	41-50	12	24
	> 50	3	6
Education status	Illiterate	5	10
	Literate	15	30
	Diploma	10	20
	Bachelor Degree	20	40

4.2. Causes of human-wildlife conflicts in the study area

According to the respondent during data collection the main Cause of human-wildlife conflict in the study area such as: - Agricultural expansion 30%, human settlement 24%, overgrazing by livestock 14%, Deforestation 18%, Illegal Grass Collection 10% and poaching 4% were in the study area. Therefore the researcher was concluded that major causes of human-wildlife conflict in and around BSWNP is mainly Agricultural Expansion 30% and 4% of the respondents was poaching are the lowest cause of HWC.

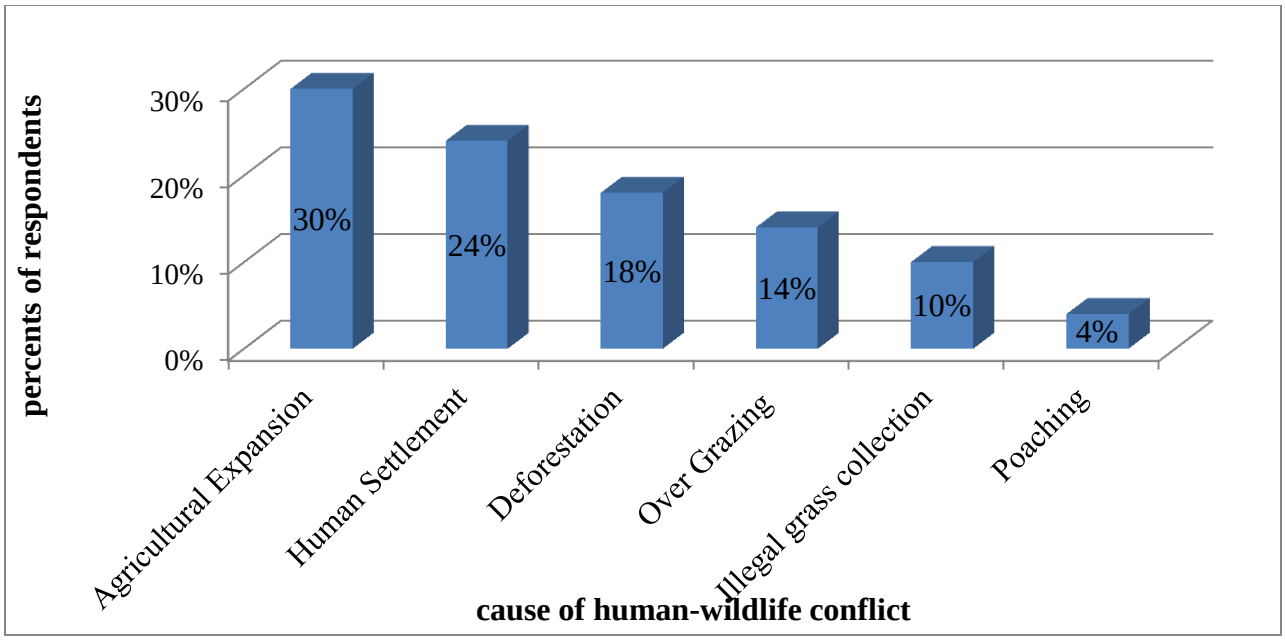

Figure: 2. Cause for Human-wildlife conflict in and around the study area

4.2.1. Agricultural expansion and human settlement

According to the respondents during data collection 30% agricultural expansion and 24% of human settlement was the major causes of human-wildlife conflict in and around the study area; recently there was agricultural practice and human settlement inside and outside the park. Due to agricultural expansion and human settlement in and around the park conflict was raised between wildlife and human.

4.2.2. Deforestation

According to the respondents response that 18% deforestation is another major causes of human-wildlife conflict in and around BSWNP. This cause was mainly caused by human activity, Local communities were cutting of trees for expansion of farm land, fire wood collection and livestock grazing send fire for the purpose of charcoal production, due to high level of deforestation in Borena Sayint Werehimeno National Park.

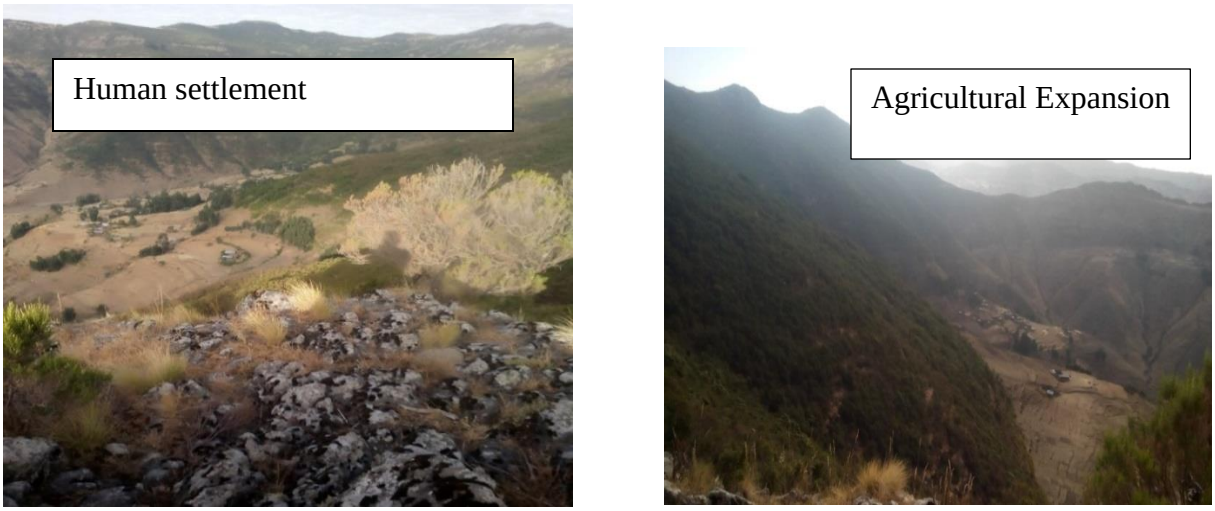

Figure 3: - Agricultural Expansion and human settlement (photo by Arega, 2019).

4.2.3. Overgrazing by livestock

According to the respondents reported that 14%, Grazing was another major cause of human-wildlife conflict the in the study area. This cause was due to the local communities were farming and livestock production are the main activities, so because of lack of grazing land for their livestock, the local communities were grazing their livestock inside the park. Due to over grazing inside the park, the number of wildlife was happened between livestock or human conflict.

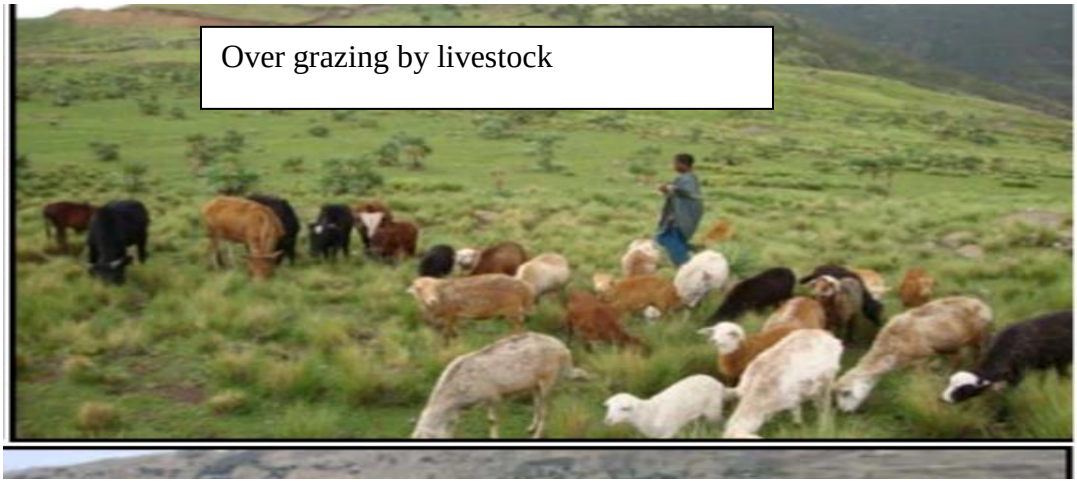

Figure 4:- over grazing by livestock (source BSWNP Office, 2019)

4.2.4. Illegal Grass collection

According to the respondents response that 10% of Illegal grass collection are one of the cause of human-wildlife conflict in the study area. The local people cut grass to feed their cattle, sell in the market and for thatching houses (especially Guassa grass).This might cause scarcity of grass for herbivores and disturb the natural behavior of wildlife in the Park. Like any other Park in Ethiopia, local people exploit the resource from BSNP as well. Forest exploitation inside the Park and traditional farming activities close to the Park might cause strong impacts on the wildlife. Wild animals are highly restricted in some parts of the Park because of human and livestock encroachment.

Figure 5: - Illegal grass collection (Source BSWNP Office, 2019)

4.2.5. Poaching

According to the respondents 4% of poaching was another cause of human-wildlife conflict of the park. Local communities were hunting of wild animal for food or another way. Due to poaching inside and outside the park a number of wild animals were reduced. The least but not the last cause of human-wildlife conflict of the park was poaching.

4.3. Impacts of Human Wildlife Conflict in the study area

The impacts of human-wildlife conflict in and around Borena Sayint Werehimeno National Park are humans have profoundly impacted wild animal and the environment in many ways, through crop damage, habitat disturbance and destruction, livestock depredation and

killing of wildlife, the incidents of Human- wild animal conflict highlight forms as the recurrent in and around that area are crop destruction, killing of domestic animals and property.

Table:-3 impacts of human to wildlife conflict and wildlife to human conflict

Impacts	No of Respondents	Percent (%)
Crop damage	15	30
Livestock depredation	12	24
Habitat disturbance and destruction	10	20
Killing of wildlife	8	16
Disease transmission	5	10

4.3.1. Crop damage

According to 30% the respondents showed that crop raidings are the majior or serious causes of wildlife to human conflict. Therefore, crop raiders wild animals in the study area, namely Gelada baboon, Vervet monkey, scared baboon, Colobus monkey (Gureza), Stark hare, and Echidna (porcupine) were causes crop raiding wild animal in different degrees. Farmers ranked crop raiding wild animals from the one causing most damage to the other cause the least damage. Gelada 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 stark hare was the third crop raiders and followed by crested porcupine or echidna, Colobus Monkey, Scarced Baboon respectively**.** During the present study of the respondents claimed that 32% Wheat and 26% barley was the most vulnerable crop to raiders' whereas the others respondent reported that Potato 18%, Maize 14% and Teff 10% crop are damaged by wild animals (figure 6).

according to the respondents reported that during data collection wheat is the most vulnerable crop, the second most vulnerable crop are barley by wild animals and the others potato, Teff, legume respectively based on rank. The result was agreed with finding of (Warren, 2008) who reported that wheat (ripe and dried) was the most frequently eaten crop by crop raiding in West Africa.

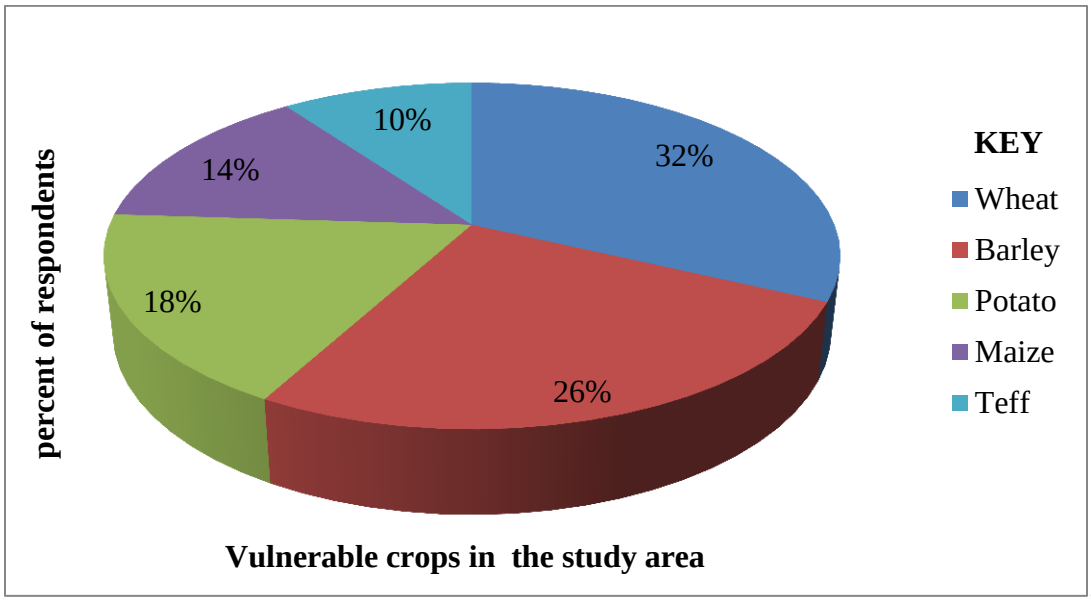

Figure: 6. Rank of vulnerable crops in the order of destruction by crop raider

4.3.2. Habitat disturbance

According to 20% of the respondents responded that habitat disturbance is destruction of the home of the wild animals. Humans kill or chase wild animals by digging, cutting, sealing by stones and smoking their natural habitat. This method is a main cause to decrease or to extinct of wild animals. The major components of habitat disturbance in the study area were settlement in and around the national park, over grazing by livestock, frequent fire and bush encroachment, tree cutting for charcoal, sale and construction of huts. Tree cutting was mainly associated with new settlement, which resulted deterioration of the remaining vegetation cover of the area. This minimizes the feeding ground, nesting and mating site of the wild animals so you have to be happened conflict between human and wild animal.

4.3.3. Livestock depredation

According to 24% of the respondents during data collection reported that a total of three common problematic wild animals were reported in terms of livestock depredation from the villages although their effect is differing from village to village. The most common Impact of human wildlife conflicts are the direct attack of predators on human and domestic animals and degradation of livestock. Large carnivores like leopard, Common Jackal and spotted hyenas.

Leopards were reported to attack cattle, donkeys, goats, sheep and domestic dog in the study site, common jackals are attack sheep, goat and spotted hyena caused the most pronounced problems and the local communities' loss their oxen, cows, donkeys, mules, domestic dog and horses. Carnivores are attacking domestic livestock due to declining number of herbivorous in the wild due to prolonged droughts and habitat degradation.

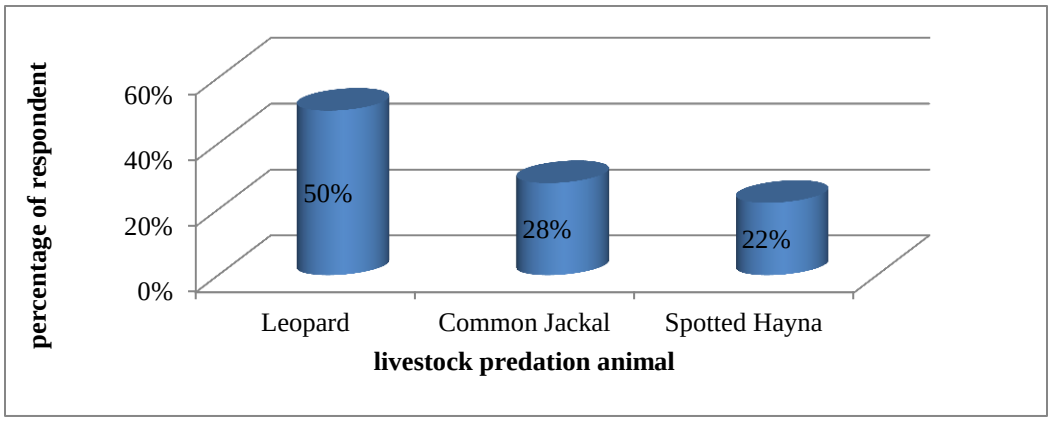

Figure: 7. Major livestock depredation wild animal in the study area

4.3.4. Killings of wildlife

According to 16% of the respondents responded that killing of wildlife are the impacts of human to wildlife conflict. Because of limited access to cash and lack of compensated for crop losses, and domestic animal killing or loss the local communities of is more suffered by crop damaged by wild animals. The study was conducted by in the study area, shows that gelada baboon is one of the major wild animals that frequently damage crops. Crop-raiding undermines food security and tolerance of wildlife within neighboring human communities. The inability to mitigate crop-raiding and absence of composition for crop losses lead to killing of animals.

4.4. Traditional Controlling Techniques of Farmers to Defend Crop Raiding

According to the Respondents used different methods to defend crop raider from their crop and include guarding, live fencing, scarecrow, chasing and smoking. There was significant difference between respondents using the different traditional methods in which of the respondents were used to defend their crop guarding 34%, live fencing 26%, and scarecrow 22%, chasing 14% whereas 5% was used smoking to repeal the crop raiders from their crop mostly in the night time which was the highest and the lowest respectively. Most respondents reported that as they guarded their crops throughout crop growing season. Live fencing and Scarecrow were

also the second and the third important methods respectively. Chasing was also the fourth important methods and smoking used to as supplementary or the least effective method. This result agrees with the finding of (Johansson, 2002) who founds that guarding and live fencing away of animals was ranked first and second in protecting crop raiders from crops.

Table: 4 Controlling Techniques of Crop Raiding Animal

Controlling Techniques of crop raiding	No of Respondents	Percent	Rank
Guarding	17	34	1
Live fencing	13	26	2
Scarecrow	11	22	3
Chasing	7	14	4
Smoking	2	4	5
Total	50	100	

4.5. Traditional Controlling techniques of livestock predations of wild animal

According to the respondent's information during data collection to defend livestock predation animal use different controlling techniques of the local community in figure 8 below such as fencing 36%, chasing 30%, scarecrow 22%, guarding 8%, and smoking 4% based on respondents rank. These traditional controlling techniques of the most effective methods are fencing and chasing, the second most effective methods are scarecrow and guarding (especially common jackal) and the least effective traditional controlling techniques are smoking. Therefore the researcher was concluded that the major or the most traditional controlling techniques to defend livestock predation animal in the study area was 36% of the respondents reported that live fencing and the least controlling techniques are smoking.

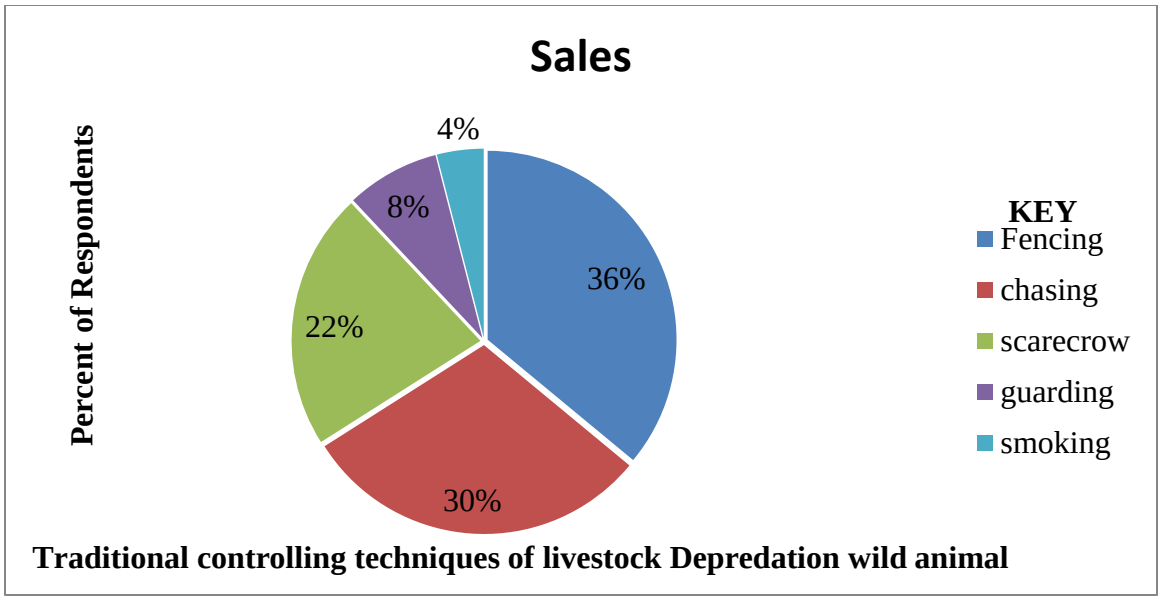

Figure: 8. Traditional controlling techniques of livestock predation animal

4.6. Management or Mitigation Measure of Human Wildlife Conflict in the study area

The present study showed that human-wildlife conflict is apparent in the study area. The conflict becomes the main Causes to the continued survival of wild animal species in the area. Not only causes for wild animals but also the conflict causes high impact in economic loss of the people in and around the study area. Therefore, human-wildlife conflicts are negative impacts on both human and wildlife as highlighted in this study. It is also a serious obstacle to wildlife conservationists. Based on these reasons, mitigation strategies are very essential to reduce the cause and impact of HWC.

Accordingly, possible mitigate possibilities for peaceful co-existence between human and wildlife are presented as follows:- Create awareness and organize training program to the local communities, identifying clear border between the closure area and the land owned by the residents, rules and regulations of the park, translocate the problematic animal to another area, equal benefit sharing of the local communities, to reduce or minimize agricultural practice inside and outside the national park, reduce deforestation by formulate rules and regulation for performed local communities, relocate agricultural activity out of the national park range, zoning or change the location of crop fields, Reduction of human settlement encroachment into the national park range.

5. DISCUSSION

This research was carried out in and around Borena Sayint Werehimeno National Park, with the objective of assessing human wildlife conflict. The result of the present study has clearly shown that there was a strong conflict between human and wildlife living in and around the study area especially in anferfra, chirocherkos and Beja chilaga kebeles.

5.1. Causes of human wildlife conflict

According to the current result, Human wildlife conflict was serious in the study area. As highlighted in this study the main reasons for the creation of strong human wildlife conflict in the present study were includes crop damage, livestock depredation, killing of wildlife, habitat disturbance and destruction and disease transmission. As a result, local communities disliked wildlife inhabiting in and around their surroundings. This has a great negative impact in conservation of the wildlife.

Therefore, determination of possible solutions to mitigate Human wildlife conflict in the study area is mandatory for peaceful coexistence of human and wildlife. Similar sources for Human wildlife were reported from Tsavo Conservation Area, Kenya.

Figure 9 causes of human wildlife conflict in the study site

5.2. Impacts of human wildlife conflict

Agricultural Expansion, human settlement, deforestation, illegal grass collection, poaching was reported as the main causes of Human wildlife conflicts (Makindi *et al,* 2014). Different causes for human wildlife conflict were reported from different parts of Africa. For instance, animal death, loss of human life, crop damage, and damage to property, injuries to people and wildlife, encroachment of forest areas for agriculture, developmental activities, and livestock grazing are some key reasons for increment of the conflict in countries such as Kenya, Namibia, Mozambique, Zambia and Nigeria (Ladan, 2014).

5.3. Major vulnerable crops and crop raiding wild animal

The current study showed that Vulnerable crops such as wheat, barley, potato; maize and Teff were raided **by** wild animals. Study conducted in Rwandan Forest Fragment indicated that maize, potato, beans, cabbage, sweet potato and tomato were raided by wild animals (Guinness,and Taylor, 2014).

A research was conducted in and around the study area showed that Gelada Baboons, vervet monkey, scarced baboon, colubes monkey(gurezza), stark hare and echidna or Porcupine, were identified as destructive animals, mainly feeding commonly on wheat, barley, potato, maize and teff. Similar finding with the current study was observed in Filinga Range of Gashaka Gumti National Park of Nigeria. Monkeys, Baboons, Birds and Rodents were listed among wild animals that attack crops including Maize, Cassava, Rice and Banana (Eniang, *et al*, 2011).

5.4. Major livestock depredation wild animals

During the present study, three species of wild animals were identified as problematic animals in livestock depredation. These animals were caused loss of domestic animals. Leopard, Spotted Hyena and Common jackal were the identified predators in the present study area. Hence, common jackal and leopards could easily penetrate the fences and drag out the sheep and goat and any other animals. So, most of the predation wild animals happened both at night time or day time. Therefore, leopard was happened during both Night and Day Time but common jackal happened in day time and then, Spotted Hyena happened during in the night time within the settlement. This result is the same as with (Mesele, Afewerk & Zelalem, 2009) that reported Leopard, Spotted Hyena and Common jackal were the major predators for domestic animals in and around Simien Mountains National park of Ethiopia.

They were responsible for loss of Sheep, Goats, Oxen, Cows, Donkeys and Mules. Eight problematic wild animals in terms of domestic animal loss were identified in Chebera Churchura National Park southwestern part of Ethiopia (Demeke Datiko & Afework Bekele., 2013). Among those hazardous wild animals three of them i.e. Leopard, Jackal, and hyena were same with the present finding.

5.5. Traditional controlling techniques of both crop raiding and livestock depredation wild animals

In the current study, during data collection respondents were used guarding, live fencing, chasing by dog, scarecrow, smoking to protect their crops and livestock from wildlife damage. Selection of the different strategies depends on the type of species, behavior of species and size of species. These results were similar to reported from Kenya Nyeri district (MusyoKi, 2014). The most effective strategy of the local communities used in preventing crop damage was guarding (34%), which is time consuming (Eniang *et al*., 2011). Similarly, the communities in the present study reported that permanent Guarding by adults is the most effective strategy to control both crop and livestock from wildlife when asked the most effective deter strategy among practiced by the local people.

They concluded that improving the technique of livestock protection such as keeping the livestock in an enclosure during the night might minimize predation risk. Active guarding by famers and members of their families was found to be the sole mode of protection from crop raiding (Guinness and Taylor, 2014).

6. CONCLUSIONS AND RECOMMENDATION

6.1. Conclusion

The present study tried to investigate human-wildlife conflict in and around BSWNP, northern part of Ethiopia. Human-wildlife conflicts exist in different forms all over the world and experienced more in developing countries. The cause of human wildlife conflict was human settlement, agricultural expansion, illegal grass collection, over grazing by livestock, deforestation, poaching to the national park. Crop raiders cause significant loss on farmer's crop production. Wheat is the main crop which was cultivated by most of the farmers in the study area and it was the most vulnerable crop raided by wild animals followed by barley in the study area. The major pest primates wild animals namely gelada baboon, vervet monkey, starka hare, scarced baboon, colubes monkey and porcupine were identified. The highest crop damage was caused by gelada baboon followed by vervet monkey in the study area. The respondent's perceived that leopards and Common Jackal among the top livestock depredators. Farmer using different traditional controlling techniques to defend or minimize crop raiding and livestock predation wild animal in the study area such as: - guarding, live fence, scarecrow, chasing and smoking techniques to defend both crop raiders and livestock predation wild animal. Most of the respondents use traditional methods using guarding and smoking which was the highest or the most effective and lowest or least effective method used by respondents respectively.

6.2. RECOMMENDATION

Based on the obtained results of the present study, the following points are recommended to mitigate human wildlife conflict in the study area

- ✓ Farmers should cooperatively keep their farm against crop raiders to minimize crop loss by using most effective method in an area.
- ✓ The park authority should provide compensation for wildlife induced damage in and around the park.
- ✓ palatable and nutritive crops should not be grown near the park edge
- ✓ The concerning body should work hard to increase the awareness of the local people about the importance of wildlife conservation.
- ✓ The park authority should provide fence or other method that used to protect crops, peoples and livestock from threat.
- ✓ Stakeholders should reduce human settlements around the forest, expansion of farmland and cattle grazing in and around the National Park.
- ✓ To reduce the dependency of the local people in and around the national park, it is better to encourage the local people to plant trees for their various types of utilization.
- ✓ Further investigation must be conducted to identify alternative crops that can be rejected by crop raiders in the area.

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8. APPENDIX

WOLKITE UNIVERSITY

COLLEGE OF AGRICULTURE AND NATURAL RESOURCE

DEPARTMENT OF WILDLIFE AND ECOTOURISM MANAGEMENT

Part I: Personal Information

I am Arega Mekete graduate student at Wolkite University. Currently I am conducting a research study on Human wildlife conflict in and around Borena Sayint Werehimeno National Park South Wollo Zone; Amhara, Ethiopia. The case of in partial fulfillment of the requirements for the degree of Bachelor of Science in Wildlife and Ecotourism management. I require your help to spend some minutes of your time with us for interview. The purpose of this Interview is to gather information about the Human wildlife conflict in this area. I can assure you that any information that provide in this interview will be kept confidential. Your kind cooperation would be greatly appreciated and is great importance for the successful completion of this study.

Thank you!!!

Appendix I: The survey questionnaire for formal interview Households survey on Human-wildlife conflicts in and around Borena Sayint Werehimeno National Park south Wollo zone, Amhara, Ethiopia.

1. General information

Household code number_____ Name of interviewer_____ sign

_____Date of interviewee day _____ month _____ year _____

1. Name of household head_____

2. Sex 1) Male 2) Female

3. District_____

4. Keble's _____ village _____

5. Level of education

A) Illiterate B) literate C) diploma D) bachelor degree E) grade 10 and above

6. Age A) 20-30 B) 31-40 C) 41-50 D) >50

7. What type of crops you grow in your farm land? Put in order to know which one is the most?

A) Potato B) barley C) legume D) wheat E) Teff F) maize G) others (Specify)

8. How much is the distance of your cultivation land from Park edge?

A) Near-bounded B) medium C) far

9. Do wild animal cause damage to your crops? Yes/ No.

10. What is the cause for the happening of HWC in your area?

A) Agriculture expansion B) overgrazing by livestock

C) Deforestation D) Human Settlement

E) Illegal grass collection F) other specify

11. Which wild animal are more responsible for crop damage?

A) Gelada Baboon B) Vervet monkey C) Scarced baboon D) Stark hare E) Others specify

12. Which wild animal are more responsible for crop damage during day time on which crop?

A) Potato B) Barley C) Legume D) Wheat E) Teff F) Maize G) Others (Specify)

13. Which type of crop is more damage by wild animal?

A) Potato B) barley C) legume D) wheat E) no damage in general

14. Which type of crop is least damage by wild animal?

A) Potato B) barley C) legume D) wheat E) Teff F) No damage in general

15. What is the cause of human wildlife conflict in the study area?

A) Deforestation B) population growth C) Human Settlement D) Others

16. What control measures have been taken to safeguard your crops from wild animal?

A) Guarding B) Chasing C) Fencing D) Smoking E) scarecrow F) Other Specify

17. Which of the techniques are most effective?

18. Which of the techniques are least effective?

19. Which Wild animal is the most damage in terms of livestock predation?

Appendix II. Lists informant interview (rural agricultural development office, District and better-Informed farmers)

1. Name _____ Date _____

2. Education status _____ your profession_____

3. How long have you studied in the area? _____

4. Is there any HWC in and around this area?

5. What are the major factors that cause Human wildlife conflict in the study area /district?

6. Why farmers are in your area face Human wildlife conflict?

THANK YOU!!!