

Analysis of Communities' Land Uses that Affect Management of Wildlife Resources in Protected Areas of Selous Ecosystem

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Abstract: Community's land uses in the vicinity of unfenced Protected Areas (PAs) can determine management and conservation sustainability of these areas. There is scanty information on land uses that affect management of wildlife resources in PAs. This paper seeks to reveal the less known community current land uses which affect management of wildlife resources in PAs using South Eastern Sector of Selous Game Reserve (SGR) ecosystem as a case study. Objectively, the study concentrates on land tenure system, and socio-economic activities that affect management of wildlife resources in the study area. Two villages were involved namely Mpigamiti and Kikulyungu. Sample of 70 respondents were selected, whereby 60 and 10 respondents randomly and purposely selected respectively. Data were collected by using Survey and Participatory Rural Appraisal (PRA) methods. Collected data were analysed by using Statistical Package for Social Sciences (SPSS) software. Results indicated that 85.0% of the respondents can get more land for cultivation out of planned land uses. Encroachment of wildlife resources increases whereas elephants poaching are at alarming rate of 33.3% per year from the year 2010. Charcoal production, honey gathering, clearance for cultivation and local beliefs resulted to increase wildfires by 12.5% per year from the year 2005. The study concludes that, management of wildlife resources in SGR is fairly sustainable. It is recommended that more understanding on resource use values and implementation of land use plan in villages adjacent to SGR are mainly vital to ensure effective management of wildlife resources.

Key words: *Protected areas, wildlife resources, land uses, ecosystem*

1.0!INTRODUCTION

Globally, Protected Areas (PAs) encompass the range of landscapes and seascapes that are managed to conserve and maintain elements of biodiversity and natural habitat (USAID, 2005). Protected areas are one of the main elements in building a local, national, or regional strategy for biodiversity conservation. Not only do PAs secure biodiversity conservation, they also secure the well-being of humanity itself. PAs provide livelihoods for nearly 1.1 billion people (CBD, 2016). PAs categorized into strict nature reserves, national parks and monuments, wilderness areas, game management and hunting areas, and national forests.

The number of PAs globally has increased both in size and number for over a century. Since 2004, nearly 6000 new PAs have been established covering at least 60 million hectares. Currently, there are about 130,000 PAs listed in the World Database on Protected areas (www.cbd.int), covering 12.9% of the Earth's terrestrial surface, and 6.3% of territorial marine areas and the growth in PAs systems world-wide continues to increase (WDPA, 2016).

Local communities resides adjacent to unfenced PAs rely heavily on the natural resources (water, rangeland, firewood and bushmeat) for their livelihoods (UNEP, 2016). Tanzania as among of Sub-Saharan African countries having unfenced wildlife PAs is not exempted from this scenario; as from the year 2001 to 2014, the country loss 1,699,305 ha of its original habitats (UNEP, 2016). Local extinction of fauna species and increased number of species that are prone to extinction in different localities manifest the impact of this loss (FAO, 2016). One of the measures to counter the extinction of fauna species was the establishment of PAs. However, the establishments of PAs deprived local people from legal access to many traditional resources particularly bush meat, which have led to antagonism among local communities towards wildlife and conservation authorities (CBD, 2016).

Selous ecosystem contains total area of 105,940 km² of continuous protected areas of various wildlife diversity and areas of sparse settlement (URT, 2005). The Selous ecosystem has the following components; Selous Game Reserve (*Est.* 47, 000 km²), Mikumi National Park (3,140 km²), Udzungwa National Park (2,000 km²), Kilombero Game Controlled Area (5,300 km²), Peripheral Areas (35,000 km²) and Selous-Niassa Corridor (11,500 km²) (URT, 2005). Like other PAs, Selous ecosystem faces different challenges including competing wildlife resources utilization which thwart its sustainability.

1.2 Problem Statement

The need for wildlife management in Selous ecosystem is undisputable. This comes from the outstanding biological, scientific, aesthetic and economic value of the area. The majority of these values stem from the region's prolific wildlife diversity. There is, however, a growing concern about the long-term viability of the Selous ecosystem due to increasing conflicts with neighbouring communities in management of protected areas imminent from unsustainable land use specifically shifting cultivation and overexploitation of wildlife due to illegal hunting. The increase of illegal hunting is likely to bring hazards to wildlife and loss in its diversity.

Although, south eastern sector of Selous game reserve ecosystem is within Liwale district and 62% of the district is considered arable, over 50% of the district area is occupied by SGR and only 2% was actually under cultivation. Besides, agriculture is practiced by small holder farmers, much of the region is shifting cultivation with low production, and little surplus. In this case, poaching for bush meat is often undertaken to supplement diet out of necessity. However, there are evidences of increasing encroachment of wildlife resources inside and outside SGR at alarming rate. Every year studies are being carried out (CBD, 2016; WWF, 2015 and MNRT, 2016) show that there is increasing encroachment of wildlife resources due to increasing price

in black market. This comes, despite the efforts taken by global communities' initiatives such as convention on international trade in endangered species of wild fauna and flora (CITES) and government in antipoaching operations and involvement of communities in wildlife conservations through establishment of Wildlife Management Areas (WMAs). This scenario led to urgency for investigation on the current communities land uses that affect management of wildlife resources in protected areas of Selous ecosystem as a case study.

2.0 METHODOLOGY

2.1 Description of the Study Area

The Selous Game Reserve is situated in south-east Tanzania between $7^{\circ} 20'S$ and $10^{\circ} 30'S$ (Figure 1). The study was carried out in south eastern sector of Selous GR because it contains WMA (MAGINGO) which acts as the buffer zone to Selous GR. The study area has been selected as it has a concentration of wild animals and wood trees that provide good living habitats of large mammals outside game reserve. Furthermore, the study area is within nine villages bordering South-eastern sector of Selous game reserve which form the MAGINGO WMA. In this study, two villages out of nine villages namely; Mpigamiti and Kikulyungu were selected for the study. The choice of Mpigamiti and Kikulyungu villages was based on their conservation performance. Mpigamiti shows better performance, while Kikulyungu is the opposite.

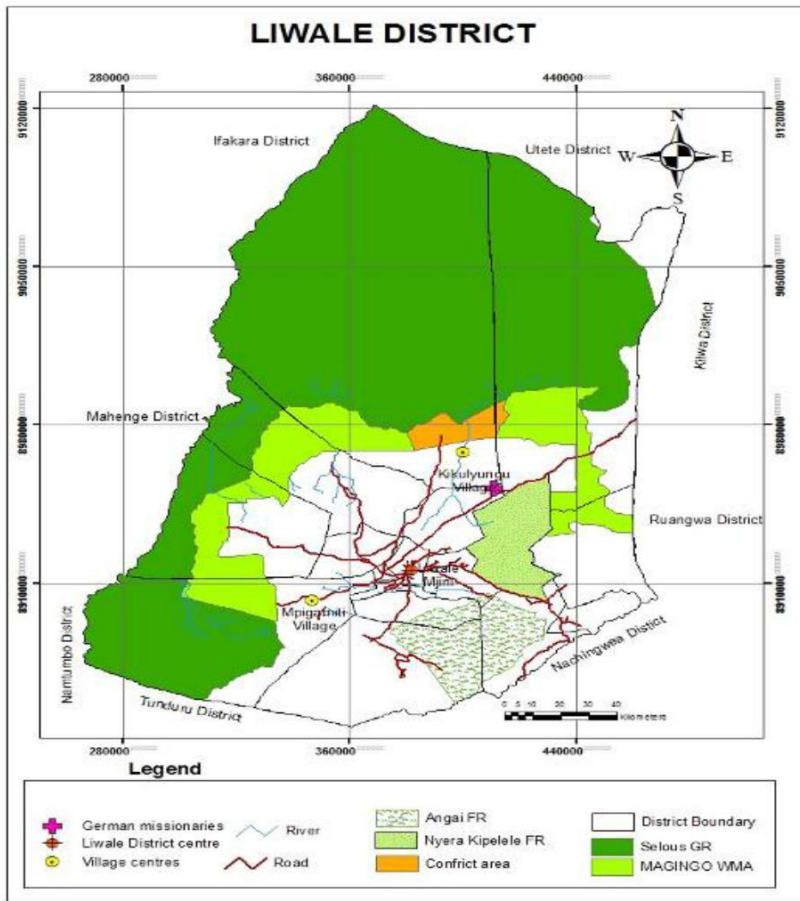


Figure 2: South-Eastern Sector of Selous Ecosystem

2.2 Research Design

A cross sectional survey design was employed. This type of research design utilizes different groups of people who differ in the variable of interest, but share other characteristics such as socioeconomic status, educational background, and ethnicity (Kothari, 2004).

2.3 Sampling Procedures and Sample Size Determination

2.3.1 Sampling procedure

Mpigamiti and Kikulyungu villages in Liwale District were purposively selected as those found within south eastern sector of Selous ecosystem. The study villages selected because (i) both are within the sector, (ii) both are members of wildlife management area (MAGINGO WMA and (iii) Mpigamiti performed well in wildlife conservation compared to Kikulyungu.

Sampling frame of this study was a list of all households from the updated village register book in the study villages. Sampling unit for this study was a household. Household was defined as a group of people living together and identifying the authority of one person the household head, who is the decision maker for the household (Katani, 1999). Simple random sampling was used to identify the sample units. In this method every household has an equal chance of being selected. Where a candidate happened to come from the same household, one was dropped (Bouma, 2000; Henn *et al.*, 2006; Veal, 1997; and Kaswamila, 2009).

2.3.2 Sample size determination

The sample size for each study village was 30 households whereby 10 households were drawn from each income group (low, medium and high) as described in village's fact sheet. Sample size in socio-economic studies can be decided by the researcher depending on the nature of study but should be at least 30 units as supported by many scholars (Bailey, 1994; Boyd *et al.*, 1981; Mbwapambo, 2000; Kaswamila, 2009). Judgmental/purposive sampling technique was used to obtain 10 key informants.

2.4 Data Collection

A combination of methods and techniques were employed to attain the data. Both primary and secondary data were collected. Face-to-face semi-structured questionnaires were administered to the sampled

households; in-depth interviews were done by using key informants. Two focus group discussions in each study village with villagers were organised; and two participatory transect walks were made in each study village, taken coordinates using Global Positioning System (GPS) and notes for the purpose of observing changes in land use pattern of the study area, effects of human activities on wildlife habitat and how wildlife damages crops of the people living adjacent to protected area.

Archive information for this study were published and unpublished obtained from SGR, village, and ward or district offices. Data accessed were in the form of reports, manuscripts, books, journal papers and other documents found in office files and other collections.

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2.5 Data Analysis

Quantitative data from questionnaire were analyzed statistically. Qualitative data from Focus Group Discussions (FGDs) and key informants were analyzed through content analysis.

2.5.1 Statistical Analysis

The Statistical Package for Social Sciences (SPSS) and Microsoft Excel were employed. Analysis of quantitative data by descriptive statistics involved frequencies, percentages, means, and standard deviations of variables such as age, marital status, sex, education level, household size and income. Also the relationship between two variables was examined by the use of cross tabulation method.

2.5.2 Content Analysis

Details of the components of verbal discussions held with key informants and FGDs were analysed contently followed procedures described by Kijazi (2006).

3.0 FINDINGS AND DISCUSSIONS

3.1 General Information on Respondents in the Study Villages

The study population comprised of males and females with different ages, family size and education background (Table 1). Out of the household heads interviewed, 81.7% were above 25 years old. This was important to the management of wildlife resources in SGR because they understand the historical trend of their areas as well as the various Indigenous Technical knowledge (ITK).

The study villages were found to have large household sizes. Results show that 43.3% have 1-5 persons per household and 56.7% have more than 5 persons. This is due to the culture of marrying many wives (polygamy) which results into a lot of dependants to feed and take care of. Education background of the surveyed population was at most primary education (83.3%), very few had at least secondary education (5.0%). This is due to shortages of schools especially primary school resulting into children walking long distances to school. There was no single secondary school in Mpigamiti village/ward and one secondary school in Kikulyungu village which belongs to Mkutano ward with only two teachers. This implies that, low education level provides low payment employment opportunities to tourism industry of SGR.

The study villages found to have low income per month resulted mostly from small-scale farming compared to standard living cost needed in the study area. Results show that 80.0% have income less than Tsh. 60,000, and 20.0% above Tsh.60,000, whereas 48.3% below Tsh.30, 000 which means below Tsh. 1,000 per day (Table 1). This shows that those employed villagers have high income compared to non-employed which shows that 69.6% of employed villagers have income per month above Tsh. 120,000 compared to unemployed villagers 86.5% have an income per month below Tsh. 60,000 as supported much by WDPA, 2016.

Table 1: General information on residents of study villages

Information	Villages		
	Mpigamiti (n=30)	Kikulyungu (n=30)	Overall (n=60)
(a)Age group			
18-24 Years			
25-35 Years	7 (23.3%)	4 (13.3%)	11 (18.3%)
36-44 Years	8 (26.7%)	9 (30.0%)	17 (28.3%)
45-65 Years	8 (26.7%)	8 (26.7%)	16 (26.7%)
Above 65 Years	5 (16.7%)	5 (16.7%)	10 (16.7%)
(b)Sex	2 (6.7%)	4 (13.3%)	6 (10.0%)
Male			
Female	23 (76.7%)	24 (80.0%)	47 (78.3%)
(c)Education	7 (23.3%)	6 (20.0%)	13 (21.7%)
Informal education			
Basic adult education	6 (20.0%)	5 (16.7%)	11 (18.3%)
Primary	1 (3.3%)	4 (13.3%)	5 (8.3%)
Secondary	19 (63.3%)	15 (50.0%)	34 (56.7%)
Above secondary	3 (10.0%)	4 (13.3%)	7 (11.7%)
(d)Household size:	1 (3.3%)	2 (6.7%)	3 (5.0%)
1-5Persons			
6-10Persons	16 (53.3%)	10 (33.3%)	26 (43.3%)
11-15Persons	11 (36.7%)	11 (36.7%)	22 (36.7%)
Above 16Persons	2 (6.7%)	7 (23.3%)	9 (15.0%)
(e) Income per month:	1 (3.3%)	2 (6.7%)	3 (5.0%)
Below Tsh.30,000	12 (40.0%)	17 (56.7%)	29 (48.3%)
Tsh.30,000-59,000	10 (33.3%)	9 (30.0%)	19 (31.7%)
Tsh.60,000-89,000	4 (13.3%)	0 (0.0%)	4 (6.7%)
Tsh.90,000-119,000	0 (0.0%)	2 (6.7%)	2 (3.3%)
Tsh.120,000-149,000	1 (3.3%)	2 (6.7%)	3 (5.0%)
Tsh.150,000-179,000	2 (6.7%)	0 (0.0%)	2 (3.3%)
Tsh.180,000-209,000	1 (3.3%)	0 (0.0%)	1 (1.7%)
Above Tsh.209,000	0 (0.0%)	0 (0.0%)	0 (0.0%)

Results also show that the study population had 38.3% of employed villagers while 61.7% were unemployed (Table 2). Mostly those villagers who were employed work in Tourism industry, and those who were not employed are likely to engage themselves in other socio-economic activities including encroachment of wildlife resources (Illegal hunting - poaching activities). Those unemployed people were the one who were poor compared to employed villagers.

Table 2: Income level of respondent per month

Income per month	Employed (n=7)	Unemployed (n=53)	Overall (n=60)
Below Tsh.30,000	0 (0.0%)	29 (54.7%)	29(48.3%)
Tsh.30,000-59,000	0 (0.0%)	19 (35.8%)	19(31.7%)
Tsh.60,000-89,000	0 (0.0%)	4 (7.5%)	4(6.7%)
Tsh.90,000-119,000	1 (14.3%)	1 (1.9%)	2(3.3%)
Tsh.120,000-149,000	3 (42.9%)	0 (0.0%)	3(5.0%)
Tsh.150,000-179,000	2 (28.6%)	0 (0.0%)	2(3.3%)
Tsh.180,000-209,000	1 (14.3%)	0 (0.0%)	1(1.7%)
Above Tsh.209,000	0 (0.0%)	0 (0.0%)	0(0.0%)

The study villages found to have large household size with low income of her people as a result people concentrates on utilizing wildlife resources in the protected areas. Alternatively, if considers employments in tourism industry, it has seen whites paid much compared to blacks and this is common in many tourism companies includes Tanganyika Wildlife Safaris (TAWISA) and Tanganyika Wildlife Company Ltd (TAWICO) which have invested in SGR – South eastern sector ecosystem (comprises eight (8) hunting blocks). This implies that, affirmative action policies may need to be adopted for a period of time to improve the conditions of the excluded and to make for more equitable access to job opportunities.

3.2 Land Tenure System

The land tenure system in the study area is given in Table 3. The dominant land ownership system is individual land obtained through inheritance (85.0%). This is followed by rent land (15.0%) where the majorities were females who were either divorced or widowed because the customary law for accessing land did not favor them. The minimum farm size owned by an individual farmer was 1 ha, while the maximum farm land was 15 ha. Average farm land per farmer was 3 ha. Regarding land area, 88.3% of the respondents have land parcels between 1-5 ha and 11.7% had more than 5 ha. However, 23.3% of the respondents claimed that land was not enough.

Table 3: Land ownership in study villages

Information	Villages		
	Mpigamiti (n=30)	Kikulyungu (n=30)	Overall (n=60)
(a)Land ownership:			
Individual	24(80.0%)	27 (90.0%)	51(85.0%)
Rent	6 (20.0%)	3 (10.0%)	9 (15.0%)
(b)Land owned in hectares:			
1-5 ha	29(96.7%)	24 (80.0%)	53(88.3%)
6-10 ha	1(3.3%)	4 (13.3%)	5(8.3%)
11-15 ha	0(0.0%)	2 (6.7%)	2(3.3%)
Above 15 ha	0(0.0%)	0 (0.0%)	0(0.0%)
(c)Land available:			
Enough	22(73.3%)	24 (80.0%)	46(76.7%)
Not enough	8 (26.7%)	6 (20.0%)	14(23.3%)
(d)Possibility to get more land:			
Yes	25(83.3%)	26 (86.7%)	51(85.0%)
No	5 (16.7%)	4 (13.3%)	9 (15.0%)

For possibilities to get more land for cultivation, 85% claimed that it was possible either through formal application to the village government (81.7%), buying from those with big farms (10.0%) and renting on temporary basis (8.3%) (Table 4). Even though, the majority of respondents (83.3%) indicated the possibility of getting

additional piece of land. During the focus group discussions it was found that there is a problem of fertile land for rice farming in Mpigamiti resulted to land use conflicts. The conflict arose in 2010 after MAGINGO WMA getting user right for the area while immigrants invaded the area and cultivated protected land and used water from the Liwale River without prior consultation and permission from the village and MAGINGO leaders. While in Kikulyungu village, the villagers were evicted from MAGINGO WMA due to border conflict between the village and SGR. The villagers claimed that, Kihurumila dam is within the village land contrary to Government gazette announcement No. 275 of 1974 which declare the boundaries of SGR.

Table 4: Means to acquire land by study villages

Information:	Frequency	Percent
Application to the village government	49	81.7
Buying	6	10.0
Rent	5	8.3
Total	60	100

Furthermore, information obtained from MAGINGO WMA office and DLO shows that, study villages bordering SGR have land use plans made by Tanzania Land Use Plan Commission (TLUPC) in collaboration with Liwale District Council (LDC) and Ministry of Land, Housing and Settlement (MLHS) in 2008 funded by WWF while excluding SGR in planning process. This in one way or another is among of the cause of border conflict between Kikulyungu village and SGR where the village land use plan map showed the border to be in Matandu River inside SGR where Kihurumila dam is automatically inside the village.

Therefore, this shows that, all professionals were only listening to villagers without considering other laws like Wildlife Conservation

Act No. 12 of 1974 which declares the boundaries of SGR. During 2010 boundary conflict resolution between MAGINGO WMA and SGR done by the committee made by then Minister of MNRT which involved professionals from TLUPC, LDC, MLHS, MNRT and SGR also Village elders of conflicting villages of Ndapata, Barikiwa, Chimbuko, Kikulyungu and Kimambi (MWMA and SGR office reports, 2010). At the end of resolution, all villages except Kikulyungu agreed with the Government Notice No. 275 of 1974 which declares the boundaries of SGR.

Consequently, land shortage in the study villages is not experienced but is endorsed to poor agricultural practices especially shifting cultivation which associated with deforestation of Miombo woodlands. Each respondent in study villages have an average of 3.0 ha, then with proper application of agricultural inputs, food shortages will be history.

3.3 Effects of Socio-economic Activities on Wildlife Resources

3.3.1 Agriculture

Agriculture is a major economic activity and source of income around Selous game reserve ecosystem. Many villagers in Liwale District practice shifting cultivation associated with destroying miombo forests which are also habitat for wild animals thereafter causing human-wildlife or wildlife-crops interactions/conflicts. Precisely, this behavior is due to low population in Liwale District for long time (from 2002 census) where it was estimated to have one hundred thousand people with average of one person per two square kilometers suitable for agriculture and outside protected areas.

Cultivated crops in the study area can be categorized into three main groups namely annual, semi perennial and perennial crops. Major annual cultivated crops include maize (*Zea mays*); rice (*Oryza sativa*) and sorghum (*Sorghum vulgare*). Semi perennial cultivated plant species are cassava (*Manihot esculenta*), sugar cane (*Saccharum*

officinarum) and banana (*Musa esente*, *Musa cavendishii*, and *Musa sp.*). Perennial cultivated plant species are cashewnut (*Anacardium occidentale*) and coconut (*Cocos nucifera*). Other minor cultivated plant species are simsim (*Sesamum sp.*), groundnuts (*Arachis hypogea*), melon (*Cucurbita mero*) and Pigeon beans (*Cajanus cajan*). Fruits plant species cultivated in study area include mango (*Mangifera indica*) and Orange (*Citrus sp.*) and pawpaw (*Carica papaya*). However, perennial and semi perennial crops are grown on small scale level but all crops are grown for subsistence and trade, but cashew nuts remains the principal cash crop.

These crops attract wild animals which are the source of conflict of interests between conservation and agriculture. The study villages show that 88.6% of respondents suffered from wildlife related problems while only 11.4% had not experienced the problem (Table 5).

Table 5: Multiple responses on problem animals destroying crops and human life

Information:	Percentages; n=60:
(a) Availability of problem animals:	
Yes	88.6%
No	11.4%
(b) Common problem animals:	
Elephant (<i>Loxodonta africana</i>)	89.4%
Vervet monkeys (<i>Chlorocebus aethiops</i>)	66.7%
Bushpig (<i>Potamochoerus porcus</i>)	68.2%
Olive baboon (<i>Papio anubis anubis</i>)	53.0%
Warthog(<i>Phacochoerus aethiopicus</i>)	15.8%

The study found the animals that damage crops in the field include elephants (89.4%), velvet monkeys (66.7%), bush-pigs (68.2%), olive baboons (53.0%) and warthogs (15.8%) (Table 5). Rats were reported by many respondents that they cause great damage on stored cereal crops at home compared to fields' crops. During transect walk and

focus group discussions it was found that, damage to crops varied from one village to another and from one plot to another within the study area. The areas which are more affected are those within the wildlife corridor which the most preferred crops by animals were maize, cassava, sugarcane, melon and cashew nuts.

During focus group discussions, the wild animals that damage crops were categorized into three main groups:

- (a) All wild animals' species which damage crops during the day. These include Vervet monkey (*Cercopithecus aethiops arenarius*), Rufiji blue monkey (*Cercopithecus mitis monoides*) and yellow baboon (*Papio cynocephalus*).
- (b) All wild animals' species which damage crops at night. These include African elephant (*Loxodonta africana*), bushpig (*Potamochoerus porcus*), buffalo (*Cyncherus caffer*) and hippopotamus (*Hippopotamus amphibius*).
- (c) All animals' species that cause minor damage of crops at night. These include warthog (*Phacochoerus aethiopicus*), eland (*Taurotragus oryx*), greater kudu (*Strepsiceros strepsiceros*), bushbuck (*Tragelaphus scriptus*), impala (*Aepyceros melampus*), black backed jackal (*Canis mesomelas*), Reed buck (*Redunca redunca*), porcupine (*Hytrix africae astralis*) and cane rat (*Thyronomys swinderianus*).

Elephants, bushpigs and baboons are animals that cause greater damage to maize farm plots both in wet and dry season. Baboons start to destroy maize seedling immediately after germination. They jab germinated maize seedlings and continue to damage crops in the growing season until they are harvested. Elephant start to feed on maize seedlings between 3 - 4 weeks after germination and continue to damage the crops until they are harvested. The relative ranking of damage caused by elephant varies in the study area. Elephants were found to enter crops most in both wet and dry season depending on

the location of the field from the feeding routes or direction of reserve. Bushpigs were reported to use stems of maize and sorghum at early stage.

The measures taken by farmers to control animals include non lethal deterrents applied by farmers include oil chilled ropes and chilled elephant dung blocks. The farmers who applied oil chilled ropes and chilled dungs around their farm plots in the study area had less crops loss or raided by animals especially elephants. In both study villages of Mpigamiti and Kikulyungu the peasants who applied the deterrents of elephants in their farm plots yielded much and had large farms plots compared to those who do not apply. The use of non lethal deterrents towards elephants was more common in Mpigamiti village rather than Kikulyungu village. Therefore, as suggested by FAO (2016) crop production in the study villages would be increased if more efforts toward preventing crop damage were focused on the control of weeds, crop diseases, and smaller species such as bush pigs, baboons, rodents or birds.

However, protected area and their wildlife resources not only represent problems for people living around them. There is also an overall great deal of respect, affection and positive culture associate with the populations of wild game. Wild animals are part of people's lives, their identity and attachment to the land. There is also a considerable faith in the manager's capability to alleviate problems around communities, and in protecting natural resources. However, major threat recently is a limited range of opportunities and alternatives in a situation characterized by wide spread poverty and increased population pressure around wildlife areas, yet it remains important to facilitate the potential for social and community mobilization that is the pre-requisite for good wildlife management (Kideghesho, 2006).

In the study area the sands are loamy, which are very imperfectly drained, "have very severe limitations that restrict their capability to

produce perennial forage crops" (URT, 2015). As a result, agriculture throughout much of the region is in the form of shifting cultivation. Furthermore, population growth of people and ghastly land uses in study villages brings pressure on resources available as results of habitat destruction and environmental degradation. During transect walk, it was seen that, many farms area directing towards the boundary of SGR which implies that, people are not only interested with growing crops only but their eyes are on wild animals.

The existence of conflicts within protected areas is based on the differing term-utilization attached to the resources of the environment. The objectives behind the conservation scheme is to conserve natural resources for long-term benefits, while the concern of the inhabitants of protected areas is the need to have a means of livelihood for survival. The different functional interpretations given to protected areas have generated the varying degrees of conflicts experienced.

3.3.2 Encroachment of Wildlife Resources in the Study Area

Encroachment of wildlife resources has already resulted in reduced populations of several resident wildlife species (CBD, 2016 and UNEP, 2016). Table 6 shows number of arrested poachers and exhibits from 2005 up to 2010 and actions taken. Results show that, out 67 poachers arrested from 2005 to 2010 only 10 poachers were taken to court of law while 54 poachers compounded and paid a sum of TZS. 3,230,000/=.

**Table 6: Poachers arrested by SGR South Eastern sector
from 2005 to 2010**

	2005	2006	2007	2008	2009	2010	Total
Number of Poachers arrested	14	7	5	10	16	15	67
Number of poachers taken to court of law	1	-	1	3	3	2	10
Number of cases in court of law	1	-	-	2	3	1	7
Number of cases convicted in court of law	-	-	-	1 null prosc ue	1 jailed 30 years,	1 jailed 10 years	3
Number of cases continues in court of law	-	-	-	2	2	1	5
Number of poachers fined	13	7	4	7	13	10	54
Total fines collected	630,000	660,000	220,000	520,000	500,000	700,000	3,230,000
Guns and other exhibits	.375, Dikdi k meat	Buffa lo meat	Harte beest meat	6 eleph ants tusks, 2 hippo tusks, Dikdi k meat	25 eleph ants tusks 25, Dikdi meat, 100 timbe rs	.375, 17 timbe rs, insya meat	2 guns, 31 elephan t tusks, 2 hippo tusks, 117 timbers , Dikdik, Buffalo , Hartebe est and Insya meat.

Source: SGR South Eastern Sector Office, 2014

Moreover, poaching remains a chronic problem in wildlife conservation in Protected Areas. In SGR and MWMA areas, the poachers mainly use guns for killing elephants whose price of the tusks rise everyday in black market due to the need of the trophies in Asian markets. Elephants trophy poaching in the study area was rampant in the year 2011 after rise of black market where one kilogram of elephant tusk in Liwale sold up to TZS. 300,000/=. This is evidenced by having a total of 67 poached elephants' carcasses in SGR-Southeastern sector, MWMA and Liwale open area in the year 2010 to 2012 (Figure 2).

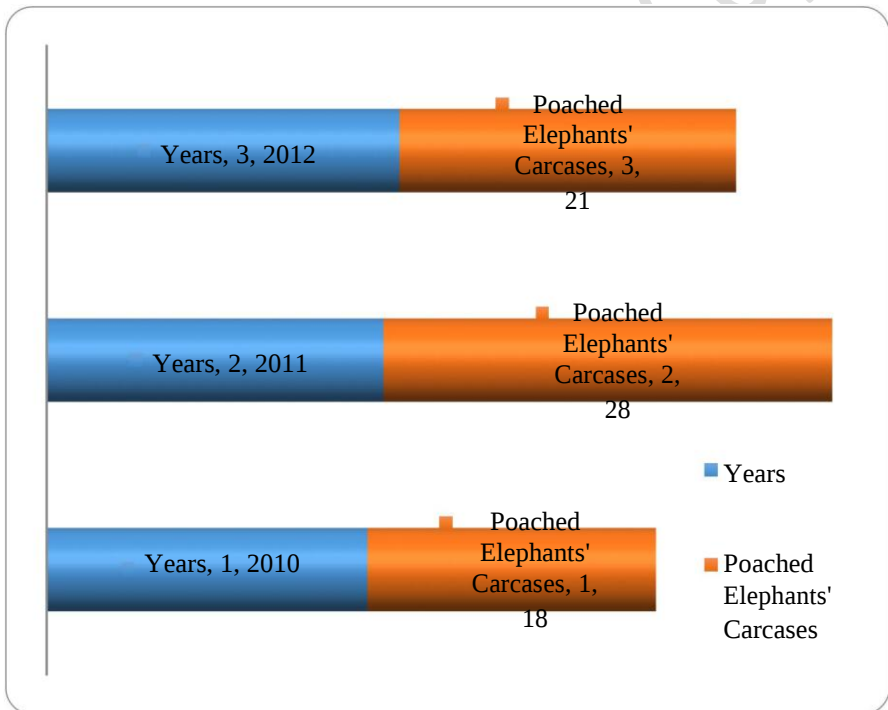


Figure 2: Poached Elephants' Carcasses from 2010 - 2012

Source: SGR – South Eastern Sector office, 2014

Additionally, evidence comes from seizing a lot of elephant ivory tones in Asia especially China and Vietnam and claimed coming from Tanzania (Interpol reports, 2012). Killing of other species include hartebeest, buffalo, eland, impala and others mostly using wire snares are for subsistence and selling almost within the district. These poaching activities are for business especially elephants ivory are transported mainly using blind ports along shores of Indian Ocean in Lindi and Mtwara Regions. Recent data available show that until September 2012 there were 16 blind ports for smuggling elephant tusks which transported to Zanzibar and Dar es Salaam ready for overseas transportation (Interpol reports, 2012).

Despite being included in the environmental crimes, poaching and other illegal harvesting of wild resources are on increase. In discussion with the focus groups, the reasons for poaching reported was the traditionally local community preferred for wildlife meat to that of domestic animals. The local people do not practice livestock keeping and it is also a part of the culture for Wangindo tribe to conduct hunting using traditional weapons (Since then they were hunters and gatherers). In the past, the kill was distributed freely to the neighboring households contrary to these days where wildlife meat is sold. However, increasing poverty has made poaching to grow. Wire snares and guns have proved effective especially to all herbivores except elephants killed by guns and poisons. The wire snares reduce the risk of poachers being arrested by wildlife authorities since a normal hunting involves a lot of chasing for the wounded animals. It is only a romantic myth that bush meat originated from small-scale consumptive poaching which is less destructive than commercial trophy poaching.

Although, villagers are involved in the management of wildlife, illegal hunting is still observed in the WMA which covers 373,358 hectares. The reason behind is that the villages governments and Magingo WMA have low capacity to invest in anti-poaching activities

regarding the huge area. For instance, patrol budget for MAGINGO WMA was TZS 59 Millions and 60 Millions for 2010/11 and 2011/12, respectively. Meanwhile, the income from their hunting quota and share from the department of Wildlife was Tsh. 50 Millions and 63 Millions for 2010/11 and 2011/12, respectively.

However, anti-poaching operations conducted by Taskforce (National and Trans – National High Crimes Intelligence Unit - NTHCIU) managed to withdraw 147 guns from Liwale District in September 2012. In addition, more than six hundred ammunition was used in illegal killing of wild animals were caught. But, poaching still continues as evidenced by seizing of 61 pieces of elephants tusks weighed 98.2kg equivalent to 34 complete tusks accounted to 17 live elephants killed in October 2012. SGR is prioritised anti-poaching activity to be highly ranked than other activities. Each game scout/warden/officer is supposed to patrol at least 20 days per month in order to make sure everywhere inside and outside SGR where are reached. Due to this it is easy to succeed in all identified management strategies of SGR and its adjacent land uses.

Conversely, the study population found to have high trust on the management of SGR. Results (Figure 3) show that 58.6% of study population rank good, 21.2% rank considerable, 9.1% excellent and the remaining percentage rank somehow and very little. This shows that SGR management should keep up with its management strategies for the future generation.

3.2.4 Encroachment for fuel wood, logging and mining

Encroachment for fuel wood, logging and mining is increasing daily in the study area as alternative source of income for their livelihoods. During transect walks in Mpigamiti village, two mining tunnels were seen but the miners shift due to emerge of other mining areas in other villages outside WMA member villages. However, logging was

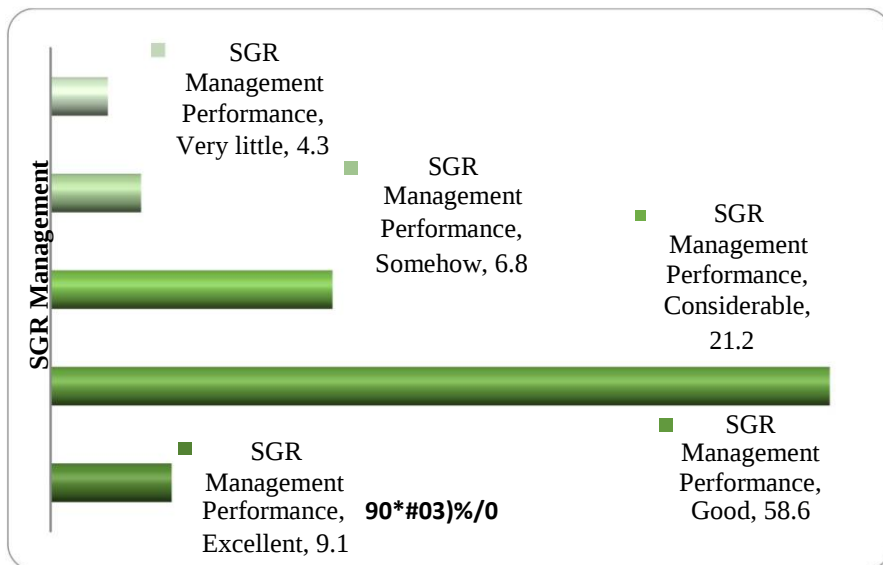


Figure 3: SGR Performance on Protection of Wildlife Resources

increased in WMA member villages as these are the only areas in Liwale District concentrated with valuable trees for logging and timbering. In the year 2012, twenty six (26) people and more than 4,000 timbers which were illegally harvested were arrested inside WMA, Forest reserves and open areas by Tanzania Forest Service (TFS) in collaboration with Selous GR. The growing number of people, farms and wildlife in the Liwale District are leading to increased conflict between the needs of conservation and development as explained much by Nelson (2009 and 2010) and Wilfred (2010).

Tree planting help to reduce shortage of fuel wood and logging which are important for households' consumption. The study villages found to have high concentration of people who do not adopt trees planting strategy contrary to the national agenda (Liwale District Report, 2012). The results (Table 7) show that 76.7% of the study villages do not plant trees so the only source of fuel wood and other needs results from trees depend on cutting down natural trees available in the

village and inside MWMA and SGR, only 23.3% of the respondents plant trees for different reasons, among which fuelwood account 33.3% for Mpigamiti and 66.7% Kikulyungu.

Table 7: Growing of trees and its purposes

Information	Mpigamiti n=30	Kikulyungu n=30	Overall n=60
(a) Growing trees:			
Yes	9 (30.0%)	5 (16.7%)	14 (23.3%)
No	21 (70.0%)	25 (83.3%)	46 (76.7%)
(b) Purpose of growing trees:			
Fuelwood	1 (33.3%)	2 (66.7%)	3 (100%)
Building material	6 (60.0%)	4 (40.0%)	10 (100%)
Soil fertility maintenance	3 (60.0%)	2 (40.0%)	5 (100%)
Wind breakers	0 (0.0%)	0 (0.0%)	0 (0%)
Shades	14 (77.8%)	4 (22.2%)	18 (100%)

For (b) multiple responses answers were obtained

Besides, results in Table 8 show that 95% of respondents in study villages were dependent on natural regeneration of trees to tackle fuel wood shortage. The study villages were found to have no crucial measures taken for dealing with shortage of fuel wood. 50% of respondents infrequent had practiced private tree planting. Similarly, 36.7% of respondents infrequent practice agro-forest and those who infrequent practice communal tree planting were 3.3%. This implies more encroachment in study area.

Also during focus group discussion, it was found that, population in the study area engaged themselves in encroachment of mining in the PAs especially in MWMA. This was evidenced by having mining holes in Mpigamiti village while village game scouts do not intervene because there is no seriousness on implementing by-laws due to fact that, until now no research of type of mine found in the village land.

Table 8: Multiple responses on measures taken to deal with fuelwood shortage

Practice	Frequency of use			
	Often	Infrequent	Not used at all	Overall
(a) Agro-forest	0 (0.0%)	22 (36.7%)	38 (63.3%)	60 (100%)
(b) Private tree	1 (1.7%)	30 (50.0%)	29 (48.3%)	60 (100%)
planting	0 (0.0%)	2 (3.3%)	58 (96.7%)	60 (100%)
(c) Communal tree	57 (95.0%)	1 (1.7%)	2 (3.3%)	60 (100%)
planting				
(d) Natural				
regeneration				

3.2.5 Wildfires

Control of wildfires is one among the strategies for conservation of biodiversity and natural/wildlife resources. Results from the study villages shows that, very few people adopt strategies/practices to control loss of wildlife resources. Results in Table 9 show that 83.3 % of the respondents in the study villages do not adopt any strategy include minimization of wildfire and only 16.7% of the respondents adopt strategy/practices for controlling loss of wildlife resources.

Table 9: Uses of strategy/practices to control loss of wildlife resources

Information:	Mpigamiti (n=30)	Kikulyungu (n=30)	Overall (n=600)
Yes	6 (20.0%)	4 (13.3%)	10 (16.7%)
No	24 (80.0%)	26 (86.7%)	50 (83.3%)

Moreover, SGR south eastern sector is surrounded by 9 villages include study villages. Study villages form part of the migratory route for migrating elephants thus causing severe crop damage and loss of life in some instances. Wildfires occur frequently inside MWMA, forest reserves and open areas. The major causes of these fires are charcoal production, honey gathering, clearance for cultivation and local beliefs. Wildfires have overwhelming effects on the biodiversity

and ecology of the Selous ecosystem thereof calls for efficiency and effective management especially when occur at the wrong season.

In Liwale District more than eight wildfires reported each year in different villages bordering MWMA and SGR. Figure 4 shows reported incidences of wildfires increases by 12.5% per year from 2005-2012 with an average of 10 incidences per year. The extent of damage to MWMA is immeasurable but SGR have natural firebreak from villages which is the river Matandu. Available by-laws for preventing wildfires were aware to many villagers but traditional ways of starting the fire is unavoidable as mostly done at night hours.

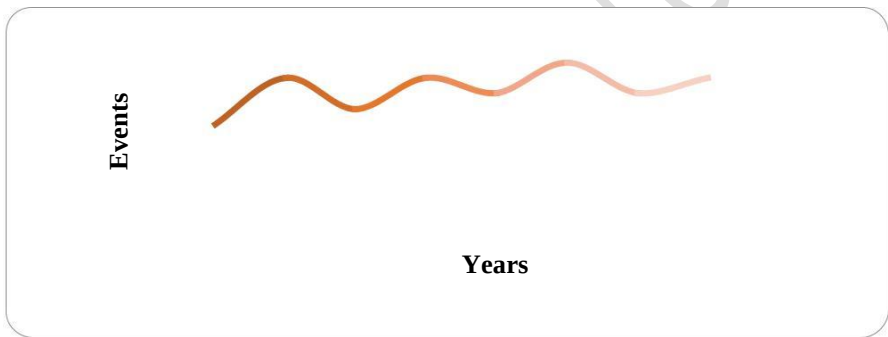


Figure 4: *Incidence of Wildfires from the Year 2005 to 2012*

Source: DGO Office, 2014.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 CONCLUSION

Communities' land uses are a major determinant for management of wildlife resources. Access to land in study area is possible for practicing socio-economic activities to sustain communities' livelihoods. However, gender inequality experienced especially to women who are continued to be discriminated and denied direct access to land and insecure. Shifting cultivation is still practiced in the study area though, the land underwent land use plan. Encroachment for wildlife resources, fuel wood and wildfires cause wildlife habitat

destruction and decrease of wildlife population as a result those direct and indirect benefits of wildlife resources in the ecosystem will be destroyed.

4.2 RECOMMENDATIONS

Land tenure system should be gendered accessed by both groups includes divorced or widowed who customary laws do not favored them. Invaded reserved land for MWMA in Mpigamiti village should be taken into account by repatriating the invaders and make sure the present land use plan is followed. Poor agricultural practices especially shifting cultivation should be reversed by cultivating on permanent farm plots which should be mechanized in terms of pesticides, herbicides and fertilizers application. Furthermore, communities should freeze those unimportant beliefs for increasing wildfires in order to assure their future life which relies on ecosystem services.

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