International Journal of
Biodiversity andConservation

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International Journal of Biodiversity and Conservation

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Full Length Research Paper

Evaluation of socio-economic factors influencing exploitation of non-timber forest products in Tanzania

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Non-Timber Forest Products (NTFPs) constitute an important source of livelihood for millions of people from forest fringe communities across the world. This study was conducted to identify main NTFPs used by local communities around Nyanganje Forest Reserve (NFR) which is within the Eastern Arc Mountains in Kilombero district, Tanzania. Furthermore, the study aimed at determining socio-economic factors influencing extraction of NTFPs in the study area. The study involved questionnaire survey in Signali, Sagamaganga and Lungongole villages which surround NFR. Data was analysed using Statistical Package for Social Sciences (SPSS) whereby inferential analysis was applied to show the relationship between NTFPs collected and socio-economic factors while Chi square test (χ^2) was used to determine the significance in dependency of certain socio-economic factors on extraction and use of NTFPs in the study area. It was observed that, socio-economic factors such as income level, education level, age distribution, household size, occupation, distance, and residence duration influenced the extraction and use of NTFPs by local communities in the study area. It was however recommended that, for sustainability of the NTFPs in NFR, the government has to initiate and emphasize the extraction and utilization of NTFPs resources in a sustainable and environmentally friendly manner.

Key words: Extraction, Nyanganje Forest Reserve, socio-economic factors.

INTRODUCTION

Non-timber Forest Products (NTFPs) are defined as all biological materials other than timber that may be extracted from the natural ecosystems, managed plantations, agroforestry systems and be utilized within the household, marketed or have social cultural and religious significance (Wickens, 1991). NTFPs constitute an important source of livelihood for millions of people from forest fringe communities across the world (Asfaw et al., 2013). It is estimated that about 300 million people living close to tropical forests earn part or their entire livelihood through NTFPs use (Mulenga et al., 2011). In Africa, a continent with a forest cover of 21% NTFPs from forests and other tree systems continue to be an important component of household nutrition, health and

as source of income (FAO, 2011). The NTFPs are therefore important forest products especially in dry land areas where they form alternative sources of livelihood (Suleiman et al., 2017; Elikana, 2013; Wollenberg and Nawir, 1998). They also contribute to poverty alleviation through generation of income, providing food and improved nutrition, medicines and foreign exchange earnings (Wollenberg and Nawir, 1998; Ahenkan and Boon, 2011; Islam and Quli, 2016).

In the Eastern Arc mountains, especially the Nyanganje Forest Reserve (NFR) in Morogoro Region, Tanzania, NTFPs are well known by the local communities (Schaafsma et al., 2014). They provide supplementary foods such as roots, tubers, vegetables, fruits and grains for families (Dubey, 2007). The increasing values of such NTFPs in this area have hastened their collection even beyond the rules and regulations guiding their management and utilization. Firewood is the most collected NTFPs from NFR. These activities are undertaken by local populations surrounding these areas. Collection of medicinal plants also results in substantial negative impactson the forest (WWF, 2004). Non-residents and people with clinics in areas which are far from NFR, collect the products in larger quantities so as to minimize travelling costs and time spent. In addition to the examples of NTFPs mentioned earlier, in Udzungwa mountains, more NTFPs including wildlife, poles, wild mushrooms, wild vegetables, wild fruits, ropes and honey are also collected (Melese, 2016; Balama et al., 2017). Taking into consideration the prominence of NTFPs, it is important and desirable to assess the socio-economic factors that influence extraction of these products from NFR. This study hypothesize that NTFPs has influence on the socio-economic factors since it has been exploited by many communities in Africa to constitute an important source of livelihood. The aim of this paper therefore was to determine the socio-economic factors influencing local communities to collect and utilize NTFPs in a study area.

MATERIALS AND METHODS

Data collection

Both primary and secondary data were collected. Primary data involved household questionnaire survey. Secondary data was acquired from relevant reports in Kilombero district office, Forest Headquarters, Tanzania Forest Research Institute and Non-Government Organizations (NGOs). Other secondary informations were obtained from published manuscripts and text books.

Household questionnaire survey

Structured questionnaires with both closed and open-ended questions were used to collect household data. The questionnaires were designed to focus on key issues including main types of NTFPs available in the study area, species extracted and parts of the plants used by the population. The questionnaires were pre-tested in 10 households prior to the actual survey. The pre-testing

assisted to check for redundancy, meaningfulness, comprehensiveness and clarity of the required information from the respondents to ensure applicability of the questionnaires.

Sampling for household survey

The actual data collection was preceded by a preliminary survey to determine the total number of sample villages and households required. A sample of three villages namely Sagamaganga, Signali and Lungongole was purposively selected on the fact that they all lie in the Eastern Arc Mountains and share border with the NFR which is located between latitude 7°56' to 8°4' South and longitude 36°39' to 36°50' East, 15 km North East of Ifakara town. Climate of the area is governed by oceanic rainfall with continental temperature.

Estimated rainfall is 2000 mm per year with mist effect at high altitude. The dry season is from June to October and the temperature range from 19°C to a maximum of 27°C. In this study, a simple random sampling technique was used to select 40 households in each village as described by Mbeyale (2007) who argued that a sample size of at least 30 units was sufficient irrespective of the population size. In this study however, the household heads were the key respondents during household survey as they are the decision makers for the households in the utilization of medicinal plants as recommended by Kajembe (1994).

Focused group discussion

A total of 5 focused group discussions from each village were employed to encourage collective responses and different opinions about collection and use of NTFPs. The focused group discussions comprised of 10 to 15 men and women with experiences on the utilization of NTFPs. Key informants including village leaders and elders were also involved to provide information in relation to the different types of NTFPs utilized.

Plant identification

Plant species were identified by Mr. Gabriel Laizer, a botanist from Tropical Pesticides Research Institute (TPRI), Arusha and voucher specimens were deposited at the University of Dodoma (UDOM).

Data analysis

Data collected were analysed using Statistical Package for Social Sciences (SPSS). Inferential analysis was applied to show the relationship between NTFPs collected and socio-economic factors while Chi square test (χ^2) was used to determine the significance in dependency of certain socio-economic factors on extraction and use of NTFPs in the study area.

RESULTS AND DISCUSSION

The interviews in the study villages yielded a wide range of information on NTFPs that are widely used. According to the interviews, extraction of NTFPs for household consumption, primary health care and income generation is to some extent influenced by a number of socio-economic factors such as income level, age distribution,

Table 1. The role of income level of respondents on collection of NTFPs in NFR, Morogoro, Tanzania.

Product	Yearly household income (TZS)					Total (%)	χ^2-value	Significance
	10 000-50 000	50 001-100 000	100 001-150 000	150 001-200 000	>200 000			
Wild fruits	10.5 (6)	35 (20)	22.8(13)	14.2 (8)	8.8 (5)	91.2 (52)	37.21	0.001***
Wild vegetables	13.7 (8)	32.7 (19)	22.4(13)	10.3(6)	8.5 (5)	87.6 (51)	38.369	0.001***
Wild mushrooms	6 (11.3)	16 (27.5)	14 (24.1)	5 (8.5)	5 (8.5)	46 (80)	29.37	0.022**
Bush meat	8.6 (5)	30.9 (18)	22.4 (13)	15.5(9)	6.8 (4)	84.2 (49)	32.573	0.008***
Firewood	13.7 (8)	31 (18)	24.1 (14)	17.3 (10)	10.2 (6)	96.3 (56)	9.943	0.870[Ns]
Honey	0 (0)	22.3 (13)	18.9 (11)	8.6 (5)	6.8 (4)	56.6 (33)	27.150	0.04**
Medicinal plants	3.4 (2)	6.8 (8)	15.5 (9)	3.4 (2)	6.8 (4)	35.9 (25)	28.166	0.030**
Poles	13.7 (8)	24 (14)	24.1 (14)	17.3 (10)	10.2 (6)	89.3 (52)	19.185	0.259[Ns]

Ns: Non significant, **Significant at P<0.05, ***Significant at P<0.01, χ^2 = Chi-Square value. Figures in the brackets present frequencies of responses and outside brackets present percentages of respondents.

education level, household size, residence duration, distance and occupation.

Local community income level

Results in Table 1 show the role of income level of a household on extraction of NTFPs. It can be noted that, there was a significant decrease in extraction of wild fruits, wild vegetables, wild mushrooms, bush meat, honey and medicinal plants as household income increases from TZS 150 000 which is equivalent to USD 60 at an exchange rate of TZS 2,500. On the other hand, increase in the levels of household income from TZS 50,000 (USD 20) results in the decrease of extraction of firewood and poles. However, decrease in extraction of these products is not significant. This can be interpreted to suggest that wild fruits, wild vegetables, wild mushrooms, honey, bush meat and medicinal plants were considered as inferior products and hence families with substatial economic status had minimal need to mount efforts to demand these products.

However, counteracting this tendency through mass education is desirable as nutritive values of such products are generally higher than their domesticated counterparts. Nevertheless, these findings conform to those reported by Saxena (2003) who observed that in areas where rural populations have achieved high incomes, use of forest products is likely to be very little.

Age distribution

The role of age of respondents on collection of NTFPs in the study area is shown in Table 2. It can be noted that, an increase and decrease in the age of respondents from age class 30 to 60 results in the decrease of extraction of wild fruits, wild vegetables, bush meat, firewood and medicinal plants, but the decrease in extraction of these products is not significant. In this regard, the decrease in age of respondents from age class 30 to 60 imply that young people are active and can walk long distances to extract most of NTFPs to secure household food security, primary health

care, cash income and other needs. Similarly, the observed increase in the age of respondents of the same age group suggests that older people have a lot of experience in varieties of NTFPs to be utilized at households. The results conform to those reported by Basnayake and Gunaratne (2011) who observed that the age of a person usually influences level of production, efficiency and experience. Paulo (2007) observed that, in Kilwa district increase in age increases extraction of wild vegetables, wild mushrooms, medicinal plants and poles but decreases extraction of wild fruits significantly. Similarly, in Mbozi district, Nyingili (2003) observed that increase in age increases extraction of wild vegetables and wild mushrooms but decreases extraction of wild fruits significantly.

Education level

Table 3 shows the results of the role of education level on collection of NTFPs in the study area. It can be noted that increase in education level

Table 2. The role of age of respondents on collection of NTFPs in NFR, Morogoro, Tanzania.

Product	Age group (Years)			Total (%)	χ^2-value	Significance
	18-30	30 - 60	>60			
Wild fruits	12.5 (11)	54.5 (48)	18.2 (16)	85.2 (75)	2.060	0.357[Ns]
Wild vegetables	11.1 (10)	52.2 (47)	20.0 (17)	83.3 (74)	6.632	0.036**
Wild mushrooms	11.1 (10)	41.1 (37)	13.3 (12)	65.5 (59)	0.028	0.986[Ns]
Bush meat	14.4 (13)	43.3 (39)	11.1 (10)	68.8 (62)	3.711	0.156[Ns]
Firewood	16.7 (15)	62.2 (56)	17.8 (16)	96.7 (87)	4.338	0.114[Ns]
Honey	10 (9)	27.8 (25)	3.3 (3)	41.1 (37)	6.831	0.033**
Medicinal plants	6.7 (6)	25.4 (23)	6.7 (6)	38.8 (35)	0.293	0.864[Ns]
Poles	14.4 (13)	61.1 (55)	15.6 (14)	91.1 (82)	6.354	0.042**

Ns: Non significant, **Significant at P<0.05, χ^2 = Chi-Square value. Figures in the brackets present frequencies of responses and outside brackets present percentages of respondents.

Table 3. The role of education level of respondents on collection of NTFPs in NFR, Morogoro, Tanzania.

Product	Level of education of a household head				Total (%)	χ^2-value	Significance
	Non education	Adult education	Primary education	Secondary education			
Wild fruits	11.4 (10)	2.3 (2)	69.3 (61)	2.3 (2)	85.3 (75)	4.598	0.204[Ns]
Wild vegetables	11.1 (10)	4.4 (4)	66.7 (60)	1.1 (1)	83.3 (75)	2.923	0.404[Ns]
Wild mushrooms	10 (9)	2.2 (2)	53.3 (48)	0 (0)	65.5 (59)	5.525	0.137[Ns]
Bush meat	8.9 (8)	0 (0)	58.9 (53)	1.1 (1)	68.9 (62)	9.736	0.021**
Firewood	12.2 (11)	4.4 (4)	77.8 (70)	2.2 (2)	96.6 (87)	0.723	0.868[Ns]
Honey	6.7 (6)	0 (0)	34.4 (31)	0 (0)	41.1 (37)	5.064	0.167[Ns]
Medicinal plants	6.7 (6)	2.2 (2)	30 (27)	0 (0)	38.9 (35)	2.726	0.436[Ns]
Poles	10 (9)	4.4 (4)	75.6 (68)	1.1 (1)	91.1 (82)	6.112	0.106[Ns]

Ns: Non significant, **Significant at P<0.05, χ^2 = Chi-Square value. Figures in the brackets present frequencies of responses and outside brackets present percentages of respondents.

especially that of secondary education, decreases significantly extraction of bush meat. It was further observed that there was a decrease in collection of wild fruits, wild vegetables, honey, poles, wild mushrooms, firewood and medicinal plants at secondary level of education. However, the decrease in collection of these products was not significant. The observed decrease in collection of wild fruits, wild vegetables, honey, poles, wild mushrooms, firewood and medicinal plants at secondary level of education would perhaps mean that literates had great chance of having other sources of livelihood and substitutes for such products.

Household size

Number of family members per household in the study area ranged between 1 and 12 people, with an average of 6 members. This is relatively high as compared to the regional household size, whose estimated average is 5 people per household (NBS, 2004). According to Abdallah (2001), large family size is attributed by the characteristics of most African societies living with their relatives as part of their families. In this study, the influence of respondent's household size on collection of NTFPs is shown in Table 4. It can be noted from the Table that, an increase in household size from 1 to 6 members, increases collection of bush meat, wild fruits, wild mushrooms, poles and medicinal plants. These results indicate that, an increase in household size reflects the gradual population growing. A rapidly increasing population has a direct correlation with the exploitation of forest products for subsistence use, primary health care as well as for income generation. Results from this study are similar to those reported by Mhinte (2000) who observed that, in Kilosa district an increase in numbers of members in the household implies more mouths to feed, but on the other hand it implies more availability of labour force. The study by Nyingili (2003) reported similar findings that increase in household size significantly increases collection of wild fruits in Mbozi district.

Residence duration

Results in Table 5 show that an increase in years of

Table 4. The influence of respondent's household size on the collection of NTFPs in NFR, Morogoro, Tanzania.

Product	Household size			Total (%)	χ^2-value	Significance
	1 - 3	4 - 6	≥7			
Wild fruits	32.9 (29)	47.7 (42)	4.5 (4)	85.1 (75)	11.884	0.220[Ns]
Wild vegetables	32.9 (29)	47(42)	4.5 (4)	84.5 (75)	14.628	0.018**
Wild mushrooms	24.4 (22)	37.8 (34)	3.3 (3)	65.5 (59)	9.369	0.404[Ns]
Bush meat	26.7 (24)	37.7 (34)	4.5 (4)	68.9 (62)	10.656	0.300[Ns]
Firewood	38.9 (35)	50 (45)	6.7 (6)	95.6 (86)	13.207	0.002**
Honey	10 (9)	28.8 (26)	2.2 (2)	41 (37)	19.298	0.023**
Medicinal plants	13.3 (12)	22.2 (20)	3.3 (3)	38.8 (35)	15.407	0.080[Ns]
Poles	38.8 (35)	46.7 (42)	5.5 (5)	91.1 (82)	3.807	0.924[Ns]

Ns: Non significant, **Significant at P<0.05, χ^2 = Chi-Square value. Figures in the brackets present frequencies of responses and outside brackets present percentages of respondents.

Table 5. The influence of respondent's tenancy on the collection of NTFPs in NFR, Morogoro, Tanzania.

Product	Residence duration (Years)				Total (%)	χ^2-value	Significance
	2-5	5-10	10-20	>20			
Wild fruits	5.7(5)	15.9 (14)	25 (22)	38.6 (34)	85.2 (75)	4.191	0.242[Ns]
Wild vegetables	4.4 (4)	12.2 (11)	25.6 (23)	41.1 (37)	83.3 (75)	9.382	0.025**
Wild mushrooms	5.6 (5)	10 (9)	20 (18)	17.8 (16)	53.4 (48)	0.395	0.941[Ns]
Bush meat	7.8 (7)	11.1 (10)	20 (18)	30 (27)	68.9 (62)	1.505	0.681[Ns]
Firewood	8.9 (8)	16.7 (15)	20 (15)	28.9 (26)	74.5 (64)	3.709	0.295[Ns]
Honey	1.1 (1)	5.6 (5)	14.4 (13)	20 (18)	41.1 (37)	4.060	0.255[Ns]
Medicinal plants	3.3 (3)	5.6 (5)	11.1 (10)	18.9 (17)	38.9 (35)	0.318	0.957[Ns]
Poles	8.9 (8)	14.4 (13)	28.9 (26)	38.9 (35)	91.1 (82)	5.353	0.148[Ns]

Ns: Non significant, **Significant at P<0.05, χ^2 = Chi-Square value. Figures in the brackets present frequencies of responses and outside brackets present percentages of respondents.

residence in the village significantly increases extraction of wild vegetables. However, extraction of wild fruits, wild mushrooms, honey, bush meat, poles, firewood and medicinal plants increases as one stays in the village for a long period. This would mean that the respondents have amassed a lot of experience and knowledge on availability, values and sources of different useful plant species by staying for long periods in the respective villages. This is consistent with the observation by Paulo (2007) who found that in Kilwa district, increase in years of residence in the village significantly increased collection of wild mushrooms, wild vegetables and medicinal plants.

Distance

In this study, it was revealed that extraction of firewood and poles differ significantly with distance (Table 6). It was further revealed that, decreases in the distance from the forest results in an increase of extraction of wild fruits, wild mushrooms, honey, bush meat and medicinal plants. However, the decreases in extraction of these products were not significant. These findings indicate that the

respondents living close to the forest (less than 5 km) depend much on forests for social and economic benefits. According to Melese (2016) people living nearest to the forest will inevitably depend much on NTFPs for their daily use.

Occupation

The respondents in the surveyed villages were grouped into five categories of occupations. These were employees, farmers, fishermen, business people and jobless. Results (Table 7) show that farmers were the main collectors of NTFPs. This implies that most Tanzanians are being involved in NTFPs activities simply because they are of great value to them. A study conducted in Lagos State, Nigeria revealed that farming was the economic mainstay of rural people in the area (Otekhile and Verter, 2017).

Conclusions

The varieties of NTFPs identified in the study area were

Table 6. The influence of distance on collection of NTFPs by the respondents from NFR, Morogoro, Tanzania.

Product	Distance (km)			Total (%)	χ^2-value	Significance
	1-2	2-5	Above 5			
Wild fruits	56.8 (50)	25 (22)	3.4 (3)	85.2 (75)	0.539	0.764[Ns]
Wild vegetables	54.4 (49)	25.6 (23)	3.3 (3)	83.3 (75)	0.632	0.729[Ns]
Wild mushrooms	45.6 (41)	17.8 (16)	2.2 (2)	65.6 (59)	1.284	0.526[Ns]
Bush meat	46.7 (42)	21.1 (19)	1.1 (1)	68.9 (62)	1.929	0.381[Ns]
Firewood	61.1 (55)	28.8 (26)	7.8 (7)	97.7 (88)	8.856	0.035**
Honey	24.4 (22)	16.7 (15)	0 (0)	41.1 (37)	4.246	0.120[Ns]
Medicinal plants	28.9 (26)	7.8 (7)	2.2 (2)	38.9 (35)	3.913	0.141[Ns]
Poles	63.3 (57)	24.4 (22)	3.3 (3)	91 (82)	7.932	0.019**

Ns: Non significant, **Significant at P<0.05, χ^2 = Chi-Square value. Figures in the brackets present frequencies of responses and outside brackets present percentages of respondents.

Table 7. The influence of respondent's occupation on collection of NTFPs in NFR, Morogoro, Tanzania.

Product	Occupation					Total (%)	χ^2-value	Significance
	Employed	Farmer	Fisherman	Business	Jobless			
Wild fruits	1.1 (1)	79.5 (70)	3.4 (3)	1.1 (1)	1.1(1)	86.2 (76)	0.919	0.82[Ns]
Wild vegetables	1.1(1)	77.8 (70)	0 (0)	3.3 (3)	1.1 (1)	83.3 (75)	6.000	0.199[Ns]
Wild mushrooms	0 (0)	61.1 (55)	0 (0)	3.3 (3)	1.1 (1)	65.5 (59)	5.908	0.206[Ns]
Bush meat	0 (0)	65.6 (59)	0 (0)	3.3 (3)	0 (0)	68.9 (62)	8.069	8.089[Ns]
Firewood	1.1 (1)	90 (81)	1.1 (1)	3.3 (3)	1.1 (1)	96.6 (87)	0.222	0.994[Ns]
Honey	0 (0)	38.9 (35)	0 (0)	2.2 (2)	0 (0)	41.1 (37)	2.914	0.572[Ns]
Medicinal plants	0 (0)	34.1 (31)	0 (0)	3.3 (3)	1.1 (1)	38.9 (35)	7.698	0.103[Ns]
Poles	1.1 (1)	84.4 (76)	1.1 (1)	1.1 (3)	1.1 (1)	88.8 (82)	0.627	0.960[Ns]

Ns: Non significant, χ^2 = Chi-Square value. Figures in the brackets present frequencies of responses and outside brackets present percentages of respondents.

found to be useful in day-to-day life of the local communities surrounding NFR. Findings from this study clearly indicated that, socio-economic factors such as income level, education level, age distribution, household size, occupation, distance from the forest and residence duration influence extraction and use of NTFPs to improve the livelihood of local communities. Despite the existing legal framework regulating the utilization of the NTFPs in Tanzania, appropriate strategic plans should be put forward to organize extraction and utilization of NTFPs resources in a sustainable and environmentally healthy manner.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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International Journal of Biodiversity and Conservation

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Perception, attitude and impacts of local communities on Senkele Swayne's Hartebeest Sanctuary, Ethiopia

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This study aimed to investigate perception, attitude and impacts of local communities on Senkele Swayne's Hartebeest Sanctuary. Questionnaire survey, focus group discussions, key informant interviews and observation were employed to collect data. A total of 196 households participated in the questionnaire survey. The findings revealed that the local communities of SSHS had unfavorable perceptions and attitude towards the conservation of the sanctuary. A higher proportion of the respondents (44.9%) perceived that the size of the sanctuary is too large so that it should be shrunk while only 26.5 and 28.6% of them viewed that the size of the sanctuary is small and optimum, respectively. Majority of the respondents (57.7%) perceived that people and wild animals cannot coexist since they are threats to their livelihoods and a means to their resources restriction. Over half of the respondents (54.6%) had negative attitude while only 22.4% had positive attitude towards the sanctuary. There was a significant difference in attitude across age groups, education level, family sizes, level of landholding size and size of livestock ownership (P<0.05).

Key words: Attitude, communities, Ethiopia, perception, sanctuary.

INTRODUCTION

As defined by the world conservation union (IUCN), a protected area is a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means to achieve the long-term conservation of nature with associated ecosystem services and cultural values. They are cornerstones to preserve global biodiversity and stop the extinction crisis. They are set aside to maintain functioning natural ecosystems, to act as refuges for species and to maintain ecological processes (Dudley, 2008).

Establishment of protected areas (PAs) dated back to the fifteenth century in Ethiopia (Vreugdenhil et al., 2012), while wildlife regulation was introduced in 1908, during the reign of emperor Menelik II, in the form of nine article law strictly forbidding the hunting of young elephants (EWCA, 2012). To date, over 60 protected areas cover more than 17.1% of the country's surface area (EWCA, 2014; Young, 2012; Alemneh, 2015). This is definitely an achievement, but establishment of PAs alone cannot safeguard the perpetuation of biodiversity (Andrade and Rhodes, 2012) as almost all PAs are highly degraded due to anthropogenic impacts (Young, 2012).
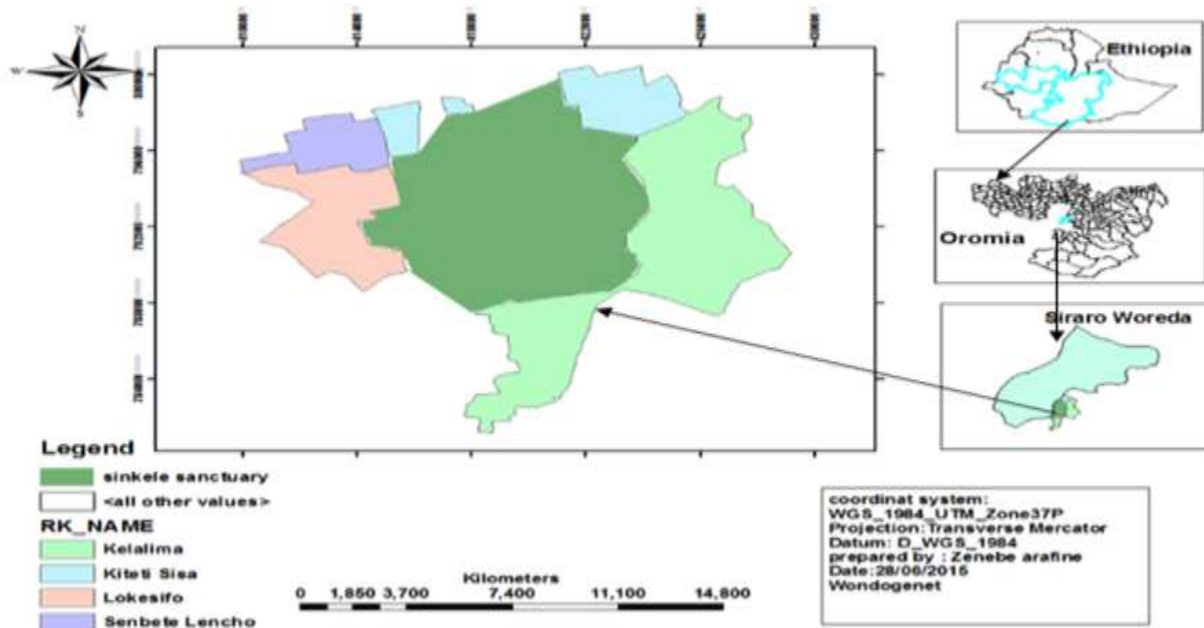
Figure 1. Map of the study area.

Principally, PAs were established to meet the needs of the local communities along with the conservation of nature (IUCN, 1994). Nevertheless, their designation has an impact on the lives of the local communities since they usually come up with new regulations and restrictions on aspects such as access to natural resources and development activities. This results in the denial of the rights of local communities to access resources, eviction from their home lands and provoked long term conflicts (IUCN, 1994; Dorji, 2009). As a result, PAs and local communities cannot co-exist if at least one of them is hostile to the other which ultimately affects the conservation effectiveness (Dorji, 2009; Vodouhe et al., 2010).

Undoubtedly, dispute over land use between local communities and conservation agencies is prevalent in areas where the local people used to utilize land until declared PAs. Likewise, the establishment of SSHS in 1976 to protect the Swayne's Hartebeests (*Alcelaphus buselaphus swaynei*) resulted in the denial of local communities of hitherto existing traditional use rights. As a result, besides its importance to shelter the Swayne's Hartebeests and other wild animals, as Burger (2011) puts it, it is a sanctuary under siege where the burgeoning local population surrounds it on three sides with interests contrary to its conservation strategies.

The boundary of the sanctuary was re-demarcated in 2010 resulting in the extension of its size from its previous area of 36 to 54 km^2 (a nearly 20% increase). With growing human population around the sanctuary, adding of new areas appears problematic. On the other hand, involving local communities in the management processes and bringing their conservation support is one of the objectives of the sanctuary. Therefore, to win over the support of the local communities and convey their compliance with its conservation strategies, it is decisive to study their perception, attitude and the impacts imposed on the sanctuary.

MATERIALS AND METHODS

Description of the study area

Senkele Swayne's Hartebeest Sanctuary is one of the federally managed protected areas of Ethiopia which was established in 1976 to protect the endemic and endangered subspecies of the Swayne's hartebeest (*Alcelaphus buselaphus swaynei*) (Nishizaki, 2004). It is located on the western side of the Great Rift Valley of Ethiopia, in the West Arsi Zone of Oromia Regional State and the Sidama Zone of Southern Nations, Nationalities and Peoples Regional State, 305 km South of Addis Ababa between latitudes 7°07' to 7°12' N and longitudes 38°15' to 38°19' E (Burger, 2011) (Figure 1).

To the east of the sanctuary lies the Tesisa, Borena and Lalima hills and Gode-hare valley. Kite Tesisa Kebele borders the sanctuary on the northern side and Senbete Lencho, Loke Sifo and Kella Lalima Kebeles are neighbor on the western and southwestern sides.

The sanctuary is surrounded with settlements from the two ethnic groups, Sidama and Arsi Oromo. Although there is no tangible record, according to their oral history, the Arsi Oromos started to settle in the area in the middle of the 19th century (Nishizaki, 2004).

Sampling and data collection methods

Four Kebeles (Kite Tesisa, Senbete Lencho, Loke Sifo and Kela Lalima) from a total of 6 bordering Kebeles were purposively

selected since they have higher interaction with the sanctuary.

By using the simplified formula developed by Yamane (1967) and reviewed by Israel (2012); a total of 196 respondents were randomly selected for the questionnaire interview with a precision level of ±7%.

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

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

Prior to the actual data collection, pilot survey was conducted with 20 randomly selected households in the selected study kebeles around the sanctuary with the help of one scout for translation of the local language, Afan Oromo. The purpose of the pilot survey was to check the clarity and sequence of the questionnaires.

Questionnaires consisting of both closed and open ended questions were administered to the randomly selected 196 respondents in the form of interview. A five-point Likert scale method of attitude measurement was carried out by using a series of statements with five response alternatives: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), and Strongly Agree (5) (Boone and Deborah, 2012).

Supported by the chief scout of the sanctuary, 10 people were selected as key informants and one focus group discussion was performed in each study Kebele. Observation was also conducted by on foot and vehicle patrol. Moreover, relevant literatures and office reports were referred to supplement data collected by other tools.

Data analysis

The data analysis was carried out using Statistical package for Social Science (SPSS) version 20. Descriptive statistics were used to compute mean values, percentages, frequencies and other important information. Chi-square test was conducted to test the relationship between selected qualitative variables and one way analysis of variance (ANOVA) was run to test if there was a significant difference between the mean attitudinal scores and the selected variables.

A total of 14 statements were prepared for the five point Likert Scale. Sample weightings (1 to 5) were assigned to the response categories. The maximum weight of 5 was given for 'Strongly Agree' and the minimum 1 was assigned for Strongly Disagree. A weight of 2, 3 and 4 were given for the response categories of Disagree, Neither Agree nor Disagree and Agree, respectively. Thus, if a respondent ticks 5 for all 14 statements, the maximum weight will be 70, whereas 14 will be the minimum weight when a respondent ticks 1 for all 14 statements. Hence, the average of the sum scores of all 14 statements for each respondent would again range from 1 to 5. Higher average scores for statements indicate positive attitude towards the sanctuary, while lower scores show negative attitude.

Respondents were classified according to their attitude as positive, neutral, negative and strong negative. Following the procedure applied by Tsehaye and Mohammed (2013), the mean and standard deviation of the average marks (the average score of the 14 statements for each respondent) were used to classify respondents based on their attitude towards the sanctuary.

A = Positive: Mean + Std. deviation ≤ A ≤ Max
B = Neutral: Mean ≤ B < Mean + Std. deviation
C = Negative: Mean - Std. deviation ≤ C < Mean
D = Strong Negative: Min ≤ D < Mean – Std. deviation

The internal consistency of the Likert scale statements was checked by calculating Cronbach's alpha reliability coefficient. The value of the Cronbach's alpha reliability coefficient was 0.87 which indicates good internal consistency of the Likert scale statements. Cronbach's alpha reliability coefficient normally ranges between 0 and 1 (Gliem and Gliem, 2003). The closer the Cronbach's alpha reliability coefficient is to 1, the greater the reliability of the items in the scale. For more illustration, the following rule of thumb was provided (Gliem and Gliem, 2003).

Rule of thumb

Cronbach's alpha > 0.9 → Excellent; > 0.8 → Good; > 0.7 → Acceptable; > 0.6 → Questionable; > 0.5 → Poor; < 0.5 → Unacceptable.

RESULTS

Socio-economic and demographic characteristics

Of the 196 respondents, 150 (76.5%) were males while the rest 46 (23.5%) were female households. The average age of respondents was 43.77 years, with a range from 24 to 78 years. The middle age group (40 to 59) comprises 45.9% of the respondents (Table 1). The classification of age groups was based on the Central Statistical Agency of Ethiopia (CSA, 2007).

The local communities living around the sanctuary had a culture of polygyny marriage. The mean wife number of male respondents was 2 ranging from 1 to 5 wives. A higher proportion of male respondents (44.7%) had two wives followed by those engaged with three wives (24%). Only two respondents (1.3%) were engaged with 5 wives for each. Generally, a total of 150 male respondents had married with 327 wives.

Most of the respondents (42.3%) were illiterate, 33.2% can read and write with informal education and the rest 24.5% attained primary education. Respondents had an average family size of 11 with a range from 3 to 35 family sizes.

Crop farming and livestock rearing were the main sources of income for local communities of Senkele Swayne's Hartebeest Sanctuary. An average landholding size of respondents was 1.06 ha with a range from 0.1 to 3 ha. There was a significant difference in the size of landholding among study Kebeles (χ^2 = 37.295, df = 3, P < 0.05). Many of the respondents from Loke Sifo (45.2%) and Senbete Lencho (33.3%) held a landholding >1.5 ha, while many of the respondents from Kela Lalima (54.35%) and from Kite Tesisa (34.7%) own a land size less than 0.5 ha (Figure 2). Respondents own a total of 5627.77 TLU livestock with an average livestock ownership of 28.7 TLU.

Local communities' perception of conservation and the sanctuary

An overwhelming percentage (98%) of the respondents

Table 1. Socioeconomic and Demographic characteristics of respondents.

Age class	Sex		Total	%	Average family size	Land holding (ha)	Average landholding (ha)	Livestock Size (TLU)	Average livestock size (TLU)
	M	F							
20-39	58	21	79	40.3	8	39.875	0.5	1229.02	15.56
40-59	65	25	90	45.9	13	112.375	1.25	3083.84	34.26
≥ 60	27	0	27	13.8	17	55.75	2.06	1314.91	48.70
Total	150	46	196	100	-	208	-	5627.77	-
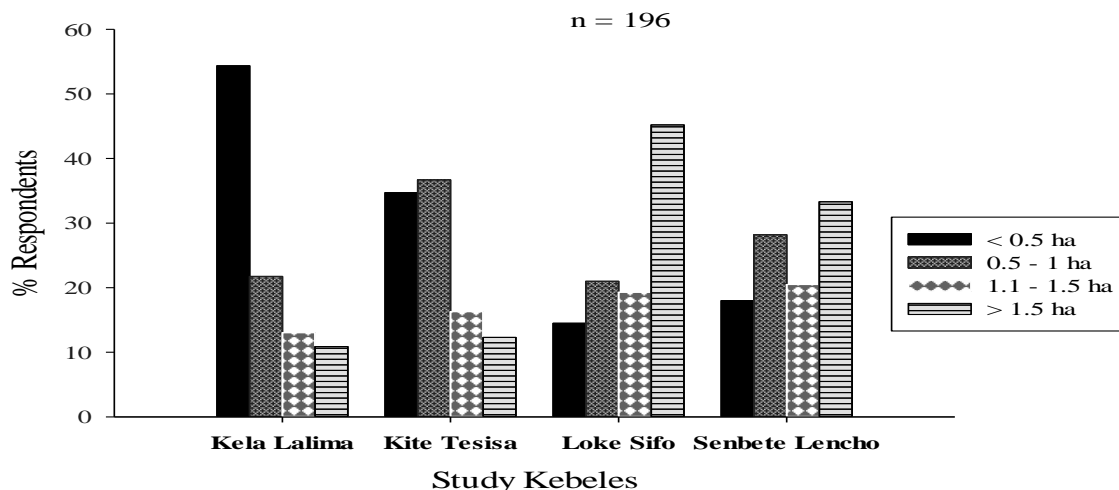
Figure 2. Landholding size of respondents across study Kebeles.

perceived that they were dependent for their livelihood on some of the resources in the sanctuary. Grazing and thatching grass were the two sources of livelihood dependences indicated by all respondents. Perception on resource dependency was not different across Kebeles and other socioeconomic characteristics (P>0.05).

With no significant difference between study Kebeles, sex, education level and landholding size (P>0.05), many of the respondents (44.9%) perceived that the size of the sanctuary is too large so that some part of it should be returned back to the community. Perception on the size of the sanctuary was different across age groups, family size and size of livestock ownership (Table 2).

Regardless of the Kebele they are living and other socioeconomic characteristics, a higher proportion of the respondents (62.8%) left the responsibility of conservation of the sanctuary to the government and only 17.9% make themselves responsible.

Over half of the respondents (57.7%) viewed that people and wild animals cannot coexist. Perception on people-wild animal coexistence was different across age groups, education level, family size, landholding size and size of livestock ownership (Table 3).

Most of the respondents, 37.8 and 33.2%, indicated that there was much and very much extent of crop damage

respectively. The remaining 29% reported crop damage by wild animals was little and no respondent agreed with the choice of no damage. A higher percentage of the respondents (59.2%) reported loss of livestock by wild animals, while the remaining 40.8% did not loss any livestock due to wild animals. However, the perception of respondents about compensation was tough. All respondents (100%) marked that there was no any form of compensation or a law which supports compensation for wild animals' damage. They indicated that the only legal incentive they get from the sanctuary was thatching grass.

Attitude of local communities towards the sanctuary

The mean attitude index score of respondents towards Senkele Swayne's Hartebeest Sanctuary on the five point Likert scale was 2.57 (SD = 0.73, n = 196). The least score on the attitude index was 1.36 showing strong negative attitude towards the sanctuary, while the highest was 4.07 which indicates positive attitude (Figure 3).

The greater proportion of the respondents (54.6%) had negative and strong negative attitude towards the sanctuary while 23% held neutral attitude and only 22.4%

Table 2. Perception of respondents about the size of the sanctuary.

Variable	Perception of respondents on the size of Sanctuary (%)						
	n	Small	Optimum	Large	χ^2	df	P-value
Age							
Youngest (20-39)	79	44.3	32.9	22.8			
Middle (40-59)	90	15.6	27.8	56.7	32.69	4	0.000
Oldest (≥60)	27	11.1	18.5	70.4			
Family size							
1-10 People	104	28.8	39.4	31.7	18.135	2	0.000
>10 People	92	23.9	16.3	59.8			
Livestock Size							
0-20 TLU	74	39.2	35.1	25.7	18.757	2	0.000
≥20 TLU	122	18.8	24.6	56.6			

Table 3. Perception of respondents on coexistence of people and wild animals.

Variable	Perception of respondents on people-wild animals coexistence (%)					
	n	NO	Yes	χ^2	df	P-Value
Age						
Youngest (20-39)	79	24.1	75.9			
Middle (40-59)	90	74.4	25.6	66.762	2	0.000
Oldest (≥60)	27	100	0			
Education level						
Illiterate	83	77.1	22.9			
Informal Education	57	59.6	40.4	34.816	2	0.000
Primary School	56	26.8	73.2			
Family size						
1-10 People	104	44.2	55.8	16.35	1	0.000
>10 People	92	72.8	27.2			
Landholding size						
0-1 ha	110	65.5	34.5	6.25	1	0.012
>1ha	86	47.7	52.3			
Livestock size						
0-20 TLU	74	33.8	66.2	27.744	1	0.000
≥20 TLU	122	72.1	27.9			

of the households had positive attitude (Table 4).

The results of one way ANOVA showed no significant difference in attitude between study Kebeles (F = 0.734, df=3, P > 0.05) and between sex of respondents (F = 0.322, df=1, P > 0.05). However, attitude towards the sanctuary was significantly different across age groups (F = 79.367, df=2, P < 0.05), education level (F = 137.498, df=2, P < 0.05), family sizes (F = 36.13, df=1, P < 0.05), level of landholding size (F = 53.259, df=1, P < 0.05) and size of livestock ownership (F = 71.886, df=1, P < 0.05)

(Table 5).

DISCUSSION

Local communities' perception of conservation and the sanctuary

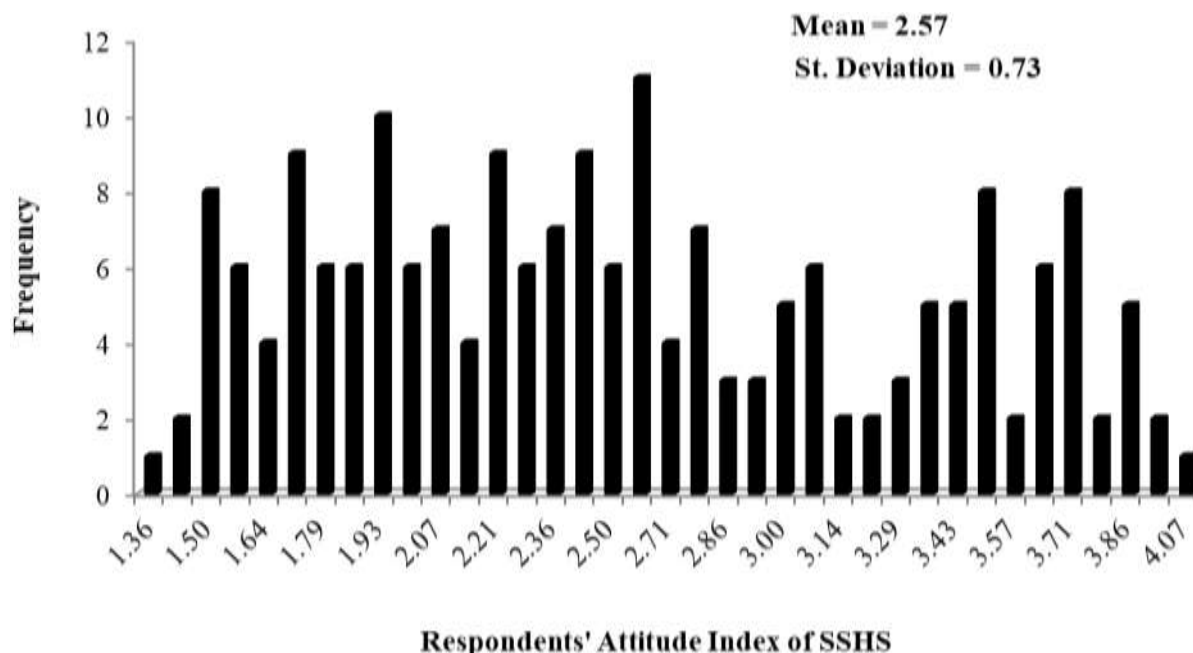Regardless of the socioeconomic characteristics or the Kebeles where the residents lived (P > 0.05), an

Figure 3. Frequencies and range of respondents' attitude index towards SSHS.

Table 4. Classification of respondents based on their attitude towards the Sanctuary.

Attitude	Frequency	%
Positive	44	22.4
Neutral	45	23.0
Negative	70	35.7
Strong Negative	37	18.9
Total	196	100.0

overwhelming percentage (98%) of the respondents perceived that they were dependent on some of the resources from the sanctuary. Grazing and thatching grass were the two sources of livelihood dependences indicated by all respondents. Similar result was reported on different protected areas, in Ethiopia and abroad (Silori, 2006; Karanth and Nepal, 2011; Anteneh et al., 2014; Tewodros and Afework, 2014).

Communities whose livelihoods chiefly involve the direct exploitation of natural resources often complain on the sizes of protected areas (Anthony, 2007). The resistance of local communities on the size of SSHS was started before decades (Nishizaki, 2004) and this was intensified with the highly growing population and demarcation of the boundary of the sanctuary while land is scarce (Burger, 2011). The local communities perceived that smaller area is enough for the finger counted wild animals in the sanctuary. The results conform to former studies on the sanctuary (Tewodros, 2006; Mekbeb et al., 2010). Linearly, local communities of Marsabit National Reserve (Kenya) also considered

establishments of protected areas as wastage of land (Shibia, 2010).

Most of the local communities had low feeling of ownership over the sanctuary and they consider it as the property of the state. A higher proportion of the respondents (62.8%) left the responsibility of conservation to the government and only 17.9% make themselves responsible. This resulted when the local communities are not involved in the management and decision making process of the conservation area (Shibia, 2010).

Threatened with their existence, most of the respondents had unfavorable perceptions about coexistence of people and wild animals. Similarly, local communities in different PAs of Ethiopia and abroad had unfavorable perception of people-wild animal coexistence because of prevalence of crop damage and livestock depredation (Tewodros, 2006; Dorji, 2009; Mekbeb et al., 2010). Respondents' perception of wild animals in the sanctuary was found better in respondents who attained primary education, young aged, with larger landholding

Table 5. Attitude of respondents across different variables.

Variable	n	Attitude				
		Mean Score	Std. deviation	df	F	P-value
Age						
Youngest (20-39)	79	3.13	0.589			
Middle (40-59)	90	2.30	0.551	2	79.367	0.000**
Oldest (60 and above)	27	1.81	0.324			
Academic background						
Illiterate	83	2.06	0.423			
Informal education	57	2.49	0.547	2	137.498	0.000**
Primary School	56	3.40	0.453			
Family size						
1-10 People	104	2.84	0.691	1	36.130	0.000**
>10 People	92	2.26	0.647			
Land holding size						
0-1 ha	110	2.27	0.622	1	53.259	0.000**
> 1 ha	86	2.95	0.678			
Livestock size in TLU						
<20 TLU	74	3.05	0.59	1	71.886	0.000**
≥20 TLU	122	2.27	0.65			

size and in respondents with small size of livestock. This was different from Mekbeb et al. (2010) in which view of local communities towards wild animals was different only with income source and benefits received from the sanctuary.

Though most of the respondents (59.2%) had ever lost livestock and faced crop damage due to wild animals, there was no form of compensation for their losses. This was contrary to experiences of other countries such as Bhutan where the government adopted a compensation scheme for the crop damage and livestock depredation in Jigme Dorji National Park (Dorji, 2009).

Attitude of local communities towards the sanctuary

Restrictions for access of resources influence the perception and attitude of the local communities towards the sanctuary. Loss of land as a result of the establishment of the sanctuary has an impact on them who are dependent on resources such as fuel wood, grazing area and thatching grass (Shibia, 2010). Since its establishment, the size of the sanctuary has been fluctuating due to the local communities' resistance to conservation. It is now found almost four times (54 km^2) lower than its original size (200 km^2) (Nishizaki, 2004; Burger, 2011).

In addition, punishments imposed by the sanctuary and wildlife damages without appropriate compensations also negatively modify the attitude of the local communities towards the sanctuary. They had unfavorable interpretations to conservation of the sanctuary and the wild animals living inside it. Due to this, majority of the respondents (54.6%) held a negative attitude towards the sanctuary while only 22.4% of them had positive attitude. The findings agree with Tewodros and Afework (2014) while contradict with Anteneh et al. (2014).

Attitude of respondents towards SSHS was independent of sex and the Kebeles where they were living. However, majority of young respondents had more positive attitude to the sanctuary. Relatively, respondents who attained primary education had better compliance than others. Likewise, respondents with less family size, large size of landholding and with small size of livestock ownership had more positive attitude than others who do not possess either of these. Shibia (2010) reported similar result on Marsabit National Reserve (Kenya).

Impacts of local communities on the sanctuary

Human population increase

The Senkele Swayne's Hartebeest Sanctuary is an island which is tightly surrounded by growing human population. The culture of the community which supports a polygyny

Plate 1. Livestock Population in different parts of the Sanctuary (Azmeraw Alemkere).

marriage contributes for the population increase and thereby contributing for the human impact on the sanctuary.

The 2008 data of human population in the four study Kebeles bordering the sanctuary was 26,725. The human population in the same Kebeles around the sanctuary was raised to 31,723 in 2014. Within only six years, the population was increased by 18.7% which was a 3.12% growth per year. This value was greater than the national average population growth rate (2.44) which was estimated for the year 2010 to 2014 (Aynalem, 2014).

The highly increasing human population around the sanctuary has increased the demand for resources such as land for cultivation and grazing, fuel wood, thatching grass and other forest products, which could consequently lead to habitat destruction and encroachment to the sanctuary. Accelerated human population growth around protected areas was identified as a severe threat for sustainability of protected areas (Mwamfupe, 1998; Kideghesh, 2006; Burger, 2011; Binlinla et al., 2014).

Livestock grazing

All respondents were engaged with livestock rearing. They owned a total of 5627.77 TLU livestock with an average ownership of 28.7 TLU. More than three fourth of the respondents (77%) graze their cattle in the sanctuary. The very weak form of punishment (10 Ethiopian Birr per household per day of restraining) contributed for the frequent grazing of livestock in the sanctuary (Plate 1).

In 2008, the total livestock identified in the four study Kebeles bordering the sanctuary was 35,397.116 TLU. Though it was not a remarkable reduction, the livestock population in the same Kebeles was reduced to 32,893.495 TLU in 2014. The reason for the reduction, as Nishizaki (2004) said it, was due to the gradual change in the importance of livestock and the increased preference of crop farming. However, the load on the sanctuary was not reduced yet. Because, according to the sanctuary staffs, the local communities always brought their relatives' livestock purposely to graze in the sanctuary. In addition, huge size of livestock also comes from neighboring Woreda administrations such as Shalla (Source: Sanctuary Staffs).

Grazing does not kill the Swayne's Hartebeests and other co-inhabiting wild animals directly. However, it is much difficult for Swayne's Hartebeests and other grazing wild animals to compete with several thousands of cattle roaming in the sanctuary. This can be considered as indirect poaching for the Swayne's Hartebeests and other grazing animals in the sanctuary (Burger, 2011). The noise made by the people and the livestock inside the sanctuary was anxious for the wild animals.

Settlement and agricultural encroachment

The increase in human population around the sanctuary increases the need of extra land for agriculture and settlement. According to the sanctuary office, 793 huts were built along the periphery of the sanctuary in a round fashion (Plate 2).

Illegal settlements in the sanctuary are not eradicated yet. According to the sanctuary staffs, over 50 huts are still left in the sanctuary. In addition, huts were built along the immediate border of the sanctuary in a round fashion. Such settlements inevitably degrade the sanctuary which, in the long run, could lead the Swayne's Hartebeests not to be seen once again on earth.

Plate 2. Settlements and construction of new huts along the periphery of the Sanctuary (Left = Huts from Kela Lalima Kebele; Right = A new hut From Loke Sifo Kebele)(Azmeraw Alemkere).

Plate 3. Part of the Sanctuary which was burnt by fire (Azmeraw Alemkere).

Fire

Fire frequently happens in the sanctuary during the dry season. When used in a controlled manner, fire has an advantage for regeneration of grass for the Swayne's Hartebeests and other grazer wild animals in the sanctuary. Abiot (2013) revealed that a higher number of Swayne's Hartebeests was observed in a fire disturbed habitat though it was opposite for warthogs. The same result was also reported by Burger (2011). However, uncontrolled fire devastates the vegetation which is highly important for other forest dwelling wild animals (Plate 3). It was appreciable that all the sanctuary staffs, heroically, tried to control the usual fire outbreak in the sanctuary. However, it was impossible for them to save all part of

the sanctuary from burning.

Respondents were asked about why they set fire in the sanctuary. Three reasons were given by them. The first was to help the regeneration of the grass for the next grazing season. The local communities understood that burning facilitates regeneration of the grass. The second reason given by the respondents was to avoid pests of their cattle, especially tick. The third was to get the good quality thatching grass in the next season.

The sanctuary staffs added two more reasons of setting fire in the sanctuary. The first was when members of the local communities have conflict with the other. After the grass is distributed to the local communities, individuals set fire on patch of the grass which belonged to somebody which they wanted to attack. The second

reason, when the distribution of thatching grass is unfair the one who thought that he did not get equal share of the grass sets fire to the sanctuary which devastates the vegetation.

CONCLUSION

The local communities living around Senkele Swayne's Hartebeest Sanctuary had unfavorable perceptions and attitude about the conservation of the sanctuary. They perceived that the size of the sanctuary is too large and viewed that the extent of wild animals' damage is much and increasing from time to time. Threatened with the intensified crop damage, livestock depredation, restrictions and punishments imposed by the sanctuary, the local communities perceived that people and wild animals cannot coexist. Concurrently, the sanctuary did not develop compensation schemes for the crop damage and livestock depredation incurred by wild animals. Consequently, most of the local communities had negative attitude towards the conservation of the sanctuary. Attitude of local communities was different across age groups, education level, family size, landholding size and livestock size. Respondents, who tend to be younger, more educated, with lower family size, high size of landholding and with low size of livestock ownership had better compliance than others who didn't possess either of these.

Senkele Swayne's Hartebeest Sanctuary is under jeopardy from the fast rising human population and the ongoing access of resources. The local communities used the sanctuary as a communal grazing land though they knew it is illegal. Border settlements are also challenges facing the sanctuary. Furthermore, fire frequently happens in the sanctuary which drastically damages the vegetation in the sanctuary.

To convey conservation support from the local communities and reduce the challenges in the Sanctuary, the local community should be actively participated in the sanctuary's affaires. Awareness and environmental educations should be given to the communities so that they will regulate their activities in the sanctuary. In addition, the sanctuary should work to improve the livelihoods of the local communities through job opportunity creation, infrastructure development and preparation of appropriate compensation schemes for crop damage and livestock depredation.

RECOMMENDATIONS

The following recommendations are given to assist the sustainable management of the sanctuary:

(1) The local communities should get awareness creation trainings, be involved in the conservation affaires of the sanctuary and should get incentives from the sanctuary.

(2) In collaboration with the government and donor agencies, the sanctuary should devise strategies to reduce the resource dependency of the local communities on the sanctuary.
(3) The local communities should get trainings on how to change their culture of polygyny marriage. Attention should also be given for family planning systems to limit the alarming human population around the sanctuary.
(4) Entrepreneurial activities in relation with the presence of the sanctuary should be initiated to bring their attention to conservation.
(5) The local communities should enjoy benefits from the sanctuary through job opportunity and infrastructure developments that might help them to diversify their livelihood.
(6) Appropriate compensation schemes should be prepared in coordination with concerned bodies such as Ethiopian Wildlife Conservation Authority to increase their tolerance to wild animals.
(7) Above all, the sanctuary should have a general management plan on which its management process is guided. This can help the sanctuary to adopt proactive conservation strategies.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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