RESEARCH ARTICLE

ASSESSMENT OF ANTHROPOGENIC FACTORS AFFECTING PROTECTED AREA: THE CASE OF SENKELE SWAYNE'S HARTEBEEST SANCTUARY, SOUTH EASTERN ETHIOPIA

*,1Mustefa Sultan and 2Teyiba Amano

1Arsi university, Asella, Ethiopia
2Hawassa University, Wondo Genet College of Forestry and Natural Resource, Wondo, Ethiopia

ARTICLE INFO	ABSTRACT
	The study on the anthropogenic factors affecting protected area was carried out in Senkele Swayne's Hartebeest Sanctuary (SSHS). Survey questionnaires, key informant interview (KII), Focus group discussion (FGD), direct observation and literature reviews were employed to collect primary and secondary data. Four kebeles were purposefully selected from 8 kebeles surrounding SSHS. Thereafter, about 151 households were selected for survey. The FGD involved 40 households at the rate of 10 households per kebele were purposefully selected whereas about 2 experts from each 5 relevant offices and 2 Aba Gada, which accounts a total of 12 key informants were purposefully selected for KII. The study revealed that the major human activities affecting SSHS were overgrazing, uncontrolled fire, illegal settlement, deforestation, agricultural expansion and poaching as replied by 66.3%, 8.6%, 7.3%, 13.2%, 2.6% and 2.0% respondents respectively. The causes for anthropogenic factors were mainly scarcity of land, enormous livestock and fast population growth as reported by 28.5%, 23.2% and 26.5% respondents respectively. About 37.7%, 27.2%, 15.2% and 19.9% of the respondents indicated that loss of biodiversity, wildlife depletion, increases in poverty and decline in agricultural productivity as the main effect of human induced factors to the sanctuary respectively. The survey result also indicated that 31.1%, 27.2%, 15.9%, 13.2% and 3.3% respondents suggested creating employment opportunity for local community, solving local community's problem, benefit sharing and Ecotourism development as principal solution to anthropogenic factors to SSHS respectively. In conclusion, the survey results revealed that local communities were highly dependent on the sanctuary particularly for livestock grazing. Currently conservation measure being taken at the sanctuary is not hopeful. Therefore, developing alternative means of livelihood for local communities and enhancing livestock quality by reducing its quantity is vital to balance the interest of local community and sustainability of the sanctuary.

INTRODUCTION

Background and justification

As defined by the International Union for the Conservation of Nature (IUCN,1994), "A protected area is an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means". Protected area is seen as a key to conserving natural resources, on land and at sea globally. Currently, about 30,000 protected areas meet the IUCN definition of conservation (Green and Paine, 1997). Ethiopia is among a few countries in the world that possesses a unique

*Corresponding author: Mustefa Sultan,
Arsi university, Asella, Ethiopia.

feature of fauna and flora with a high level of endemism (Jacobs and Schloeder, 2001). On the other hand, the challenges facing the conservation of Ethiopian wildlife today are becoming increasing in alarming rate. As agricultural productivity is very low, increase in food production depended on increasing the area under cultivation and grazing. Usually, agriculture expansions are at the cost of wildlife resources leading to the loss of flora, fauna and their habitats (Leykun, 2000). To conserve natural resources, Ethiopia has established many protected areas such as National Parks and Sanctuaries, which are referred to as principal conservation areas, cover only approximately 2.9% of the country's surface area (Leykun, 2000). The Senkele Swayne's Hartebeest Sanctuary (SSHS) is among the Protected Areas in Ethiopia. The Sanctuary was established in 1976 to protect the Swayne's hartebeest (*Alcelaphus buselaphus swaynei*). It is located between 7^0 10' N and 38^0 15' E (Messana and Netsereab,

1994). Swayne's hartebeest is one of the fifteen races of African hartebeest of which two are already extinct and Swayne's hartebeest is critically endangered. It was first discovered by Brigadier General Swayne in 1891-92 at Jijiga, as a herd of 300-400 and even herds of thousands were observed. As a result of the render pest outbreak, at the end of the 19th century, the number of Swayne's hartebeest (*Alcelaphus buselaphus*) decreased to 880 (Hunting Technical Service Ltd, 1976). This subspecies which was formerly found in both Somalia and Ethiopia is now limited only to a few localities in Ethiopia. Senkele area had the largest population of Swayne's hartebeest in 1973. The 200 km^2 area occupied by the hartebeest in 1972 was reduced to about 58 km^2 in 1973, and then to 36km^2 (Messana and Netsereab, 1994).

At present, less than 28 km^2 of sanctuary remains for the Hartebeest (kumsa, 2006). In the Senkele Plains, in the late 1960s, areas of pasture were increasingly brought under cultivation and the pressure on remaining pasture was intensified (Messana and Netsereab, 1994). At present rapid degradation and depletion of the forest resource base is already finding its expression in the different sectors of the economy such as agriculture, water resources, energy and biodiversity. Therefore, the main focus of the study was to assess anthropogenic factors affecting Senkele Swayne Hartebeest Sanctuary.

Statement of the problem

Having a wonderful biodiversity and natural resources, Ethiopia has had much complexity in protecting it since the establishment of a Conservation and Protected area Program in 1965 (Jacobs and Schloeder, 2001). Nowadays, the country has lost key plain species like the black rhinoceros and other species now face the threat of extinction (IUCN, 1996). Due to the lack of data, there also cause for concern over how many other species may be at risk (Hillman, 1993a). Furthermore, several of Ethiopia's protected area exists on paper only, while some have declined in size (Jacobs and Schloeder, 1993). These problems are the result of human encroachment and conflicts among the different local communities surrounding for most protected areas. The SSHS is affected by human and/or livestock interferences since 1991 when disorder prevailed in protected areas of Ethiopia due to political unrest. Like others protected areas of Ethiopia; conflicts between local communities' and SSHS are the challenge in management of SSHS. Accordingly, the local communities devastated the SSHS by overgrazing. In the surrounding area, livestock and crop production are the major sources of income. The Sanctuary is the only grazing land in the area and over 10,000 cattle depend on the area (Kumsa, 2006). The subspecies is threatened by further loss of habitat to subsistence agriculture, overgrazing by domestic cattle and by increasing number of new settlements in and immediately around the Sanctuary (Kumsa, 2006).

These factors make Swayne's hartebeests of Senkele in greater danger of extinction at present than any other time in the past. As far as analysis of different literatures indicated, most of the previous studies focused only on the effects of protected areas; however, factors influencing these effects are the basic to be studied. Therefore, the current study attempted to contribute towards filling this gap in terms of designing and implementing sustainable management of the protected area particularly that of SSHS.

MATERIALS AND METHODS

Description of the study area

The study was conducted in Senkele Swayne's Hartebeest Sanctuary, Oromia Regional State, Ethiopia. It is located at 53 km south of the Shashemene-Arba Minch road close to the town of Aje and 320 km away from Addis Ababa. It is located between 7^0 10' N and 38^0 15' E. The altitude of the Sanctuary is estimated to be ranging from 2000 to 2100m ASL. The Sanctuary was established in 1976 to protect the Swayne's hartebeest (*Alcelaphus buselaphus swaynei*), a mammal endemic to the country. The 200 km^2 area occupied by the Hartebeest in 1972 was reduced to about 58 km^2 in 1973, and then to 36 km^2 due to settlement expansion (Messana and Netsereab, 1994).
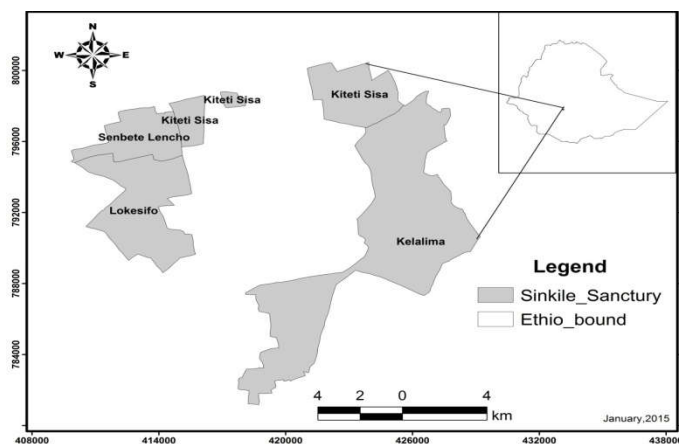

Figure 1. Map of Senkele Swayne's hartebeest sanctuary

The vegetation communities at the sanctuary, based on the height of grass, are Pennisetum Grassland type, Mixed Grassland and the vegetation in the Sanctuary is best described as montane savanna and comprises various habitat associations such as savanna woodland, natural grassland (with fewer tree and shrubs) and, in the valleys, rich shrub land (Tekle, 1996). In addition to the Swayne's Hartebeest, other wild animals that inhabit the Sanctuary were Bohor Reedbuck *(Redunca redunca)*, Warthog (*Phacocoerus aethiopicus*), Greater kudu (*Tragelaphus strepsiceros*), Oribi (*Ourebia ourebi*), vervet monkeys (*Cercopithecus aethiops*), Crested porcupine (*Hystrix cristata*), Aardvark (*Orycteropus afer*), Abyssinian hare (*Lepus habessinicus*) and Spotted hyenas (*Crocuta crocuta*) (Tekle 1996).

Research methodology

The major activities of the study were started by conducting a reconnaissance survey in and around SSHS from December 2014 to January 2015 time frame. After a reconnaissance was done, sampling design for household survey and other concerned stakeholders were undertaken and finally, sample size determination was made.

Study population

The researcher was selected Siraro woreda kebeles surrounding SSHS as population of the study. There were three target groups selected to collect the required information for this study. The first group was respondents for household

survey from surrounding four target kebeles including Loke sifo, Senbete lencho, Kela lalima, and Kite tesisa. The second group was from community representatives living in and around the sanctuary for Focus Group Discussion. The third group was Aba Gada[1] and experts from concerned offices at Siraro woreda including Cultural and tourism office, Agriculture office, Land and Environmental protection office, Small and micro enterprise and SSHS for key informant interview.

Sample size determination and sampling procedure

The households Kebele who were part of the study were purposefully selected from Siraro wereda surrounding area of Senkele Swayne's Hartebeest Sanctuary. Four kebeles were purposively selected to address the research questions and objectives of the topic under the study. This is due to the fact that those kebeles are surrounding the sanctuary and they have high intervention with the sanctuary. Those kebeles are Loke Sifo, Senbete Lencho, Kela Lalima, and Kite Tesisa. Accordingly, each has a total household of 1588, 1200, 1064, and 924 respectively. Sample size was determined by considering margin of error (8%)

$$n = N/ [1+N (e)^2]$$……………………….. (Israel, 1992)

Where; N = the total population that will be studied=4776

n = the required sample size
e = the margin of error which is = (8%)
$n = N/ [1+N (e)^2]$
$n = 4776/ [1+4776(0.08)^2]$
n = 151

To get the distributions of sample size across each kebeles we calculate by using formula:

$n' = n(N'/N)$
$n'= 151(1588/4776)$
$n'= 50$…………..

So the distributions of sample size across the kebeles are 50, 38, 34 and 29 for Loke sifo, Senbete lencho, Kela lalima and Kite tesisa correspondingly. Based on the name list of member households in each kebeles households were selected using random sampling technique.

Data sources and data collection tools

Both primary and secondary data were used in the study. Primary data were collected through household survey, key informant interviews, focus group discussions, and direct observation. Secondary data were collected from published and unpublished materials sources.

Structured questionnaire

Questionnaire consisting of both open and close ended questions were used to obtain information from the samples of 151 households selected from four kebeles. The questionnaire surveys were used to generate quantitative data and it was translated into Afaan Oromoo before administration. The actual questionnaire survey were preceded by a pilot testing

using five questionnaires in two kebeles (Bitana Kubi and Jarti Bokole) which were not to be sampled. Based on the feedback obtained adjustments were made in the questionnaire. The data collection was carried out with the help of the scouts of the Sanctuary. Before the commencement of data collection, training was given to the enumerators on how to fill out the questionnaires and how to approach sensitive questions related to illegal activities. To gain people's confidence, the purpose of the study was clearly presented to the respondents. The questionnaire was alternating male and female respondents and different age groups.

Key informant interview

For the purpose of this study, semi-structured questionnaires were delivered. Key informants were selected from different offices of the woreda depending on their relevance to the issue under study. The offices from which key informants were selected include Culture and Tourism office, Agriculture office, Land and Environmental Protection office, Small and Micro Enterprise, SSHS and Aba Gada[1]. Accordingly, a total of 12 Key interviewees (two Aba Gada, and two experts from each of the offices mentioned above) were selected for the interview.

Focus group discussion

Focus group discussion is important data collection tool to generate the qualitative information on the issue. The FGD involved 40 households, at the rate of 10 households per kebele. The discussants were community representatives, religious leaders', women, local elders and landless young groups resident in the kebeles.

Direct observation

Field observation is another method applied to shed more light on the status of issues under investigation in the study area. It was also used to verify information and compare responses gathered by other data collection tools. During field observation, the study site was visited and photos of the site and notes were taken. Thus, the researcher opinion on his visit of the study area was included in the analysis.

Secondary data collection

The use of secondary sources plays a major role in the field research, especially at the study area. In an effort to make this research more valid, creditable and applicable secondary sources which are important to the study were reviewed. For this purpose, both published and unpublished sources were investigated systematically especially books, web pages, policy directives, reports, project papers, annual and action plans, etc which support anthropogenic factors affecting Sanctuary were reviewed and used in the discussion.

Method of data analysis

Data collected from house hold survey was coded and entered into Statistical Package for Social Science (SPSS). The results of analysis were interpreted and presented using descriptive statistics (frequency and percentages) through Tables, Graphs, and Charts. Chi square tests were used for selected variables to determine the degree of dependence between independent

Aba Gada[1] is a community leader in Gada system of Oromo society

variables. Data gathered through key informant interview, focus groups discussions and direct observation were used to support the quantitative data.

RESULTS AND DISCUSSION

Socio-economic characteristics of sample households

Contribution of the different economic activities to the Sample households' annual income

The annual share of the respondents' income from crop, livestock, forest, trade and hired labor are presented in Table 1 below.

About 28.5% of the respondents indicated that 21-30% of their annual share of income was obtained from crops while equal respondents (19.9%) acquired about 31-40% and <10%. However 3.3% respondents did not earn from crop production. Similarly, the results in the above table revealed that 24.5% of the respondents received 41-50% of their annual income from livestock rearing while 21.9% and 19.9% of the respondents received 10-20% and 31-40% of their annual income from livestock respectively.

annual share of respondents' income from hired labor was null. Based on key informant interview, livestock rearing takes the lion's share in local community source of income for livelihood as the local communities had high number of cattle. In general the above result showed that the level of livelihood diversification in local communities in and around SSHS was low. This in turn may have forced the local communities to heavily depend on the resources of the sanctuary and thereby becoming a threat to its existence. According to Brockman, (1962), threats to protected areas are driven by fundamental causes such as poor governance, poverty, inappropriate policies, inadequate financial resources, greed and lack of alternative livelihoods.

List of livestock holding of respondents

Livestock production plays an important role in Ethiopia's economy. The same is true for respondents around the study area as shown in the table below.

As indicated in Table 2 above, 26.5% of the respondents owned 11-20 cattle whereas about 25.8% respondents owned 1-10 cattle. Likewise, 19.9% respondents had about 21-30 cattle. Majority (88.8%) of the respondents had 1-10 equines

Table 1. Contribution of the different economic activities to the annual income of the households

Variables	(0%)		<10%		10-20%		21-30%		31-40%		41-50%		>50%	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Crop	5	3.3	30	19.9	25	16.6	43	28.5	30	19.9	6	4.0	12	7.9
Livestock	4	2.6	10	6.6	33	21.9	29	19.2	30	19.9	37	24.5	8	5.3
Forest	62	41.1	60	39.7	17	11.3	10	6.6	2	1.3	-	-	-	-
Trade	123	81.5	14	9.3	7	4.6	3	2.6	-	-	-	-	-	-
Hired labor	151	100	-	-	-	-	-	-	-	-	-	-	-	-

Table 2. List of livestock respondents own

Variables	Number of livestock											
	0		1-10		11-20		21-30		31-40		>40	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Cattle	1	.7	39	25.8	40	26.5	30	19.9	16	10.6	19	12.6
Equines	11	7.3	140	88.8	-	-	-	-	-	-	-	-
sheep	127	84.1	10	6.6	8	5.3	-	-	-	-	-	-
Goat	47	31.1	38	25.2	41	27.2	19	12.6	-	-	-	-

Table 3. Land holding size of sample households

Do you own land inside or adjoining the sanctuary?									
Variables	Number of respondents				Percent				
yes	130				86				
No	21				14				
Total	151				100				
Variables			Land size							

Variables	0 hectare		<1 hectare		1-<2 hectare		2-5 hectare		>5 hectare	
	No.	%	No.	%	No.	%	No.	%	No.	%
Farm land	3	2.0	61	40.4	66	43.7	-	-	-	-
Grazing land	130	86	21	14	-	-	-	-	-	-
Others	116	76.8	11	7.3	3	2.0	-	-	-	-

These results indicated that crop production and livestock rearing were the major sources of income for the surrounding community. Moreover, 39.7% of respondents earned <10% of their annual income from forest while 11.3% obtained 10-20% income from forest. Besides, majority (81.5%) of the respondents didn't get income from trade at all; while about 9.3%, 4.6% and 2.6% respondents annual income from trade was <10%, 10-20% and 21-30% respectively. In contrast,

while only 7.3% of the respondents had no equines. Most (84.1%) of the respondents had no sheep while only 6.6% and 5.3% had 1-10 and 11-20 sheep respectively. The results showed that 27.2% of the respondents had 11-20 goats whereas 25.2% respondents had 1-10 goats. The relative abundance of cattle was high in the study area while the livestock population around the study area was dependent on the sanctuary. Therefore, overstocking of livestock in the sanctuary was

resulting in overgrazing and increasing foraging competition between livestock and wild animals. In line with this, Fassil (1996) stated the problems facing the Swayne's hartebeest were primarily due to a reduction of the habitat and the consequent competitions with man and domestic animals.

Land holding size of respondents

As indicated in Table 3 above, about 43.7% respondents had 1-<2 hectare of farm land while 40.4% of the respondents had <1 hectare. However, there was no significance difference among kebeles in owning farm land adjacent to the sanctuary. In difference, kumsa, (2006) stated that the land holding of majority of the households in Senkele area was less than 0.5 hectare. This is a strong indication that the very small landholding might have forced the local communities to encroach to the sanctuary. Similarly, the result above indicated that majority (76.8%) of the respondents had no land for other use (plantation, settlement) while 7.3% and 2.0% of respondents had <1 hectare and 1-<2 hectare respectively. Additionally, most of the respondents (86%) had no grazing land whereas about 14% had <1 hectare. Regarding to graze land, the critical value of $\chi 2$ is 11.345 at 1% significance level with degree of freedom 3 which is less than calculated $\chi 2$ which is 19.12. This value indicates that there was a significant difference in owning grazing land at 1% significant level. Most the respondents in Loke Sifo kebele have their own grazing land; contrarily none of the respondents in senbete lencho have their own grazing land. This is due to relatively high human population and high distance of Loke sifo kebele from the sanctuary. Generally, SSHS is the main pasture land in the district. According to Birdlife International (2003), SSHS is the only available grazing land in the zone and over 10,000 cattle depend on the area.

Respondents dependency on the sanctuary for livelihood activities

As indicated in Table 4 below, majority of the respondents (94.7%) were dependent on the sanctuary while only 5.3% of the respondents did not depend on the sanctuary for livelihood. The critical value of $\chi 2$ is 11.345 at 1% significance level with degree freedom of 3 which is less than 11.52. This value indicated that there was a significant difference among the kebeles in dependency on sanctuary for livelihood at 1% significant level. This might be due to the variation distance of each kebeles from the sanctuary. Respondents depended on the sanctuary mostly (62.3%) for grazing. The results also indicated that 9.9%, 11.3% and 3.3% of the respondents depend on the sanctuary for farming, settlement and collection of fire wood respectively. However, 0.7% of respondent reported that they depended on the sanctuary for hunting. Additionally, the information from key informant interview revealed that the problem of grazing land has been increasing from time to time as the number of livestock was increasing in the area while there was no another graze land in the area. According to Messana and Netsereab (1994), there was no wide pasture land to graze livestock in the senkele area except the sanctuary. In general local communities were highly dependent on the sanctuary mainly for grazing and settlement expansion. Consistent with this survey, Kumsa (2006) summarized that the Swayne hartebeest is threatened by further loss of habitat to subsistence agriculture, overgrazing by domestic cattle and by increasing number of new settlements in and immediately around the Sanctuary.

Table 4. Respondents dependent on the sanctuary for their livelihood activities

Variables	No .of respondents	Percent (%)
Yes	143	94.7
No	8	5.3
Total No of Households	151	100
Resources of the sanctuary needed by the respondents		
Land for farming	15	9.9
Land for grazing	94	62.3
Hunting	1	0.7
Wood for fire	5	3.3
Settlement	17	11.3
Land for grazing and wood for fire	9	6.0
For others purposes(medicinal plant, recreation)	2	1.3
Total No of Households	143	94.7

Local communities current access to the sanctuary

About 46% of respondents replied the current access to utilize the sanctuary by local community was medium whereas 21%, 22%, 6.0% and 5% respondents replied it was easy, hard, very easy and very hard respectively.
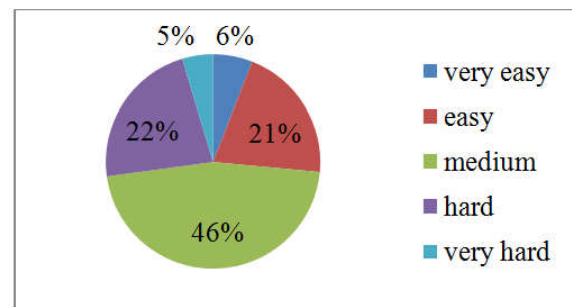

Figure 2. Current access to the sanctuary

Local community was access to sanctuary resources utilization, particularly grazing. During key informant interview experts from Siraro woreda culture and tourism office stated as, "The first means of access was legally where local community form association and used grass from the sanctuary for different purpose like construction of house, to made cultural materials and for livestock grazing in buffer zone where the utilization was regulated by sanctuary management. Those associations contributed to conservation of sanctuary by protecting it from illegal activities with scouts. The second is via illegal means where local community used area mostly for grazing due to lack of graze land outside sanctuary. These resulted in overgrazing, soil erosion and created conflict between local community and the sanctuary staff." Similarly the study carried out by Lumprey (1990) revealed, as population increases unsustainable land use practices outside the protected areas made life difficult. Thus, demand for available resources made people illegally use and then destroy the natural resources inside protected areas and getting into conflict with conservation authorities.

Feeling of the respondents on the size of the sanctuary and causes for shrinking

Among respondents, 53.0% replied that the size of the sanctuary was shrinking while 39.7% respondents replied there was no change on the size of sanctuary. In difference, 7.3% respondents reported as the size of the sanctuary was

expanding. Likewise Messana and Netsereab (1994) pointed out in the Senkele area in 1972 about 200 km^2 areas was occupied by the hartebeest. However, in 1973 it was reduced to about 58 km^2, and then to 36 km^2. Based on the various group discussions, local community consider the area of sanctuary as very large and were interested to take some part of land for other uses assuming that small area is enough to conserve wildlife.

Table 5. Views of the respondents on the size of sanctuary and causes for shrinking

Variables	No. of respondents	Percent
Expanding	11	7.3
Shrinking	80	53.0
No change	60	39.7
Total No of Households	151	100
Causes for shrinking		
Expanding of settlement	25	16.6
Expanding of agricultural land	9	6.0
Livestock grazing	46	30.5
Total No of Households	80	53.0

Among the respondents, 30.5% replied that the causes for shrinking of Senkele sanctuary was livestock grazing, whereas 16.6% replied the cause was the expansion of illegal settlement to the sanctuary. According to (Batty, 2002), Hartebeest range has been radically reduced due to habitat destruction, hunting and foraging competition with domestic cattle. Similarly during key informant interview Aba Gada Kabato Edamo Wabe confirmed the major current causes for sanctuary shrinking was expansion of illegal settlement, agricultural expansion and livestock grazing.

Communities feeling on what should be done with regarding to the size of the sanctuary

About 53.28% of the respondents replied the Senkele sanctuary area should be increased and fenced while about 39.74% respondents believed its area should be demarcated and fenced as it is. About 7.28% respondents replied its area should be reduced and fenced. Aba Gada, Jaldo Moti also stated that the sanctuary should be clearly demarcated and fenced as it is. However most of the respondent stated the area should be increased by assuming the government resettles them to Billito agricultural development in close proximity.
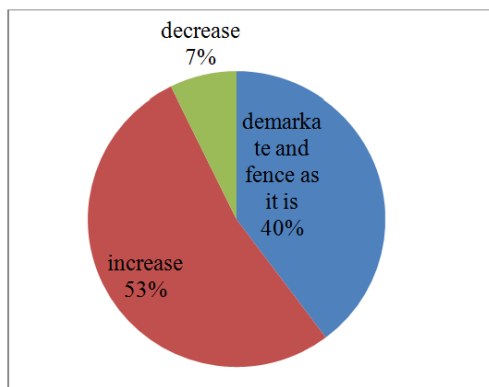

Figure 3. Communities feeling on the size of the sanctuary

Key informant interview declared that before 2013 the area was shrinked in an alarming rate due to various factors. However from 2013 onward the area was clearly demarcated

and there was no change in the size of the sanctuary. They also suggested that the area had to be fenced. Nevertheless some discussant stated that small area is enough to conserve wildlife and it had to be reduced. These respondents were interested to take some part of sanctuary for their livelihood. According to (kumsa, 2006), local communities around SSHS believe that Sanctuary had conserved large area beyond its need and they feel that small area is enough for the existing wildlife and some part of conservation area should be returned for them.

Communities feeling on the utilization of Senkele sanctuary resources if there were no restrictions

Most of the respondents (39%) were interested to use the sanctuary for grazing while about 30% were interested to expanding agricultural land if there were no restrictions. Similarly, about 16% respondents had interested to expanded settlement to the sanctuary.
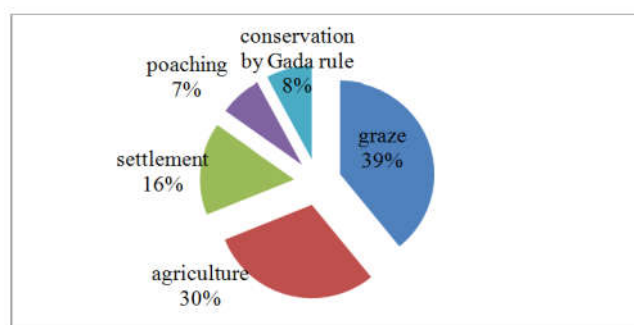

Figure 4. Communities feeling on the utilization of Senkele sanctuary resources if there were no restrictions

Additionally, Aba Gada stated that local community wants to share some part of land for settlement, grazing and agriculture. Corresponding to this Kumsa (2006) stated local communities around SSHS suggested that the Sanctuary management team have to allow them to use resources like pasture, firewood and access to grazing without restriction. As said by Aba Gada, according to Arsi oromoo culture when a son was married, parents had to give him a portion of land for agriculture, settlement and grazing. However currently there is high family size and shortage of land. Therefore, newly formed households could not inherit land in the original place and forced to encroach to the sanctuary.

The Distance between sanctuary and respondents house

As Fig. 4 showed the same proportion (40%) of the respondents lived very near (<1km) and near (1-5km) to the Sanctuary whereas 20% lived (5-10 km) away from sanctuary
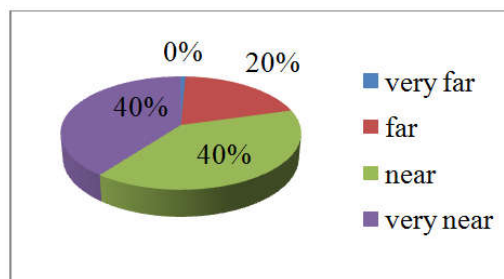

Figure 5. Pie chart of the distance between sanctuary and respondent's house

Majority of respondents lived on the immediate border of the Sanctuary. As the distance of sample household's house close to the sanctuary border the interference of local communities to the sanctuary will be increased. Therefore, buffer zone of the sanctuary is densely populated and this aggravated resource used from the sanctuary. According to Kumssa and Afework (2013), household census in and around the immediate border of the Sanctuary showed 229 huts. Additionally, as indicated by CSA (2007), the population density of Siraro woreda was 239/mk^2.

Anthropogenic factors, causes and effect to Senkele Swayn's Hartebeest Sanctuary

Anthropogenic factors affecting SSHS

As indicated in table 10 below the major anthropogenic factors affecting the SSHS includes overgrazing, deforestation, agricultural expansion, illegal settlement, uncontrolled fire and illegal hunting.

Table 6. Anthropogenic factors affecting SSHS

Variables	No. of respondents	Percent (%)
Overgrazing	100	66.3
Deforestation	20	13.2
Agricultural expansion	4	2.6
Illegal settlement	11	7.3
Uncontrolled fire	13	8.6
Illegal hunting	3	2.0
Total	151	100

Among the respondents, majority (66.3%) of the respondents replied that overgrazing was the major human induced threats to the sanctuary. However, 13.2%, 2.6%, 7.3%, 8.6% and 2.0% respondents replied deforestation, agricultural expansion, illegal settlement, uncontrolled fire and illegal hunting were the main threats to the sanctuary respectively. In accordance with this idea, Fassil (1996) summarized as Swayne's hartebeest are threatened by further loss of habitat to subsistence agriculture, overgrazing by domestic cattle and by increasing number of new settlements in and immediately around the Sanctuary.

Causes of anthropogenic factors affecting SSHS

Table 7. Causes of anthropogenic factors

Variables	No. of respondents	percent
Scarcity of land	43	28.5
Lack of awareness	15	9.9
Fast Population growth	40	26.5
Lack of benefit sharing	10	6.6
Damage caused by wildlife	2	1.3
SSHS management problem	6	4.0
High livestock number in the area	35	23.2
Total	151	100

Among the respondents, about 28.5% responded that scarcity of land was the basic cause for anthropogenic factors affecting SSHS whilst 26.5% respondents replied that fast Population growth was the major caused to anthropogenic factors affecting the sanctuary. However, about 23.2% respondents reported high livestock number in the area was the basic caused for anthropogenic factors affecting SSHS. The primary causes of anthropogenic factors affecting the sanctuary were

scarcity of land, fast population growth and high livestock number in the area. According to Kumssa and Afework (2013), the demand of the local people on the sanctuary grass is a function of many factors such as population growth, lack of awareness, enormous livestock number, lack of alternative animal forage and low-income source. Such factor sums up and makes the conflict in the Sanctuary even worse.

Effects of anthropogenic factors affecting the Senkele Swayne's Hartebeest

Among the respondents, about 37.7 % said that loss of biodiversity was the major effect caused by anthropogenic factors toward SSHS whereas 27.2% respondents reported that depletion of wildlife was the main effect caused by anthropogenic factors to the Sanctuary. However, 19.9% and 15.2% respondents responded declined in agricultural productivity and increased in poverty were the major effects caused through anthropogenic factors to SSHS respectively.

Table 8. Effects of anthropogenic factors affecting Senkele Swayne's Hartebeest

Variables	No. respondents	Percent (%)
depletion of wildlife	41	27.2
Increase in poverty	23	15.2
Loss of biodiversity	57	37.7
Decrease in agriculture productivity	30	19.9
Total	151	100

The most important effect of anthropogenic factors affecting SSHS are loss of biodiversity, depletion of wildlife population and increase in poverty. In line with this, Dudley, N. and A. Phillips (2006) confirmed that as many rural communities depend on protected forests, pastures, wetlands and marine areas for subsistence and livelihoods, protected areas contribute directly to the global agenda for sustainable development, poverty reduction and maintaining cultures.

Trends in the threat to SSHS

Majority (50.3%) of respondents reported that the threat to SSHS was increasing while about 33.1% were responded as the threat was decreasing. However about 16.6% respondents were determined as the threat was not changed for many years. In addition, as key informant interview stated the threats to SSHS were increased as the size of sanctuary was reduced due to different human induced problems. According to Fassil, (1996), further loss of habitat to subsistence agriculture, overgrazing by domestic cattle and increasing number of new settlements in and immediately around the Sanctuary make Swayne's hartebeests of Senkele in greater danger of extinction at present than ever.

Table 9. Trends in the threat to SSHS

Variables	No. of respondents	Percent (%)
Increasing	76	50.3
Decreasing	50	33.1
No change	25	16.6
Total	151	100

Ways of reducing threats to SSHS

Among the respondents, 31.1% replied that creating employment opportunity for local community was crucial to

reduce threats to SSHS while 27.2% indicated that solving local community problem was vital to reduce threats to the sanctuary. The principal ways to reduce anthropogenic factors affecting SSHS were creating employment opportunities for local community, providing benefit to local community, Ecotourism development (diversifying local livelihood activities) in the area, participating local community in decision making and solving local community's problem such as lack of clean water and grazing land.

Table 10. Major ways to reduce threats to SSHS

Variables	No. of respondents	Percent
Ecotourism development	20	13.2
Benefit sharing to local community	24	15.9
Compensation to wildlife damage	5	3.3
Participating local community in decision making	14	9.3
Creating employment opportunity for community	47	31.1
Solving local community problem	41	27.2
Total	151	100

Additionally, Aba Geda, Kabato Edamo Wabe stated "government should balance the interest of local communities and conservationist for sustainability of the sanctuary. The major interests of local communities were benefit sharing, participating in decision making, to get alternative grazing land, to get clean water and employment opportunity". The critical value of $\chi2$ is 11.345 at 1% significance level with degree freedom of 3 which is less than calculated $\chi2$ which is 39.93. This value shows that there was a significant difference among the kebeles in participation in management and decision making of the Sanctuary at 1% significance level. Most respondents from Loke Sifo kebele were participated in management and decision making process of the sanctuary. Participating local communities in conservation and management of SSHS is vital for sustainability of SSHS. In line with this Martinet and McNeely (1992) stated that managers have realized that conservation efforts that are not supported by the local people are bound to fail.

Conclusion and Recommendation

In the present study, the major human induced problems to the sanctuary were identified. Socio-economic characteristics of local communities were determined in relation to anthropogenic factors affecting the sanctuary. Other factors related to human induced problems to the sanctuary were assessed. The study provides important insight about the anthropogenic factors that affects the sustainability of protected area particularly of Senkele Swayne's hartebeest sanctuary. It also indicated areas of intervention for concerned institutions and used as a reference for further study. The major sources of income for livelihood of local communities in senkele area were farming with a mixture of crop cultivation and livestock rearing. Among the socio economic problems, lack of livelihood diversification, scarcity of agricultural land, lack of graze land and enormous cattle are the major ones. Livelihood diversification, reducing livestock quantity and enhancing its quality and introduction of animal forage extension should be enhanced. The surrounding area of the sanctuary was densely populated. There should be a buffer zone between community's village and Sanctuary to protect intensive use area (nesting site, breeding site, feeding site) from disturbance. If possible relocation action should be

implemented to nearby Billito Agricultural development through negotiation. And Sanctuary should be fenced and indigenous tree should be planted surrounding the boundary. The major human activities affecting SSHS were Overgrazing, Uncontrolled fire, illegal settlement, deforestation and agricultural expansion. Thus sanctuary should be well protected from human impact and conflict between local community and conservationist should be negotiated. It is vital to enhance awareness creation, benefit sharing, and creating employment opportunity to local community. Overgrazing by livestock was top ranking threat to sanctuary. The causal factors for human causing threats to sanctuary were scarcity of land, lack of employment opportunity and lack of awareness with local community. Current threats to the sanctuary were resulting in wildlife depletion, decline in agricultural productivity, increase in poverty and loss of biodiversity. Human induced problem should be urgently resolved and if not, the Sanctuary will no longer sustain. Additionally, a detailed investigation should be carried out on the Biology of Swayne's Hartebeest and relative abundance of food for Swayne's Hartebeest.

REFERENCES

Batty, K. 2002. *Alcelaphus buselaphus* "on line" http://animal diversity. Ummz. Umich edu/site/accounts/information /*Alcelaphusbuselaphus*.html.

Birdlife International 2003 "online" http://www.birdlife. Org.

Brockman, C.F. 1962. "Supplement to the Report to the Committee on Nomenclature" In: Adams, A.B. (Ed.) *First World Conference on National Parks*. Washington, DC: National Park Service.

CSA 2007. Summary and Statistical report of population and housing census in Ethiopia, PP 114.

Dudley, N. and A. Phillips 2006. *Forests and Protected Areas: Guidance on the use of the IUCN protected area management categories*. Best Practice Protected Area Guidelines Series No. 12. Gland and Cambridge: IUCN.

Fassil Tekle 1996. Community-based Conservation of Senkele Swayne's Hartebeest Sanctuary. M.Sc. thesis. International Center for Protected Landscapes. University College of Wales, Canterbury.

Green, M. and Paine, J. 1997. State of the world's protected areas at the end of the twentieth century. Social Science Research Net work, Albany.

Hillman, J.C. 1993a. Ethiopia: Compendium of Wildlife Conservation Information; Vol 1 Wildlife Conservation in Ethiopia. The NYZS, Wildlife Conservation Society, Addis Ababa, Ethiopia.

Hunting Technical Services Ltd. 1976. Swayne's Hartebeest: a Preliminary Study of its Status in Ethiopia and Recommendations for Future Management. Report to Ethiopian Wildlife Conservation Department. Boreham Wood Herts, London.

Israel Glenn, D. 1992. Sampling, the Evidence of Extension Program Impact, Evaluation and Organizational Development. Inistitute of Food and Agricultural Sciences: University of Florida.

IUCN 1994. Guide to the Convention on Biological Diversity. IUCN, Gland, Switzerland, Cambridge University, UK.

IUCN 1996. World conservation, Special issue on collaborative management, NO-2.

Jacobs, M.J.M. 1993. The Awash national Park management Plan (1993-1997)-NYZS and EWCA, Addis Ababa.

Jacobs, M.J.M. 2001. Impacts of Conflict on Biodiversity and Protected Areas in Ethiopia. Washington, D.C.: Biodiversity Support Program.

Kumsa, T. 2006. Human-wildlife conflict and population status of Swayne's hartebeest (*Alcelaphus buselaphus swaynei*) in Senkele Swayne's hartebeest Sanctuary. M. Sc. thesis Addis Ababa University, Addis Ababa, pp. 114.

Kumssa, T. and B. Afework 2013. Human-Wildlife Conflict in Senekele Swayne's hartebeest Sanctuary, Ethiopia. Journal of Experimental Biology and Agriculture Sciences 1:33-38.

Leykun Abunie 2000. The Challenges of conserving Ethiopian wildlife: Overview. *Walia* 21: 56-61.

Lumprey 1990. Challenges facing protected area management in sub-Saharan Africa. *Oryx* 1:27-31.

Martinet, C. and McNeely, J. 1992. Managing parks for the 21st century: A device from the parks congress. - Parks 3: 13-21.

Messana GM. and Netsereab B 1994. The Senkele Swayne's Hartebeest Sanctuary Management Plan. Ethiopian Wildlife Conservation Organization, Addis Ababa, pp: 33 - 38.

Tekle F 1996. Community-based Conservation of Senkele Swayne's Hartebeest Sanctuary. M. Sc. thesis. University College of Wales, Canterbury, pp: 32-39.

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