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Wildfire and socio-economic activities of the local communities adjacent to the North-Eastern Selous Game Reserve, Tanzania

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ABSTRACT

Wildfires are known to originate from both natural and anthropogenic sources. Man has been associated with fire overtime in the history. Humans through various activities are known to be major source of wildfire in the Selous Game Reserve. This study aimed at determining the role of socio-economic activities in the occurrence of wildfire in the reserve. Semi structured interview and Likert scaling was used in data collection. Poaching, charcoaling, agriculture, pastoralism, fishing and residential protection were among of the socio-economic activities influencing the occurrence of wildfire in the reserve. Charcoal production (Mean=4.455±0.0082) scored highest while pastoralism (Mean=2.338±0.15) scored least of all. However the attitude of local communities between Ngarambe and Tapika villages varied significantly due to difference in socio economic activities between these two villages. It is recommended that education provision, extension services and law enforcement to these local communities will enhance proper use of fire and decrease the destructive unnecessary wildfires.

Keywords; Socio-Economic, Local communities, Wildfire, Selous Game Reserve

INTRODUCTION

Selous Game Reserve is the largest reserve in Africa with size of about 50,000km^2. It is a UNESCO world heritage site with big herds of large animals and pristine habitats. Fire from either prescribed or uncontrolled burning in the reserve is known to occur regularly [1]. The un-prescribed burning is associated by socio-economic activities of the local communities adjacent the reserve. However to date there was no study conducted to determine the causes and effects of wildfire in this precious ecosystem.

Studies on socio-economic activities of the local communities that hasten the occurrence of wildfire in different protected area including Selous Game Reserve are vital. In other places, it has been observed that, socio-economic activities are crucial in the occurrence of wildlife in different ecosystem. Study done in East Kalimantan Indonesia has found that, integration of local communities with their knowledge in the management of forestry against fire was vital. When indigenous knowledge was combined with scientific knowledge on fire management technologies, the integrity and productivity of the forestry increased while the occurrence of the hazardous fire decreased [2]. In Thailand fires are not new to the landscapes. People and fires have been culturally linked for centuries. In rural

areas, people have been using fire as a land preparation tool, for promoting annual grasses for grazing livestock, to facilitate mushroom and bamboo cultivation, to assist in hunting and land clearing. Such land management (method or technique) has generated benefits to some people and costs to others. For proper management of fire in the ecosystem, the participation of local communities was observed to be essential [3]. The same finding was observed in Gambia, where the cooperative conservation with rural Gambian community to forest fire management has provided positive results in the biodiversity conservation [4]. The frequency of fire is influenced by seasons, precipitation, and fuels in Uluguru Mountains, yet, human being play a greater role in the ignition of fire in this area [5]. In addition, wildfire in Bukombe forest, Tanzania has been observed to be caused by agriculture (especially farm preparation and shifting cultivation), logging, charcoal burning, hunting, collection of honey (smoke is used to drive animals from their hideouts and bees from their hives), arson and traditional tribal fire uses [6]. Furthermore, the major problems faced by the Bukombe forest against fire protection, were age-old traditional attitudes, socio-economic activities and, to some extent, past national forest policies that dissociated the local communities from their traditional access and utilization of the forests [6].

In Selous Game Reserve the threats to biodiversity including wildfire has been little reported [7], but the social economic influence on wildlife in this reserve has not yet been documented. For this reason, this study assessed the anthropogenic (socio-economic) influence on the occurrence of wildfire in the reserve by determining activities which can cause wildfire, finding out the influence of age in occurrence of wildfire.

MATERIALS AND METHODS

Study area.

The study took place in two villages, namely Ngarambe and Tapika. These Villages are adjacent to Selous Game Reserve in the Northeastern Sector, Kingupira which is located at $7^{o}20'10^{o}$ 30′S to $36^{o}00'$-38^{o} 40′E and is 65Km away from Utete town.

Methods

Semi structured interview was used to collect data (with open and closed questions) (Plate 2.4.4). Likert scaling was used in the questionnaire (with 1-5 Scale, where 1=strongly disagree and 5=strongly agree) [8,9]. The questions were aimed at determining the socio-economic causes, effects, their understanding and attitudes on un-prescribed burning (Appendix 2).The questionnaires were administered to individuals from the local communities by considering gender and age groups. Random sampling was employed to select the interviewees in each group. Demographic attributes (e.g. age , sex, ethnicity, and education) were also considered.

Four categories of key informant namely Game wardens, Game rangers, Wildlife Researchers and village local government leaders were involved. In-depth interviews of 30 key informants who were selected randomly in each category was carried out. Last but not least, group discussion was done after carrying out the interviews with the local communities and key informants to supplement the information gathered during the interview.

Using SYSTAT version 10 [10], descriptive statistics were used to analyze the social-economic data. Data collected through Likert scaling was tested using the Wilcoxcon -Mann -Whitney test [8, 11] at α=0.05. The –same statistical test was also used to compare the opinions of local communities in Ngarambe and Tapika on the socio economic influence on wildfire [8, 11].

RESULTS

A total of 122 villagers were interviewed of whom 50% were from Ngarambe and the rest from Tapika. Intensive interviews were directed to 5 game officers, 10 game wardens, 11 local government leaders and 4 wildlife researchers. The villagers interviewed were dominated by men, because men in their families were allowed to speak more than women. For instance, 49 and 40 men form Tapika and Ngarambe respectively were interviewed while only 12 and 21 women were interviewed from Tapika and Ngarambe respectively. 79.51% of respondents, equivalent to 97 people said that, they have ever started wild fire; out of these 22.68% (22) were women.

Young people of the age group between 21-30 years old were observed to be more influential in the occurrence of wildfire in the Selous ecosystem while age group between 11-20, 61-70 and 71-80 years old had little influence in the occurrence of wildfire (Fig 1).

The socio-economic activities which were observed to be the source of wildfire in the SGR included; agriculture, culture, poaching, honey harvesting, tourist hunting, pastoralism, protection from dangerous wildlife, charcoaling, lumbering and fishing. The charcoaling (Mean = 4.455±0.0082, S.D=0.957, Range = 4, Max =5) scored highest followed by agriculture (Mean=4.388±0.0084, S.D=1.028, Range=4, Max = 5), Poaching (Mean=4.190±0.0079, S.D=0.907, Range=3, Max = 5) and honey harvesting (Mean = 4.132±0.0081, S.D=0.939, Range=4, Max = 5). The Pastoralism activities scored least (Mean=2.338±0.15, S.D=1.62, Range=4, Max=5) than others followed by Culture (Mean =3.207±0.0095, S.D= 1.290, Range = 4, Max = 5), uses of fire for protection (Mean = 3.711±0.0095, S.D= 1.307, Range = 4, Max = 5) and Tourism Hunting (Mean = 2.339±1.615, Range = 4, Max = 5) (Fig 1).

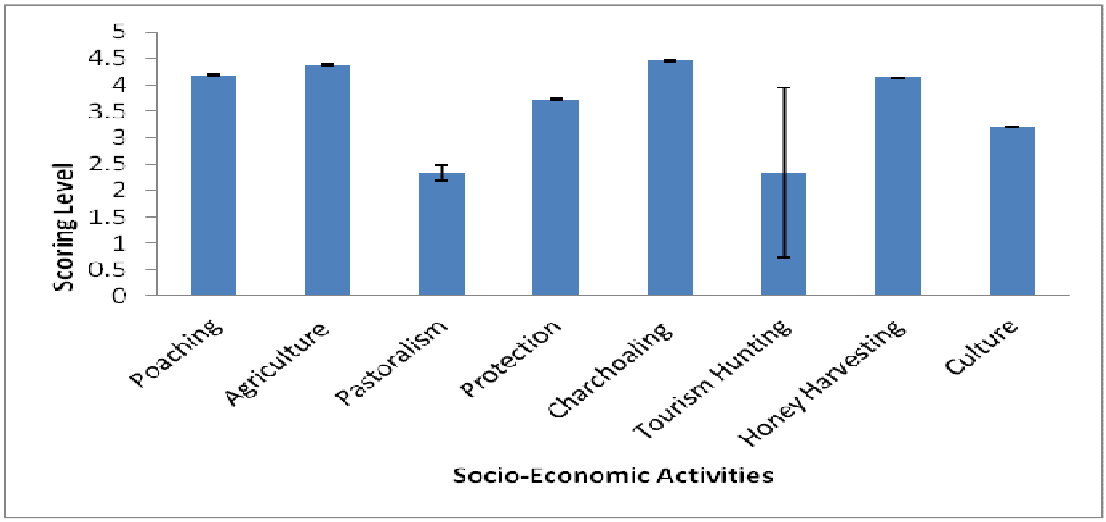


Figure 1 Scoring level (Mean ± SE) of different Socio-economic activities influencing the occurrence of wildfire in Selous Game Reserve as obtained through Likert Scaling.

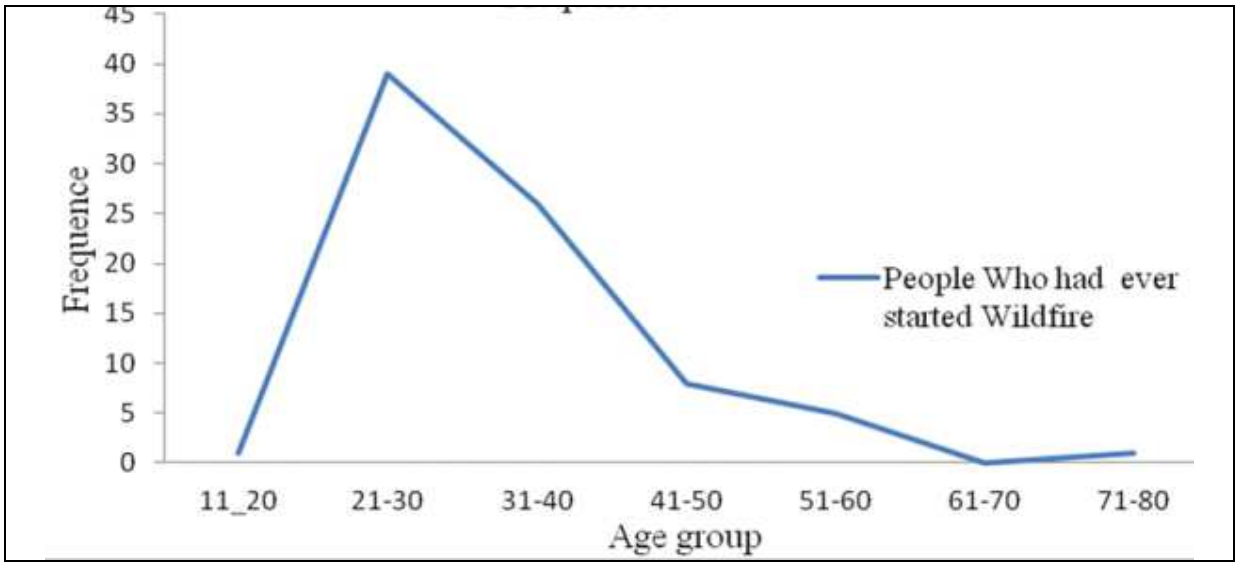


Figure 2 Influence of age on the occurance of wildfire by the local communities adjacent to the the Selous Game Reserve.

In comparison between the two villages, Ngarambe (Mean=233±0.998, SD=62.717, Range =193, Max =290) scored higher than Tapika (Mean = 223.125±0.7135, S.D= 32.581, Range = 74, Max =257) (Figure 3). In Ngarambe agriculture activity scored highest while pastoralism scored least compared to other socio-economic activities (Table 1). In Tapika village the results showed some variation where, Charcoaling scored highest while culture score least than other activities (Table 1). The attitudes differences in socio-economic activities influencing the occurrence of wildfire in Selous Game Reserve between Ngarambe and Tapika Village was significant (U=2233, P <0.05).

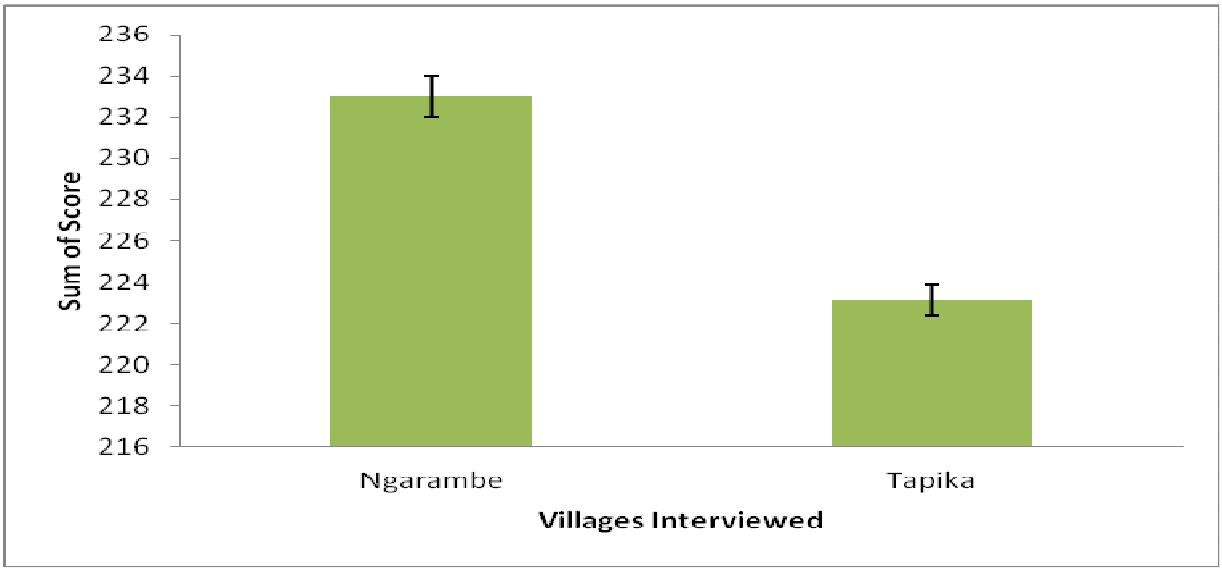


Figure 3 Sum of scores (Mean ± SE) for Ngarambe and Tapika Villages through Likert Scoring.

Table 1 The Sum of score for each socio economic activity, sum and average of score for all socio activities in Ngarambe and Tapika Village as collected through Likert scoring.

Villages	Ngarambe	Tapika
Agriculture	290	241
Culture	205	183
Poaching	252	255
Honey harvesting	262	238
Tourism hunting	212	240
Pastoralism	97	186
Protection	264	185
Charcoaling	282	257
Sum of Score	**1864**	**1785**
Average of Score	**233**	**223.125**

DISCUSION

The relationship of man and fire in Selous Game Reserve has existed even before the colonial era [12]. Before colonial period, man co-existed with wildlife in this reserve and the fire application was sustainable because indigenous people cared and were involved in the conservation of the wildlife for their benefit [12]. When the indigenous people evicted from the reserve (from colonial era up to now), the sense of ownership of wildlife resources by these people decreased regardless of the community based wildlife management [12]. The pressure of wildfire in this reserve has increased from within and outside the reserve. The association of wildfire and people has not only occurred in Selous but also even other places. For instance, Study done in Venezuela showed that, most of wildfires are caused by human, for example deliberate fire-starting (This was illegal), Sparks from train wheels or from machinery, Military training, Household chimneys, camp fires which have not been extinguished properly, Slash and burn farming techniques, Discarded cigarettes, Children playing with matches and Electricity pylons falling down in high winds[13]. A similar trend has also been observed in Zambia, Ghana and Nepal [14-16].

The attitude on the wildfire for the local communities between Ngarambe and Tapika Villages were different due to socio-economic activities which apply fire. In Ngarambe Agriculture scores highest while in Tapika, charcoaling scored highest (Also see Table 1).

Agriculture activities were observed to sway the episode of wildfire in this reserve. Indigenous people from Ngarambe and Tapika were observed to use fire in preparation of farms for growing maize; sorghum and rice. Unlike Tapika village, Ngarambe people were involved in Sesame cultivation which is a commercial crop in this area. The cultivation of sesame crop does not use only fire but also applies shifting cultivation which destroys the wildlife habitats hence threatening the survival of insects and other wildlife species (Pers' observation). People interviewed said that, some time the fire from their agricultural activities does escape from the farm due to wind mostly when their effort for suppression has failed. A fire occurrence surveys conducted in Namtumbo and Tunduru districts, covering all villages in Selous-Niassa Wildlife Protection Corridor (SNWPC) noted the same situation of wildfire. High frequencies of wildfire were observed to occur in dry season and had detrimental effect to the environment in general and wildlife in particular. The major cause of wildfires was shifting cultivation but other factors such as poachers, lumberers, honey gatherers and charcoal burners [17] also came into play. A similar study which was done in Zambia showed that, local communities around the Kasanka National Park and the Kafinda Game Management Area use fire for Agriculture to sustain their livelihoods [16]. This call upon participatory wildfire management with these indigenous people for sustainable wildlife conservation in these protected areas [16].

Also Charcoaling was observed to be a serious problem in this place. Charcoal especially in Ngarambe has been used as fuel for heating purposes. In addition the local communities process charcoal as source of income by selling the charcoal to the people from town. It was observed that, Charcoaling process uses fire which when not well managed, can escape and spread to the neighboring habitats. It was also noted that, during charcoaling, the trees were cut down leaving behind dry matter which was able to support burning by providing fuel. A study which was done in Msangani and Mwendapole, Kibaha municipal to determine impact of charcoaling found that, charcoaling does not only cause wildfire but also affects the regeneration of plant species which could be used by insects and other wildlife species as habitats [18]. Unlike farming activities, Charcoaling was dominated by men while women involved in other activities like cultivation, firewood collection and business work [18]. Respondents furthermore said that, charcoaling and sesame crop were great source of income to their families. Family size had great influence in charcoaling and farming. The larger families were observed to work harder by cultivating larger farms, and burnt more charcoal to meet the demand of their families.

The Study from Bukombe concluded that, old people were more influential in the occurrence of wildfire [6]. In Selous Game Reserve young people of age ranging 12-30 followed by age of 31-40 years old were noticed to have more influence than any other age group. The respondents said that, this is due to, this age groups being considered as productive bunches which has to involve in economic and social work for instance farming, charcoaling and tour guiding/trackers and poaching.

Although culture is not a serious problem like agriculture, charcoaling and poaching, the indigenous people sometime do burn the habitat as part of their entertainment. One of the respondents was noted saying that "….*Huwa tunachoma moto kwa kushindana, aliyewasha moto na ukaunguza sehemu kubwa yeye huwa ni Mshindi kuliko wengine, na huo moto huitwa moto kichaa*…." This translates"…… *We do compete to start fire, the winner is determined by size of the area burnt and that fire is called barmy fire*……..*"*

Furthermore, indigenous people have been using fire for a long time for protection against the dangerous wild animals like lions, snakes and scorpions. As means of protection the bushes which surround the residential areas were cleared by burning. Fire was also used for protecting crops like maize against pest animals such as elephants and bush pigs. Similar findings have made in Gambia and Uluguru of Tanzania [4,5].

Moreover, poachers utilized fire during hunting. 77% of people interviewed said that, poachers use fire to burn the bushes so as to see animals easily. They insisted that, burnt area helps the poachers to scrutinize the animal trails so as they can set their traps more effectively. Additionally, poachers and fishermen use fire in the bush for drying meat and fish respectively. A study from Nepal revealed that, Poachers and hunters were observed to apply fire for clearing the bushes for the animals to be visible to the hunter [14]. The impact of uncontrolled fire was observed to affect the diversity and abundances of wildlife species. In addition the government made the strategies to combat the

wildfire in collaboration with the local communities [14]. Other sources of wildfire in Nepal were; livestock keeping, non-timber forest collectors, discarded cigarette butts, fuel wood collector and shifting cultivation [14].

Last but not least, tourism hunting was observed to have influence in the incidences of wildfire in this reserve (see Table 3.3). Gun bearers (Magambela) were noted burning the wild habitats. Some respondents believed that, burning of bushes increases the visibility of wild animals for tourist hunters. Group hunting for game and uncontrolled burning to clear land for maize cultivation were identified as the two main causes of bushfires in the Tano North District of Brong-Ahafo Region [15]. The impacts of wildfire was anticipated to cause wildlife loss, economic loss to individuals and destruction of medicinal plants, cash crops and economic trees that belonged to the State were more serious than the profits being made by those engaged in the menace [15].

Pastoralism by Sukuma people was observed to take place in other neighboring villages of Rufiji district, still it was not a great threat in Ngarambe and Tapika may be for cattle which were perceived to be in transition from one place to another via the Ngarambe village. Similar observations have seen to occur in Ghana.

CONCLUSION

From this study it is evident that, local communities are essential in the occurrence of wildfire in the Selous game reserve. For instance, poachers are known to start fire for insuring that the animals are visible to the hunters, fire from agricultural preparation do escape to the protected area and causing destruction of biodiversity.

In this case, community base conservation of this reserve is vital to ensure that unintended fires are being prevented in the reserve. This can be achieved through training the local communities of how best the fire can be used without causing destruction to biodiversity in this mega reserve. Also extension services may increase the practical knowledge and law enforcement may add to mitigations of the wildfire issue in the area.

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