Vol. 11(1), pp. 48-57, January 2019
DOI: 10.5897/IJBC2017.1144
Article Number: 8E9F36D59785
ISSN 2141-243X

http://www.academicjournals.org/IJBC

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International Journal of Biodiversity and Conservation

Full Length Research Paper

Impacts of human activities on wildlife: The case of Nile Lechwe (*Kobus megaceros*) Gambella National Park, Southwest Ethiopia

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Received 24 August, 2017; Accepted 23 November, 2017

Assessing human-induced threatening factors to wildlife is the basis in determining and proposing appropriate conservation measures. The present study was conducted to assess impacts of human activities on wildlife in Gambella National Park, Southwest of Ethiopia, from October 2015 to March 2016, focusing on the case of Nile Lechwe (*Kobus megaceros*). The data in this study were gathered using questionnaires with structured interview and focus group discussion. Data on the threatening factors were compared among villages using chi-square test in SPSS version 20 software. Out of the 384 respondents, 139(36.2), 51(13.2) 49(12.8), 43(11.2) and 41(10.7%) of them informed that agricultural investment, illegal hunting, overgrazing, rice cultivation in the area and habitat loss, respectively, were the most predominant human factors affecting Nile Lechwe. Thus suggests that agricultural expansion and illegal hunting are those human activities with the highest impact on the Nile Lechwe. Before designing and implementing any development investment particularly large scale agricultural expansions, the government and other stakeholders should give consideration and attention to the rapidly declining natural resource beside to the development. Therefore, designing appropriate eco-friendly management with options must be adopted to mediate the effects and minimize future impacts.

Key words: Agriculture, anthropogenic disturbance, habitats, Nile Lechwe, Gambella National park, wildlife.

INTRODUCTION

The impacts of human-induced factors on wildlife need to be understood and has become the controversial issue and globally recognized (Vitousek et al., 1997). Similarly, the imbalance between the needs of human and the

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needs of wildlife population in basic life supporting systems of the biological environment which have always been resulted in conflict between human and wildlife that affect the lives of both counterparts. Despite the efforts made to conserve biological diversities, our natural ecosystems have been exposed to change significantly by humans at some point in human history (Turner et al., 1990). As a result, biodiversity conservation is achieved through eco-friendly traditional human cultural practices and beliefs (Wuver and Attuquayefio, 2006).

Nowadays, the increase in human population, besides to the question of the better life through improvements in science and technology, the global biodiversity has become easy targets for human over-exploitation. This situation is an indication that global biodiversity is being exploited at an alarming rate than ever before with negative implications for sustainable human livelihood (Mamo and Bekele, 2011). Consequently, it has been suggested that biodiversity is facing a decline of crisis proportions which could ultimately lead to mass extinctions in the very near future. In Ethiopia, increasing evidence indicates that the rate of environmental degradation has increased in recent times, with previously rich forests being converted to arable agriculture and existing lands converted into near desert (Andren,1994). It has been estimated that forest cover in the country was approximately 40% of the country's total landmass a century ago, but now has shrunken to only 3% (Berry, 2003; Adugnaw, 2014).

To undergo effective conservation measure of wildlife it is very important to understand the interaction among human, wildlife, wildlife and their habitats. Human factors such as illegal hunting, large scale agricultural investment, encroachments of human and livestock particularly the buffer zone of the protected area, result in negative interaction between the wildlife and peoples that reside near the protected area. This situation occurred in the present study area where there are different large scale agricultural investments even when crossing the protected area. Another very important issue in wildlife conservation practice is, understanding the policies existed in a country besides the anthropogenic factors. Weak enforcement of polices and strategies has a negative impacts on natural resource. In Ethiopia, although, there had been conservation attempts since long before, the implementation of wildlife policy is typically underestimated. In addition, several of Ethiopia's protected areas including Gambella National park exist on paper only, while others have declined in size or quality (Schloeder, 1999). The majority of conservation problems, however, can be attributed to Ethiopia's adoption and implementation of an exclusionary protected area policy and to the causes and consequences of its prolonged engagement in different conflicts.

The Ethiopian Government has designed major developmental activities during the last decade in different regions of the country including Gambella. Such activities, especially large scale agricultural practices, have caused drastic changes in the natural environment in the country. As a result, the natural resources of the country have been depleted alarmingly for over two decades. Such act of leasing lands to private investors for development activities should be encouraged, as it is important for the development and wellbeing of the nation. However, if appropriate environmental impact assessment is not well conducted and risk minimizing strategies are not developed accordingly, it will have tremendous adverse impacts on the wildlife and their habitat (Mann and Smaller, 2010; Mohammed and Afework, 2014). Hence, taking proper care and controlling and managing the activities are mandatory for protection of wildlife and their habitats.

Gambella is one of the regions in Ethiopia where intensive agricultural investments are currently expanding. These investment activities involve conversion of virgin lands to cultivation fields, in which most the sites are concentrated around the Gambella National Park (GNP). As a result, recent observations indicate that extensive wildlife poaching, human and livestock population pressure, and inappropriate land use policy accompanied by extensive investments have resulted in massive destruction of wildlife habitat and severe wildlife population decline in the region (Biodiversity Indicators Development National Task Force [BIDNTF], 2010). Thus, to practice effective conservation of wildlife in the area, it is important to understand existing interactions among human, wildlife, and wildlife habitats. Human factors such as illegal hunting and land use change through agricultural activities, and encroachments of human and livestock in and around protected areas, results to negative interactions between wildlife and local people. Gambella National Park, in the western Ethiopia, is one of the areas where such situations are occurring currently; the extent of large-scale agricultural investment areas, even some of them extending inside the boarder of the park.

GNP was established as a protected area in 1973 to conserve a diverse assemblage of wildlife and unique habitats (EWCA, 2014). Among the key wildlife species protected in the GNP is Nile Lechwe (*Kobus megaceros*), which is uniquely adapted to the wetland habits, including, swamps and marshes. In the National Park, Lechwes inhabit is almost exclusively the flood plains of

Alwero wetlands. The source of this swamp is the Alwero river which is also highly utilized by the large-scale rice cultivation in the area (Rolkier, 2015). This unregulated river water diversion lead to decline in the extent and productivity of the wetland ecosystem, ultimately affecting Nile Lechwes and their habitat.

Furthermore, human and livestock encroachment in the park has been increasing, which is due to weak enforcement of existing wildlife policies. Therefore, improved understanding on the effects of such anthropogenic disturbance to wildlife is needed to guide decision making and mitigate both the threats and their ecological impacts. Hence, the present study was designed to assess the effect of such human activities on wildlife in the Gambella National Park, with special emphasis to Nile Lechwe (*K. megaceros).*

MATERIALS AND METHODS

Description of the study area

In 1944, further legislation was passed to regulate hunting of wildlife and ensure that certain species were not over hunted (Hillman, 1993). Currently the Federal Government of Ethiopia established different protected areas particularly national parks in different regions of the country to conserve wildlife species. One of these parks is Gambella National Park which primarily established conserve diverse wildlife and their habitats (Figure 1).

Gambella National Park is located at 850 km west of Addis Ababa. It was established as a protected area in 1973 to conserve a diverse assemblage of wildlife and unique habitats. Its location is between 33045' to 34015'E and 07030' to 08015'N at the west part of Gambella town, in the Gambella National Regional State. The park is located in the centre of Gambella Regional state between the rivers of Baro and Gilo (EWCA, 2014*).*

The Park is characterized by heavy rainfall during the wet season (May to October) and very little precipitation during the dry season (November to April). The mean annual rainfall of the park is 1400 mm. The mean annual temperature is 27°C but the mean monthly temperature varies significantly. The absolute maximum temperature of 45°C has been recorded in mid-March while the absolute minimum temperature of 10.3°C has been recorded in December (CSG, 2000).

Sample size determination

Since the estimated population around the National Park would be beyond 10,000, hence, by the assumption of normal distribution the sample size was determined as follow:

$$n = \frac{n_0}{1 + \frac{n_0}{N}}$$

Where:

$$n_0 = \frac{Z^2_{\alpha/2} pq}{d^2}$$

Where: n = sample size; d= margin of error N = total number of house heads near the national parks;
p= proportion of population α = level of significance Z= Score of normal distribution Q = 1-P;
d = 0.05p = 0.5α=0.05.

$$n_0 = \frac{(1.96)^2 \times 0.5 \times 0.5}{0.05^2} = 384$$

Data collection

Data for this study was collected from October to March 2015/16 which involved a sample of 384 local people that include dwellers of six villages, found in the study area (Pochalla, Pokedi and Ollaw from Agnua village and Puldiang, Mun and Gir from Nuer village) and the Gambella National Park staffs. Questioner survey, structured interview and focus group discussion (FGD) were used to collect data. Structured question were administered to members of the household on a random manner (Kumssa and Bekele, 2013). In the household survey, questioner was distributed to the respondents and training was provided for the data collectors prior to data collection. Focus group discussion was held to appropriately clarify validate information obtained through interview. One FGD was conducted in each sampled villages. The group size in each discussion varied from 10 to 15 people.

The questions used for interview and focus group discussion were mostly open-ended which included major human activities that affect wildlife and their habitats in the area, benefits and disadvantageous of agricultural investment to the local community, the presence and method of hunting and its impact on wildlife. Finally, they were asked if current Government policies have affected the Nile Lechwe and their habitats in the study area.

Data analysis

Responses to each question were coded priori to analysis. SPSS statistical package (software) version 20 was used to analyze the data. Results expressed in percentage and, for some variables, chi-square test was used to examine whether responses respondents from the six villages were significantly different. Data obtained from focus group discussion was analyzed through content analysis method (Field, 2000).

RESULTS

Socio-demographic characteristics of the respondents

The socio-demographic characteristics of the respondents were summarized and depicted on Table 1. Accordingly, the majority of respondents (252, or 66% of

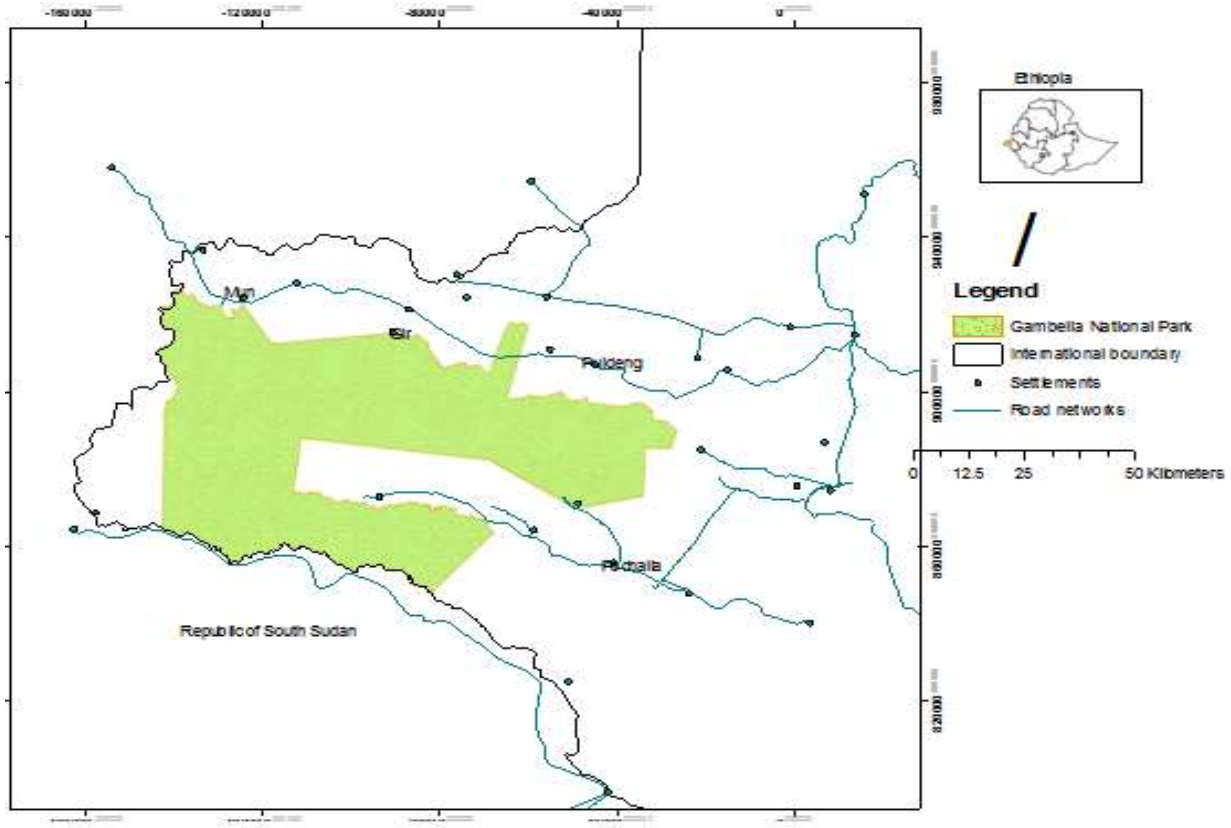

Figure 1. Map of the study area (Source: Extracted from Ethio- GIS).

Table 1. Socio-demographic information of respondents adjacent to Gambella National Park, Southwest of Ethiopia from October 2015 to March 2016.

Category	Frequency	Percent (%)
a) Gender		
Male	252	65.6
Female	132	34.4
Total	384	100
b) Ages in years		
18-27	162	42.2
28-37	83	21.6
38-47	75	19.5
48-57	40	10.4
Above 57	24	6.3
Total	384	100
c) Education level		
Illiteracy	325	84.6
Primary school	37	9.6
Secondary school	16	4.2
Above secondary school	6	1.6
Total	384	100
d) Income source		
Agriculture	217	56.5
Fishing	61	15.9
Employment	27	7
Hunting	35	9.1
Charcoal Making	24	6.3
Livestock keeping	20	5.2
Total	384	100

the total) were males, in the younger age group (i.e. 18 to 27 years old; 42%) and illiterate (85%). The mode of livelihood for most of them (57%) is agriculture, followed by fishing (16%) (Table 1).

Table 2. Habitats and population status (in the last decade) of Nile Lechwe in the study area, Southwest of Ethiopia.

Category	Frequency	Percent
a)Habitats		
Gambella National Park	206	53.6
Baro river basin	12	3.1
Alwero wetland	161	41.9
others	5	1.3
Total	384	100.0
b) Population status		
Decreasing	311	81.0
Increasing	15	3.9
Can't estimate	57	14.8
Stable	1	0.3
Total	384	100.0

Table 3. Factors reported by the respondents that contributed to the decrease in population and habitats of Nile Lechwe in the study area.

Factors	Frequency	Percent
Large scale Agriculture	139	36.2
Illegal hunting	51	13.2
Overgrazing	49	12.8
Habitat loss	41	10.7
Bush fire	23	6.0
Reduced of Alwero river for irrigation	38	9.9
Rice cultivation in the area	43	11.2
Total	384	100.0

Habitat and population status of Nile Lechwe in the study area

Most respondents indicated that preferred habitats of the Nile Lechwe in the study area are Gambella National Park followed by Alwero wetland. Perceptions of the respondents towards trends in population status of the Nile Lechwe within the year 2005 to 2015 indicate that 311(81%) of the respondents responded in decreasing trend (Table 2).

Factors affecting population and habitats of Nile Lichewe in the area

According to the responses of the respondents, the most anthropogenic factor adversely affect habitats and population of Nile Lichwe in Gambella which is a large scale agricultural investments (36%), followed by illegal hunting/poaching (13%) and livestock overgrazing (13%) (Table 3).

Of the 64 respondents interviewed in each of the six villages in the study area, 94 to 97% of them pointed out that agricultural investment (both small and large scale) have affected both population of the species and its habitats in the study area (Table 4). This result also indicated that, all villages have similar perception (x^2 = 2.133, df = 5, P = 0.830).

The present study also assessed the major source of fuel wood consumption in the study area. Source of fuel wood consumption in the study was significant (p=0.004) and most of the respondents replied that, they obtained fuel wood by harvesting from wild 268(69.8%) followed by collecting from farm after burning 78(20.3%) (Table 5).

Table 4. The presence and impact of Agricultural investment on Nile Lechwe in the study area.

Response	Villages						Total
	Pokeddi	Puchalla	Olaw	Gir	Puldiang	Mun	
yes	62	60	61	59	59	59	360
no	2	4	3	5	5	5	24
Total	64	64	64	64	64	64	384

x^2= 0.837 df= 5 P-value 0.008.

Table 5. Sources of fuel wood in the study area.

Source of fuel wood	Villages						Total
	Pokeddi	Puchalla	Olaw	Gir	Pudiang	Mun	
Harvesting from wild	50	48	47	45	35	43	268
Buying from market	5	9	9	8	3	2	36
Collecting from farm after Burning	9	7	8	11	26	17	78
Others	0	0	0	0	0	2	2
Total	64	64	64	64	64	64	384

x^2= 41.626 df = 15 p-value 0.004.

Table 6. Hunted animals in the study area.

Species	Frequency	Percent
Nile Lechwe	191	49.7
African elephant	57	14.8
White ear kob	47	12.2
Bush Buck	39	10.2
Primates	16	4.2
Others	34	8.9
Total	384	100.0

Regarding hunting as threat to Lichwes, half of the respondents indicated that Nile Lichwe the most frequently hunted animal species in the area is followed by the African elephant (as reported by 57(15%) of the respondents (Table 6).

However, the respondents further indicated that hunting, including Lichwe, is practiced as primary economic activities (Table 7), with similar frequency of responses among the study villages (x^2 = 7.696, df = 5, P = 0.174). Over half (56%) of the respondent mentioned that people use gunshot for hunting (Table 8), with significant difference among villages (x^2 = 25.071, df = 10, P <0.05).

RESULTS

Similar to the individual Respondents, about three fourth of the discussant replied that the most devastating human factors to wildlife in the study area were hunting, overgrazing, wildfire, fish hunting, agricultural expansion and habitat loss in order of importance. On the other hand, the most predominant human factors particularly to the population of Nile Lechwe were large scale agricultural expansion in and around the Gambella national park, irrigation for rice cultivation, illegal hunting, overgrazing, charcoal making, wildfire in order of importance in the study area. Moreover, they had

Table 7. Hunting activities across the study villages adjacent to Gambella National Park, Southwest of Ethiopia.

Hunting as an activity	Villages						Total
	Pokeddi	Puchalla	Olaw	Gir	Puldiang	Mun	
Primary activity	10	5	7	14	6	7	49
Secondary activity	54	59	57	50	58	57	335
Total	64	64	64	64	64	64	384

x^2= 38.242 df= 5 P=0.000.

Table 8. Hunting tools adjacent to Gambella National Park, Southwest of Ethiopia.

Hunting tools	Villages						Total
	Pokedi	Puchalla	Olaw	Gir	Puldiang	Mun	
Shotgun	30	34	30	46	40	35	215
Locally manufactured trap	12	10	18	7	17	18	82
Spear	22	20	16	11	7	11	87
Total	64	64	64	64	64	64	384

informed that the presence of agricultural investment intheir locality did not benefit the local people except some employment opportunities, rather this investment activity exploit the natural resource of the area in turn affect the population of wildlife and their habitats.

The village of Pokedi serves as an example of the consequences of Saudi Star's operations. Domestic investors are encroaching on land to its north side while Saudi Star has cleared the land to its south. The damming of the Alwero river will affect the village's local industry just as it receives a population influx from relocated communities. Combined with ongoing raids by neighboring tribes, Pokedi's economic and social future looks bleak.

Almost all the discussant responded that illegal hunting is common in the study area even there were professional hunters whose livelihood mainly relies on hunting and are both individual and group hunters. The majority of hunters use the shotgun for hunting. This is a good indication that, illegal hunting is one of the most anthropogenic factors which affect the wildlife in the study area.

Regarding the effects of government investment policies on the Nile Lechwes and their habitats, one third of the discussants revealed that though the policy dictates, investment activities are sometimes undertaken without considering the side effect of the investment on the environment and the surrounding local communities and even without creating awareness among the local communities.

Besides they also indicated that the government and other stake holders should create awareness and if possible provide alternative means of income generation to tackle the situation present in the study area.

DISCUSSION

The present study identified that, most predominant human activities which affect wildlife and their habitat in the study area were large scale agricultural expansion, illegal hunting, overgrazing, habitat loss, rice cultivation in the area and bush fire. Similar findings were reported in different corners of Ethiopia (Stephens et al., 2001; Mamo and Bekele, 2014; Tadesse and Kotler 2013) and by Kiringe and Okello (2007) in Kenya in which the major threats to protected area biodiversity were illegal killing of wildlife for bush meat and recent agricultural expansion and other incompatible land use changes.

Large scale Agricultural expansion is the most anthropogenic factor recorded in the present study particularly for Nile Lechwe because large scale rice cultivation resulted in the reduction of the wetland. The Ethiopian Wildlife Conservation Authority (EWCA) estimates that some 438,000 ha of land have been awarded to investors, in early 2008 in the vicinity of the Gambella National Park, all without carrying out Environmental Impact Assessments. Wetlands, with

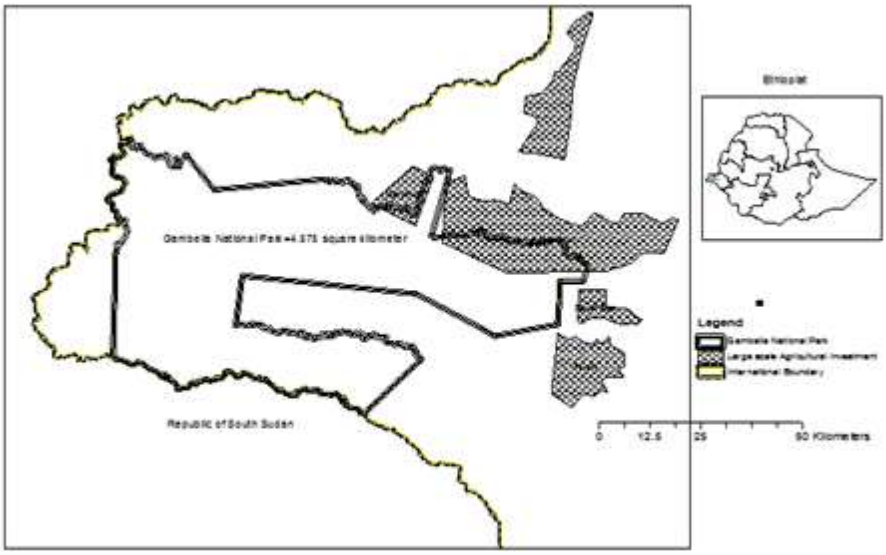

Figure. 2 Large scale agricultural investment in the buffer zone of Gambella national park.

abundant fish populations and birdlife are presently being converted to rice production while extensive forest cover in nearby areas has been completely cleared. The present findings revealed that more than 93% of the respondents replied that the presence of agricultural investment in the study area affected both the habitat and the population of Nile Lechwe.

Figure 2 revealed that the large scale agricultural investment in the buffer zone of Gambella national park tried to engulf the park itself. The finding indicated that the major threat which encountered wildlife by humans were agricultural expansions and illegal hunting. As advocated in the study, the agricultural expansions were due to the large scale agricultural organization at the adjacent part of the national park in the area. Populations of the study area are more of small holder and agro pastoralist which have little experience in agricultural practiced as compared to the highland parts of Ethiopia besides, among six study villages with highest agricultural expansion as indicated in Pokedi village found around Alowero swampy area, which is the key area where Nile Lechwe (*K. megaceros*) is found (Rolkier, 2015). Since Nile Lechwe is a non-migratory and wetland lover antelope, its population has been declining in the meantime.

Hunting for harvesting of bush meat for food and other purpose is one of the foremost issues confronting the management of the protected areas and life in the communities adjacent to the national park. As most this hunting is illegal, the actors are involved to face a continuous threat of adverse reactions. At the same time, hunting for subsistence and to some extent commercial reasons is a historically important activity to the communities with salient cultural and social dimensions in addition to the direct benefits of providing food or other income for survival reasons. In the present finding from the focus group discussion a clear majority of the discussants reported that, hunting is an important activity in their village. The Findings of the present study also revealed that, more than 12% of the respondents replied that their daily lives are mostly interconnected with hunting which indicate that hunting is one of the most anthropogenic activities which affect the wildlife population in the study area (Table 7). Majority of the respondents in the study area practice group hunters and use shotgun for hunting. As expected, shotgun hunting was the most popular method of hunting, because it enabled the killing of larger game within a shorter period, and was, therefore economically more profitable (more meat with less hunting effort). Another reason for the popularity of shot gun hunting was that, trapping is considered inefficient and dangerous, since the traps sometimes catch non-targeted dangerous animals (e.g. snakes), and the trapped target animals could be stolen, often together with the trap.

Major threats to wildlife by human which occurred in highland part of Ethiopia is habitat shrinkage (fragmentation) and agricultural expansions as reported

by Kumsa and Bekele (2013) and Ashenafi and Leader-Williams (2005) but in contrary to this study, illegal hunting was not reported as a major threat by highland parts of the country, however, in Africa particular Tanzania where Serengeti national park found similar problem was reported by Bitanyi et al. *(*2012). Gambella national park is one of the protected Areas in Ethiopia where the second highest seasonal migration of large and medium size mammal's population occurred in Africa next to Serengeti National park. Hence the problems such as illegal hunting should not be considered as simple threat because hunting conducted by gun fire (modern fire arms) has a big problem for wildlife existence and conservation management (Tedla, 1995).

Another anthropogenic disturbance of wildlife was wildfire in the study area which is mostly associated with land-use practices and changes. The property, health and welfare of people in these areas are negatively affected by direct and indirect consequences of fire and air pollution. Active involvement of the local people has therefore been recognized as a condition for the successful implementation of fire management programmes, especially at the interfaces between wild lands, managed systems and residential areas (Johann et al., 2002).

Fuel wood plays an important role in human activities like fish smoking and charcoal production in every community. Although, most of the communities obtained energy sources from fuel wood, this situation has many side effects in the destruction of natural resource. Inline to this view the present study revealed that majority of the respondent replied that, fuel wood is obtained by collecting from the wild.

CONCLUSION AND RECOMMENDATION

From these findings, the major human activities that impacts on the Nile Lechwe (*K. megaceros*) of the study area were agricultural investment and illegal hunting. The large scale agriculture activities close to the protected area produce effect to the wildlife resource in the area.

Therefore, any development practice should give consideration and attention to the rapidly declining natural resource beside the development. Hence there should be choral relationship between agricultural investments and conservationist as well as finding out possible ways in which both activities go harmonically side by side.

Once more it is the duty of the Government and Developmental Entities of the country to give more attention which further investigate the problems and mitigate the effects of the human factors.

ACKNOWLEDGEMENT

Authors acknowledge Gambella University for funding the research project. Our gratitude also goes to the study village communities for their kind support in facilitating this study.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

Adugnaw B (2014). Environmental Degradation and Management in Ethiopian Highlands: Review of Lessons Learned. International Journal of Environmental Protection and Policy 2(1):24-34.

Andren H (1994). Effects of habitat fragmentation on birds and mammals in landscapes with different proportions of suitable habitat: a review. Oikos 71(3):355-366.

Ashenafi ZT, Leader-Williams N (2005). Indigenous common property resource management in the Central Highlands of Ethiopia. Journal of Human Ecology 33(4):539-563.

Berry L (2003). Land Degradation in Ethiopia: Its Extent and Impact. Commissioned by the GM with WB support, pp. 2-7.

Bitanyi S, Nesje M, Kusiluka L, Chenyambuga S, Kaltenborn B (2012). Awareness and perceptions of local people about wildlife hunting in western Serengeti communities. Tropical Conservation Science 5(2):208-224.

Biodiversity Indicators Development National Task Force BIDNTF, (2010). Overview of Selected Biodiversity Indicators. Ethiopia, Addis Ababa. p. 23.

The conservation strategy of Gambella CSG, (2000). Volume I the resources base. The Gambella peoples' National Regional state. Bureau of planning and Economic Development unpublished report.

EWCA (2014). About Gambella national park. Federal Negarit Gazette, 2015. Council of Ministers Regulation to Provide For the Designation of Gambella National Park Regulation.

Field AP (2000). Discovering Statistics Using SPSS for Windows: Advanced Techniques for the Beginner. Sage Publications, London.

Hillman JC (1993). Ethiopia: Compendium of Wildlife Conservation Information 1. NYZS and EWCO, Addis Ababa.

Johann GG, Peter GF, Mike J, Evelien MK, Teri K, Soo IM, Manuel P (2002). Community participation in integrated forest fire management: experiences from Africa, Asia and Europe. In Communities in Flames; Proceedings of an International Conference on Community Involvement in Fire Management, Balikpapan, Indonesia (25-28 July 2001). Bangkok: FAO Regional Office for Asia and the Pacific. RAP Publication 25:33-52.

Kiringe JW, Okello MM (2007). Threats and their relative Severity to Wildlife Protected areas of Kenya. Applied Ecology and Environmental Research 5(2):49-62.

Kumssa T, Bekele A (2013). Human-Wildlife Conflict in Senkele Swayne's Hartebeest Sanctuary, Ethiopia. Journal of Experimental Biology and Agriculture Sciences 1(1): 33-38.

Mamo Y, Bekele A (2011). Human and livestock encroachments into the habitat of Mountain Nyala (Tragelaphus buxtoni) in the Bale Mountains National Park, Ethiopia. Journal of Tropical Ecology 52(3):265-273.

Mann H, Smaller C (2010). Foreign land purchases for agriculture: What impact on sustainable development? Sustainable Development Innovation Briefs. New York, US: United Nations.

Mohammed K, Afework B (20140. Threats to Mammals on Fragmented Habitats around Asella Town, Central Ethiopia. International Journal of Biodiversity 20:1-15.

Stephens PA, d'Sa CA, Sillero-Zubiri C, Leader-Williams N (2001). Impact of livestock and settlement on the large mammalian wildlife of Bale Mountains National Park, southern Ethiopia. Biological Conservation. 100:307-322.

Rolkier GG, Yehistial K, Prasse R. (2015). Habitate map of distribution of key wild animal species of Gambella national park. International Journal of Innovative Research and Development 4(4):240-259.

Schloeder CA (1999). Investigation of the determinants of African Savanna vegetation distribution: a case study from the lower Omo basin, Ethiopia. PhD. Dissertation, Utah State University, Logan.

Tadesse SA, Kotler BP (2013). The impacts of humans and livestock encroachments on the habitats of mountain nyala (Tragelaphus buxtoni) in Munessa, Ethiopia. International Journal of Biodiversity and Conservation 5(9):572-583.

Turner BL, Clark WC, Kates RW, Richards JF, Matthews JT, Meyers WB (1990). The earth as transformed by human action. Cambridge University Press, Cambridge.

Vitousek PM, Mooney HA, Loobehenco J, Melillo JM (1997). Human domination of Earth's ecosystem. Science 277:494-499.

Wuver AM, Attuquayefio DK (2006). The Impact of Human Activities on Biodiversity Conservation in a Coastal Wetland in Ghana. West African Journal of Applied Ecology 9:1.