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Pare's people perception influences on conservation of wild plant diversity in protected areas in Kilimanjaro Region, Northern Tanzania

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This study was designed to assess Pare people's perception about the role of protected areas in biodiversity conservation. Viewpoints on factors causing biodiversity loss, related consequences and people's participation in forest husbandry activities were also investigated. Data were collected from Same and Mwanga Districts using semi structured interview. Results indicated generally that majority of people in the two districts regardless of sex have positive perception on the role of protected areas ($p<0.01$). However, consequences of biodiversity loss are more serious in Same than in Mwanga District. This contradicts the general perception. Factors that cause biodiversity loss were scored less serious in Same District and only less that 50% of people participate in forestry husbandry activities. The need to understand people's perception prior to establishment of protected areas is emphasized. Where the general perception is positive, ascertain existence of supportive evidence as it may be misguiding as observed in Same District.

Key words: Conservation of forest biodiversity, perception of Pare people, role of PAs, consequences of biodiversity loss.

INTRODUCTION

Convention on Biological Diversity (CBD) considers protected areas (PA) to be the cornerstone of biodiversity conservation. As defined by Dudley (2008), protected area is a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve long-term conservation of nature with associated ecosystem services and cultural values (Dudley, 2008). In theory, PA should offer economically valuable goods and services that benefit society and secure livelihoods. However, policies and management strategies of PAs (e.g. forest reserves, game reserves and national parks) in many developing countries including Tanzania, keep humans away from these areas using laws or by- laws. These strategies have not been welcomed and in some places have led to hatred between protected area managers and local communities due to

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negative perception developed by local people on the role of PA (Rao et al., 2002). The reason of the hatred is not only the exclusion but the consequences of the exclusion. People no longer enjoy the environmental benefits they used to enjoy before creation of protected areas and their environmental incomes are low compared to what is typically found in such rural areas (Vedeld et al., 2012). In such a situation, management of protected areas has been expensive and sometimes counterproductive (Leimgruber et al., 2005). In the Congo basin, 34 protected areas in five countries have failed to attain their objectives due to tensions and negative perceptions held by local communities towards protected areas management (Pyhälä et al., 2016). Ntuli et al*.* (2019) showed that in Southern Africa if people see the rules of the park in a negative way, then they are less likely to conserve it. The author concluded that local communities' perceptions of PAs are important determinants of the success of conservation efforts. Thus, understanding people's perception is important because the attitudes and perceptions of local people towards the role of PAs are important for their long-term survival and a key to improve protected areas–people relationship (Weladji et al*.,* 2003; Htun et al., 2012).

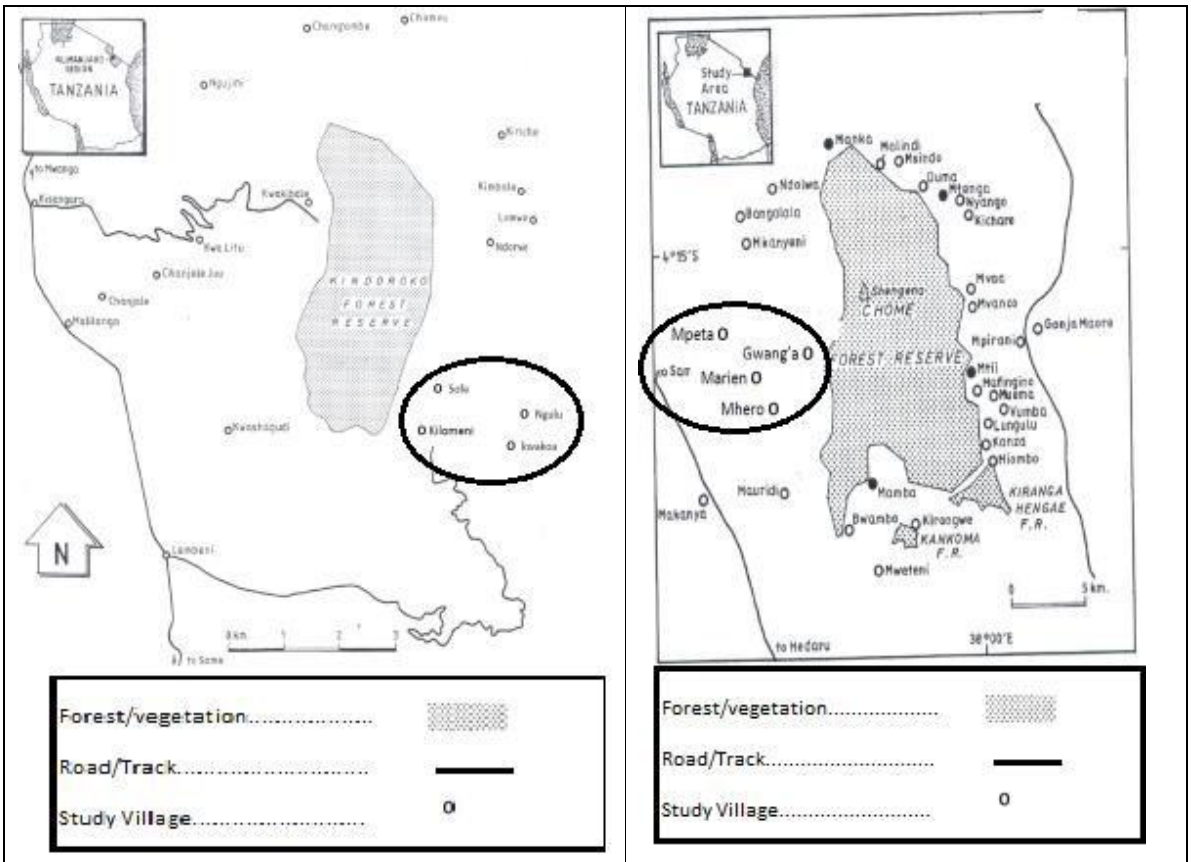
Many factors influence the perceptions of the role of protected areas held by residents living in their periphery. Some of these are history of the areas management, degree of awareness of protected areas existence among people (Ormsby and Kaplin, 2005) and the education level (McClanahan et al*.,* 2005). Others are reference to future generation (Bauer, 2003), sex and ethnicity (Gillingham and Lee, 1999; Mehta and Heinen, 2001). In Pendjari National Park, in Benin (West Africa), Bale National Park in Ethiopia and Popa Mountain Park in Myanmar what influenced people's perception were the type of management offered by the PAs and/or socioeconomic gains (Ormsby and Kaplin, 2005; Htun et al., 2012; Mamo, 2014). In Pakistan gender, crop damage, livestock predation, and total livestock holding shaped the people's perception to PAs respondents who had suffered crop damage or livestock predation by wild animals exhibiting negative attitudes toward wildlife conservation.

The contribution of income from the environment to rural people in developing countries ranges from 6-44% of their total annual income (Angelsen et al., 2014). According to Angelsen and Wunder (2003), income from the environment supports household consumption and acts as a fall back support in response to shocks. In addition it is considered to be a gap filling in case of seasonal shortfalls and a means to accumulate assets; thus an alternative way for families to get out of poverty. Before understanding and accommodating the need of the people living on the periphery, managing Pendjari National Park was often characterized by conflict between local people and forest administration (Tiomoko, 2007). In Gabon, communities said parks were responsible for their poverty (Pyhälä et al., 2016).

Residents' positive perceptions towards the role of PAs makes it possible to create place-based management strategies that uphold positive perception and help to mitigate any negative perceptions (Rao et al., 2002). The current move of tilting protection policies towards creation of PAs for poverty alleviation and putting a management emphasis on livelihood-based approaches and social safeguards as seen in Madagascar (Gardner et al., 2013; Gardner et al., 2018) reflects the need of understanding the people. In Cambodia households bordering the PAs are significantly better off due to greater access to markets and services (Clements, 2014).

In Tanzania forest reserves are managed under the Forest Act No 14 (URT, 2002). Under this protectionist model, after official gazzetment, most local people's activities that used to be without restrictions are criminalized or require permit from government authorities. Example of such restricted activities include, grazing, cutting fodder or roofing grass, fishing and making new paths or roads. Others are cutting of construction poles and ropes by debarking live trees, harvesting forest products for sale, and harvesting bee products (URT, 2002). There are twelve government forest reserves in the area; most of them were created in the past decade as a measure to control increased loss of biodiversity outside clan forests and status of some have been raised to nature reserves. As in other places where PAs have been used creation of these forest reserves has resulted into exclusion of people as residents, prevented consumptive use, and minimized other forms of human impacts. Mariki (2001) showed that some people living near Pas in Tanzania were poorer than national average.

Much has been written about Pare people. They range from history and religion, how they conserve biodiversity, biodiversity richness in traditional forests, forest and tree symbolism and conservation and fragmentation of indigenous forest and loss of indigenous knowledge within the young generation (Kimambo, 1969; Kimambo and Omari, 1972; Mshana, 1992; Mwihomeke et al., 1998; Newmark, 1998; Persha, 2003; Ylhäisi, 2004; Jones, 2013). However, there is limited information on Pare's perceptions towards the role of protected areas to conserve forest biodiversity in their area. Pares still maintain clan forest managed under indigenous knowledge; however, the reason why there is continuous forest loss and disturbance has not been fully explained. Specifically, this study was thus designed to answer the following questions: 1) What is the perception of Pares about the role of protected areas in biodiversity conservation in relation to location (Mwanga and Same) and gender; 2) What are the factors that lead to forest biodiversity loss; 3) What are the main consequences of



Selected villages around Kindoroko Forest Reserve – Mwanga District (37°25′-37°58′ E; 3°25′-3°55′ S).

Selected villages around Chome Forest Reserve - Same District (4°15'0" S and 37°55'0" E).

Figure 1. Map of Mwanga and Same districts in Tanzania showing the study sites in circles.
Source: Geography Department University of Dar e s Salaam.

forest biodiversity loss; and how do people participate in selected forest husbandry activities.

MATERIALS AND METHODS

Study area and sampling

Pare mountain forest blocks are wholly confined to Same and Mwanga Districts in Kilimanjaro Region. It is situated between 40 10' and 4024' South and 370 53' and 380 00' East. It reaches up to 2,463 m altitude. Most of the lands outside the government reserves are villages and traditionally managed forest patches in farmlands. Existence of both traditional managed forest and government forest reserves in the same areas made this area ideal for this study. The study was carried out in Same and Mwanga Districts. In each district, 4 villages were systematically selected: two villages located close to the forest reserve and two villages away from the forest reserve. The villages were: Mhero, Marieni, Gwanga and Mpeta from Same District and Sofe, Kilomen, Ngulu and Kwakoa from Mwanga District (Figure 1). In each village, 30% of households were included in the study; from Same District, Mhero village, 95; Marieni village, 98; Gwanga village, 108 and Mpeta village, 84 households. From Mwanga district were Sofe village, 112; Kilomen village, 86; Ngulu village, 129 and Kwakoa village, 49 households. Total sample size was thus 761 households.

In each village households were selected systematically where every fourth household was picked. In case where the selected household had no people the next household was included. In each household either a male or a female was interviewed in an alternating order. During data collection, it was also ensured that people interviewed were of different ages, levels of education and sex. Data on youths from below 18 years of age were obtained from secondary schools. Figure 1 provides the names and locations of the systematically elected villages around Kindoroko Forest Reserve in Mwanga District and around Chome Forest Reserve in Same District.

Data collection and analysis

Data from household members were collected using semi structured interview. An interview questionnaire was designed to cover all issues that were intended for this study. Data from youths were collected from school students during working hours. On general perception interviewees were asked how they perceived the use of forest reserve to conserve forest biodiversity and the expected answer was whether they had a positive or negative

Table 1. General perception of Pareson use of PAs to conserve diversity of wild plants.

District	Those with positive perception						Those with negative perception					
	Male		Female		Total		Male		Female		Total	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Same	190	49.4	147	38.2	337	87.6	26	6.8	22	5.7	48	12.4
Mwanga	167	44.4	163	43.4	330	87.8	26	6.9	20	5.3	46	12.2

Source: Authors

Table 2. Rating percentage index on activities that cause loss of forest biodiversity.

District	Habitat loss (%)	Over exploitatation (%)	Poor management (%)	Forest fire (%)	Logging (%)	Mining (%)
Same	46	43	50	36	32	46
Mwanga	44	44	42	40	41	44

Source: Authors

perception. It was assumed that their perception could be influenced by knowledge of factors that causes loss of forest biodiversity in the area and the consequences. The participants were also asked which activities they thought were more important causes of biodiversity in the area and what the important resulting consequences were. Responses to these questions were selected from prepared list of known causes of biodiversity loss and their possible consequences. The causes of biodiversity loss and consequences were those that have been reported in the area by other workers and forest authorities. It was also thought that how they participated in forestry husbandry activities was a reflection of how they understood the consequences of forest biodiversity loss and showed their readiness took initiatives to counter the problem.

The collected data were sorted and analyzed using Statistical Package for Social Science (SPSS) for windows version 16. Attitude of people towards the role of FRs to conserve biodiversity was also tested statistically using Analysis of Variance (ANOVA) of the software INSTAT 3. Tukey post hoc test was run to confirm where the differences between groups occurred following the differences observed under ANOVA to be significant. Other data were compared ranked based on percentage using Rating Percentage Index calculated with the formula,

$$= \quad (WP^{*}0.25) + (OWP^{*}0.50)$$

Where WP = Percentage of acceptance and OWP =percentage of rejection and 0.25 and 0.5 are constants. The lower the value of RPI the more the acceptance is.

RESULTS

Table 1 presents general perception of Pare people of Mwanga and Same districts on the use of Forest reserves to conserve biodiversity. Results are presented as number of people (real count and percentage. This table showed that 87.6% of all people interviewed in Same District generally had positive perception towards the role of Pas, that is, forest or nature reserve to conserve wild biodiversity in the area. Males constituted 49.4% and females, 38.2%. Only 12.5% of all people interviewed, 6.8% males and 5.7% females had negative perception towards the role of FRs as a strategy to conserve wild plants diversity in Same District.

This pattern was not different from the pattern observed in Mwanga District. In Mwanga 337 people which are 87.8% of all people interviewed generally had positive perception towards the role of FRs to conserve diversity of wild plant in Mwanga District. This percentage was made up 167 males (44.4%) and 163 females (43.4%). Only 46 people (12. 2% of all people interviewed had negative perception. Of these 6.9% were males and 5.3% were females.

Though the number of males with positive perceptions was higher in each district compared to number of females in both districts the differences observed were not statistically significant ($p>0.05$). This pattern was similar to the one observed between males and females with negative perception within each district. On the other hand, the number of females or males with positive perception was higher than females or males with negative perception within each district and across districts and these differences were highly significant ($p<0.01$).

Factors that causes loss of forest biodiversity

Table 2 presents Rating Percentage Index (RPI) scores for each activity in each district and Figure 2 presents results on what Pares of Mwanga and Same consider to be causes of loss forest biodiversity in their area.

The percentage of people that agree that habitat loss through agriculture, over exploitation of forest products, poor forest management, forest fires, timber harvesting

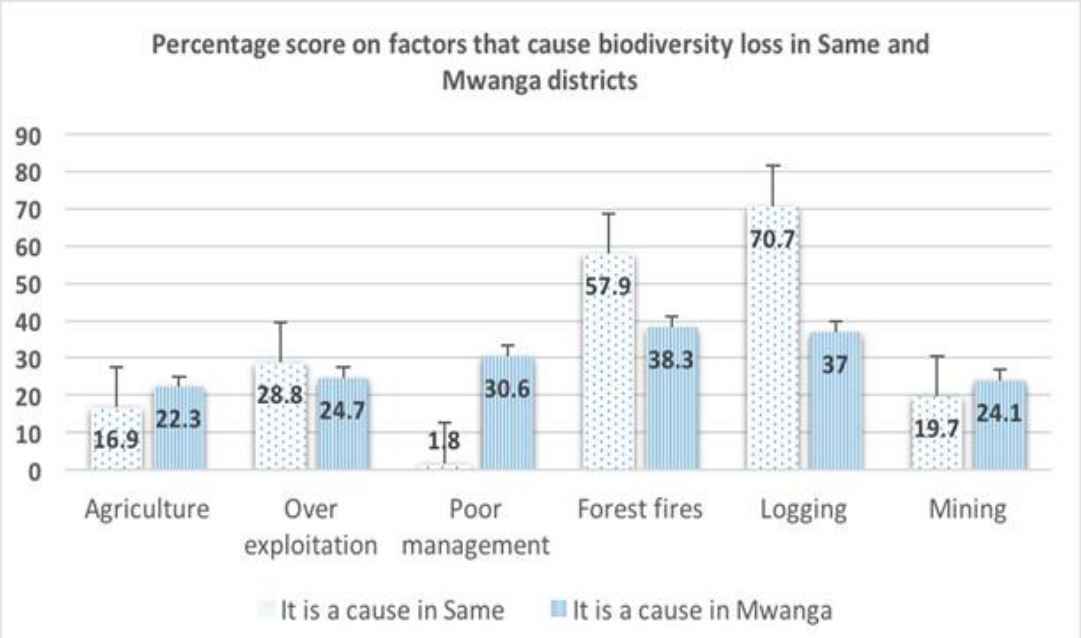


Figure 2. Pares percentage score per activity known to cause forest biodiversity loss. Whisker on bars represent standard errors.
Source: Authors

Table 3. Rating percentage index scores on consequences of forest biodiversity loss in the study area.

District	Unreliable rainfall	Drying of water source	Diminishing source of firewood	Wildlife unavialability	Loss of herbs	Drought
Same	37	36	44	49	36	34
Mwanga	41	41	44	44	39	33

Source: Authors

(logging) and mining has caused loss of forest biodiversity in Mwanga District were below 40% of all (22.3 to 38.3%) the people interviewed. The results for Same District almost compare with those in Mwanga District. People who considered habitat loss, overexploitation, mineral exploitation and poor management to be causes of loss of forest biodiversity in Same District were below 30% of the people interviewed.

The exception of the above observation was that in Same District 70 and 54% of people interviewed agreed that logging and forest fires cause forest biodiversity loss in their district. Based on Rating Percentage Index, timber harvesting and forest fire overexploitation of resources were the activities that were rated higher in the two districts but seemingly to have more effects in Same than in Mwanga. Poor forest management was rated the least contributor in Same District whereas in Mwanga it was habitat loss through agricultural expansion, over exploitation of resources and mining.

What Pare people consider main consequences of loss of forest biodiversity in their area

About what Pares considered to be major consequences of loss of forest biodiversity in their area are unreliable rainfall, drying of water sources, diminishing of firewood, unavailability of wildlife, loss of useful herbs and drought. Results in this case are presented in Table 3 (PRI scores per activity in each district are presented) and Figure 3.

In Same District, majority of the people (51.8 to 62.3%) agreed that four of the six consequences of loss of forest biodiversity studied namely; unreliable rainfall, drying of water sources and loss of useful herbs and drought were evident consequences of loss of forest biodiversity. Diminishing of firewood and unavailability of wildlife were not considered by majority to be consequence of loss of forest biodiversity in Same District. In Mwanga District almost all factors listed were considered to be consequences of forest biodiversity loss only by less than 40% of people interviewed (that is 22.6-36%). The

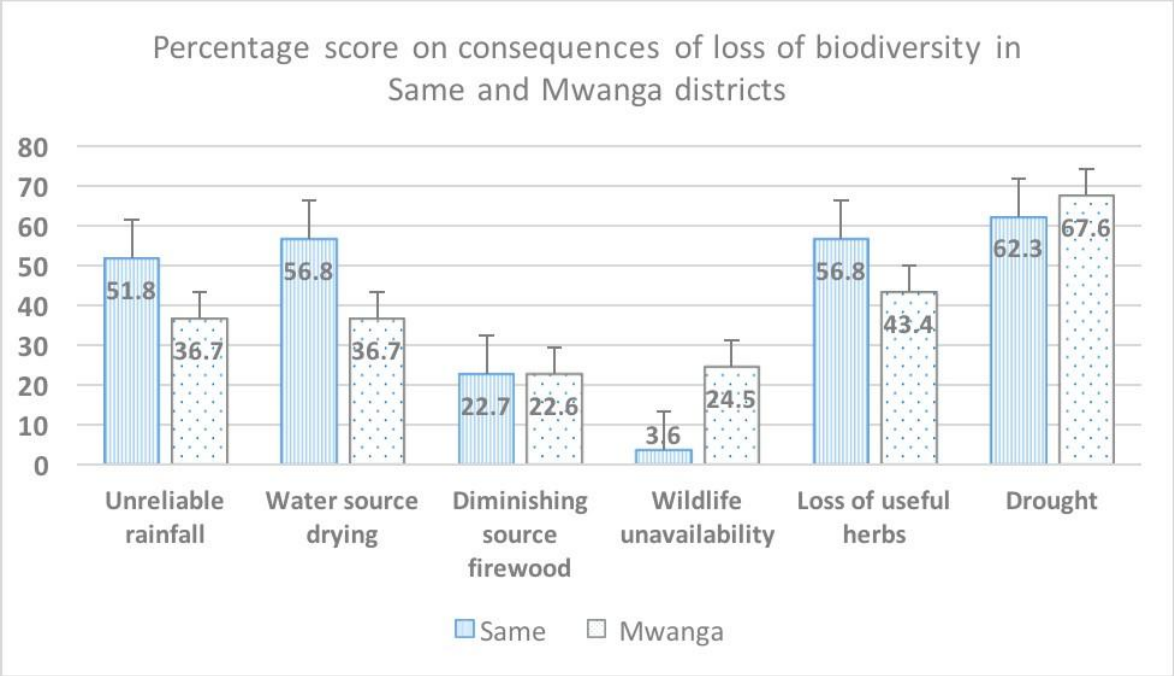


Figure 3. Scores of Pares people on consequences of forest biodiversity loss in their area. Whisker on bars represent standard errors.
Source: Authors

exception was only drought which was considered a consequence by 67.7% of Pares interviewed in Mwanga. The RPI for drought was closer for the two districts. Based on Rating Percentage Index in Same District drought was rated first followed by drying of water sources; loss of useful herbs were rated equal, followed by unreliable rainfall, diminishing source of firewood and lastly unavailability of wildlife. In Mwanga District as in Same District drought was rated first, followed by loss of useful herbs, unreliable rainfall and drying of water sources were rated same and similarly diminishing source of firewood and wildlife unavailability were rated same. With exception of diminishing of firewood sources which was rated equally in both Same and Mwanga districts and wildlife unavailability all other consequences were rated to have lower consequences in Mwanga than in Same.

Participation in forestry husbandry activities

Figure 4 presents results on the participation of Pare people on selected forest husbandry activities. These are activities that directly or indirectly contribute to serve forest biodiversity and their services; they are planting trees, conserving water catchment, controlling forest fire, and observing forest resource conservation regulations. Table 4 presents results on RPI scores.

Results on the participation of Pares in the two districts on the four selected forest husbandry activities were not comparable contradicting the results on general perception in Table 1. In Mwanga District, the percentage of people who said they participate in the four forest husbandry activities ranged from 58.8 to 88.1%. The highest percentage was on controlling forest fires and the lowest being on planting trees. Observing forest resource conservation regulations and conserve water sources were at 60.1 and 63.5%, respectively. Since engagement on these four forest husbandry activities supports conservation of forestry diversity, Mwanga results agree with general perception of Pare people. On the contrary, results on how Pares in Same District participate in the four selected forest husbandry activities gave a different picture. The percentages of people participating in each of these activities were lower than 50% (range from as lower as 11.7 to 41.5%). The highest percentage for Same District was not on controlling forest fires as in Mwanga but on planting trees, controlling forest fires was lowest of all in Same District.

Based on Rating Percentage Index (Table 4), people in Same participated mostly in controlling fires, followed by conserving water sources, whereas planting tree and observation of forest regulations rate last and equal. On the other hand, in Mwanga District what was rated highly was tree planting and observation of forest regulations (RPI 40 each) followed by conserving of water sources and lastly controlling of fires. Observation indicates also

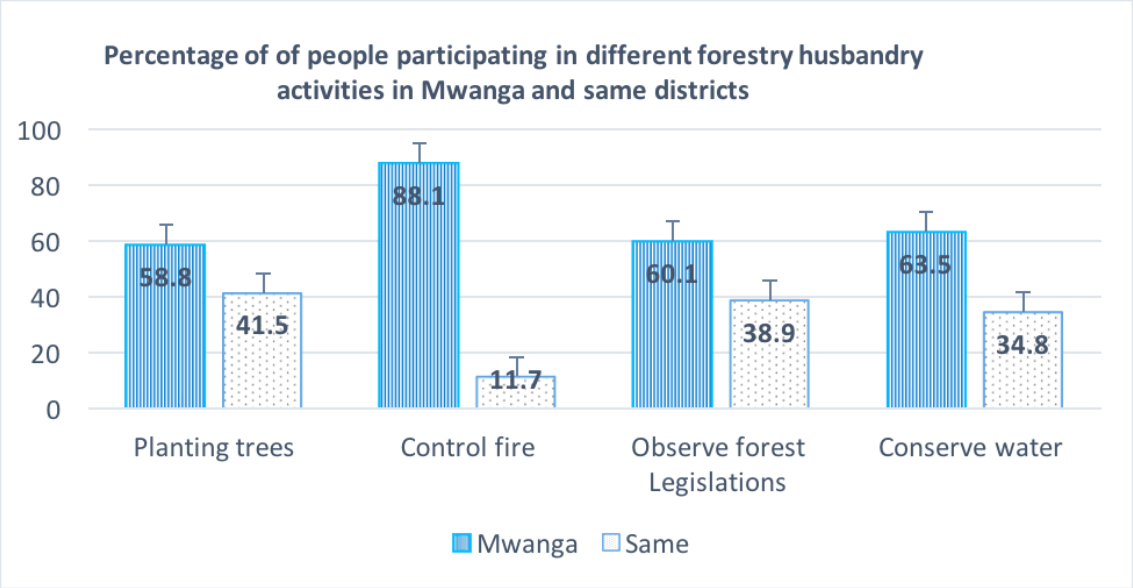


Figure 4. Percentage of Pares that participate on selected forest husbandry actions. Whisker on bars represent standard errors.
Source: Authors

Table 4. Rating Percentage Index scores on forest husbandry activities in the study area.

District	Tree planting	Control forest fires	Observe forest legislations	Conserve water sources
Same	35	28	35	34
Mwanga	40	47	40	41

Source: Authors

that comparatively each activity was rated higher in Same District than in Mwanga.

DISCUSSION

Local community's perception on the role of PAs on the conservation of forest biodiversity

The Pare person with positive perception on the role of forest reserve to protect forest diversity was significantly higher than those with negative perception regardless of their sex. This suggests generally that majority of Pares in Mwanga and Same districts regardless of their sex perceive the role of forest reserve to conserve diversity of plant species positively. Conserving forests biodiversity is not new to Pares as they themselves maintain sacred forest that are protected under indigenous regulations and in fact, are more protected than government reserves.

Although the positive perception recorded by Pares may be taken to indicate that they have accommodated the presence of forests reserves such as Kindoroko, Kamwala I and II, Minja and Mramba in Mwanga district (North Pare) and Chome Nature Reserve, Kwamwenda, Chambogo and Mwala in Same districts (South Pare) the real situation is different. A study on carbon losses caused by deforestation between 1980s and 2000 and between between 1999/2003 and 2010/2011 depicted a gloomy picture. For example, Chome Nature Reserve was found to be among reserves in the eastern Arc Mountains that showed a higher carbon loss than other protected forests of similar protection status such as Magamba NR, Kilombero NR and Udzungwa scarp NR. Carbon loss per year of these later protected areas was only in few hundreds whereas that of Chome NR was 1,692.88 t/year. In fact, other protected areas like Uluguru NR and Udzungwa Mountains National Park recorded no carbon loss at all (URT 2010). Ylhäisi (2004) reported that between 1982 and 1997 Pare Mountains lost 37% of all types of forest.

This indicates that the rate of deforestation was higher in Chome than in the other mentioned protected forests of the same status. This is sad because South Pare

Mountains host 10% of the all 554 plant taxa endemic to the Eastern Arc Mountains and two of six endemic taxa of plants namely *Pentas hindsioides var. parensis* and *Streptocarpus parensis* which are restricted to Chome Nature Reserve (URT 2010). This observation was not new. The Division of Forestry and Beekeeping (FBD 2005) concluded that protected forests in Same and Mwanga districts were highly disturbed by human activities being more so in the earlier than the later. This observation contradicts Andam et al. (2008)'s conclusion that PA was a major means of reducing deforestation.

Positive perception has been considered an important condition towards success of protected areas. Allendorf et al. (2007) in Bateman (n.d) have argued that ―management effectiveness of protected areas is dependent on the actions of people living in close proximity to their borders‖. In addition, local people are unlikely to support PAs if they have negative perceptions and attitudes toward them (Alkan et al., 2009). Local communities' behaviour towards the role of PAs in conserving biodiversity is shaped by the perceived benefits (Vodouhê et al., 2010). This could be the reason why some workers like Newmark and Hough (2000) proposed use of incentives to win local communities' support of PAs and mitigating negative perception towards the role of PAs in biodiversity conservation.

Positive perception serves as an entry point towards establishing positive relationships between PAs managers and the local residents (Hayes and Ostrom 2005). Engaging Indigenous people more effectively in conservation of biodiversity represents a win win situation due to that most of the world's major biodiversity centres coincide with areas occupied or controlled by indigenous people (Sobrevila, 2008).

Evaluation of causes of forest biodiversity loss by Pares in Mwanga and Same districts

Factors that are known to cause forest biodiversity loss that were evaluated are habitat loss through agriculture, over exploitation of forest products, poor forest management, forest fires, logging and mining. Majority (63-77.9%) of people interviewed in Mwanga District did not consider these factors to be major causes of forest biodiversity loss in their area. Similarly, only two of the six causes assessed namely logging and forest fires were considered to cause forest biodiversity loss in Same District but not habitat loss through agriculture, over exploitation of forest products, poor forest management, and mining. Some of these observations however contradict earlier findings. Between 1982 and 1997, North Pare where Mwanga District is located increased the cultivated area by 68% (Ylhäisi, 2004). There are three catchment forests reserves and three more being proposed in Mwanga District and nine forest reserves in Same District and three more being proposed. Most of these forest reserves have biodiversity value that is comparable to other eastern Arc mountains (Wass, 1995). Generally, forest reserves are created only where threats to forest biodiversity are evident. According to the Forest Policy, creation of protected areas is the main official mechanism of protecting forest biodiversity in Tanzania. That means having all these forest reserves and proposing more indicate that forest biodiversity in such areas is threatened. The situation on the ground depicts a similar picture too. In order to attract more funds for conservation from a global NGOs for protection and conservation, the government of Tanzania in 2010 (URT 2010) proposed nine protected forests to be included in the UNESCO's World Heritage sites. Chome Nature reserve was one of them and was proposed based on UNESCOs criteria ix and x. These two criteria reflect the status of threats and level of taxa endemism. In addition, assessment of effectiveness of management of forest reserve based on management effectiveness tracking tool (METT) showed that Chome forest reserve was only averagely managed. Although based on this observation Chome forest reserve is not managed as expected, 98% of people interviewed considered poor management not to be a factor that is contributing to loss of biodiversity in Same District where Chome forest reserve is. Same District lost 25 ha of forest between 2000 and 2010; Mwanga District did not record any loss. In order to increase level of protection, Chome Forest Reserve was elevated to Nature Reserve.

This pattern is not unique to Chome Nature Reserves but a study by Nigel and Sue (1999) on effectiveness of protected areas in Eastern Arc Mountain forests concluded that only 10 of these areas were effectively protected and the rest lacked the necessary infrastructure to monitor and control causes of biodiversity loss. Failure of protected areas is now being reported from several places in Africa. According to respondents the major causes of forest biodiversity in Same are logging and forest fires. This collaborates with URT (2010) which concluded that the two were the major causes of forest biodiversity loss in Chome Nature Reserve which is in Same District. For Mwanga District forest fires and poor management of forest reserves were scored higher. Rating Percentage Index for different activities that cause forest biodiversity loss in Mwanga rated logging and forest fires (RPI=41 and 40, respectively). This was in line with URT (2010)'s findings too.

In the present study only less than 20% of people in Same and at least 24% in Mwanga considered mining to be a cause of biodiversity loss. This is not in line with Eastern Arc Mountains Conservation Endowment Fund study findings (EAEF 2013) that showed mining was one of the major causes of forest degradation in Same. Though not widely distributed mining is practiced in Same and not in Mwanga.

Consequences of forest biodiversity loss

In our discussion a consequence is considered evident in

the area if it is scored by at least 50% of respondents otherwise is considered less serious. Similarly, people participating in a forest husbandry activity are considered to be majority if more than 50% participate otherwise are considered to be minority. Since unreliable rainfall, drying of water sources, loss of herbs and drought were scored by more than 50% of participant interviewed in Same District, these are thus serious consequences. In this line only loss of sources of firewood and unavailability of wildlife are not serious consequences. On the other hand, that almost all consequences in Mwanga district scored less than 50% with exception of drought, suggests that these consequences were not serious in Mwanga District. Drought is the only serious consequence in Same and Mwanga districts, in fact the most serious of all. It is thus more evident that of the two districts Same District experiences consequences related to loss of forest biodiversity more than Mwanga District.

Participation in selected forest husbandry activities

Majority of the people were considered to be participating in in forest husbandry activity if more than 50% of the people interviewed participated in that activity; otherwise it was considered that only minority participated. Since only 11.7 to 41.5% of people in Same participated in three of the four forest husbandry activities, it can be concluded that with exception of controlling forest fires, majority of the people did not participate in forest husbandry activities in this district. This observation, however, gives a different picture. The later indicates that, although there are more serious consequences as a result of biodiversity loss in Same than in Mwanga District, minority of people in Same do participate in forest husbandry activities. In Mwanga District, majority of people participate in planting trees, controlling of forest fires, conserving of forest by observing forest legislations and conserving water sources; whereas in Same, it is the minority. This observation was not expected for Same District. The present study and other studies (URT, 2010) show that forest fires and timber harvesting are the major management challenges for Chome Nature Reserve which is in Same District. According to Ylhäisi (2004) in North Pare, fires have damaged a quarter of closed forest in recent years. Generally, the named factors cause some of the said consequences; this is why corresponding forestry husbandry actions have been proposed to control them. For example, according to FORCONSULT-SUA and TAFORI (n.d) Mwanga District was one of the districts in the Eastern Arc areas where use of bylaws, anti-fire campaigns, proper forest management plans, and maintenance of sacred forests that engage residents in the quest for solutions have proved effective in both preventing and controlling wild fires.

Part IX section 70 of Forest Act 2002 prohibits setting up of fires. Part 2 reads: ―Any person who willfully and unlawfully sets fire to any forest reserve, forest plantation, standing trees, sapling or shrubs, whether indigenous or not, commits an offence and upon conviction shall be liable in accordance with the provisions of section 321 of the Penal Code‖. This means where fire is one of the major threats to forest biodiversity this regulation is observed by minority. In the present study 88.1% of people in Mwanga District participate in controlling forest fires but only 11.7% do so in Same District. On the other hand, Forest Act 2002 Part IX section 71 gives power to require persons to assist in extinguishing fire. Para 3 of this section reads, ―Any person in the vicinity of a fire has the obligation whether called upon do so or not, to attempt or assist in extinguishing such fire which he has reasonable cause to believe is not under control or may become dangerous to life or property but no person shall be obliged to take any action which a reasonable person or firm disposition would consider likely to endanger his life or cause him injury‖. That only less than 12% of Pares in Same participate in extinguishing forest fires indicate most likely that majority of residents of this area do not observe this regulation whereas in Mwanga majority (88%) do. In several places in Africa, Europe and Asia it has been shown that success on controlling fires was only achieved through Community-Based Forest Fire Management Program that accommodated both the interest of communities and the need to conserve the natural resources (Mengistu (n.d); Goldammer et al. (n.d)).

Conservation of biodiversity trends and lessons that can be learnt

It is well established that people‘s perception towards the role of PAs is key to their success as methods of conserving among others forest biodiversity. However, based on the present study, it is also important to understand what the general perception decodes in real terms. The current study indicates that majority of people in the two districts have positive perception towards the role of protected areas to conserve forest biodiversity. However, as evidenced, protected areas in the two districts are threatened, the situation being more serious in Same District. On factors that are known to cause loss of forest biodiversity in the area only minority considered them to be serious in the in their area; though in the group as indicated in the literature, the study areas fall in one of the areas in Tanzania where forests are threatened by human activities. Yet, when it comes to consequences of biodiversity loss in the two districts, majority of people in Mwanga District indicate that unreliable rainfall, drying of water sources, diminishing source, unavailability of wildlife and loss of useful herbs are not taking place in their areas though these are said to be serious in Same District. This is confusing because

the two districts border each other and there are no external factors that explain the observed differences. Consequences of biodiversity loss are mitigated by performing forest husbandry activities and observing forestry legislations. Though there is more loss of biodiversity consequences in Same District majority of the people in this district do not participate in forest husbandry activities. While this is the state, on the ground, loss of forest biodiversity continues in protected which raises the question whether protected areas have the ability to conserve biodiversity. As a matter of fact, while national protected forests such as Chome Nature Reserve and Kindoroko Forest Reserve are highly disturbed, the fairly protected are clan forests protected under indigenous beliefs. The reported success of village forest reserves such the Duru-Haitemba Babati District in Tanzania cannot also be explained by the protected areas model. Village forest reserves work because villagers are empowered to be managers and not merely users or beneficiaries (Wily, 2002). According to Brockington and Igoe (2006) local people‘s displacement to allow establishment and enforcement of protected areas makes the relationships between conservationists and rural groups in many parts of the world unfavorable. In such a situation, it is most likely that the belief that protected areas are the cornerstone for biodiversity conservation can no longer stand the test in every situation.

Conservation measures that allow human use and access to resources in PAs or models that are not rooted in conservationists‘ priorities are disputed (Redford et al., 2000; Brockington, 2007). However, Nigel and Sue (1999); WWF (2004) and Bruner et al. (2001) have shown that protected areas are not sufficient to protect biodiversity by themselves. Similarly, a study of 34 protected areas in five countries in Africa namely; Cameroon, Central African Republic, Democratic Republic of Congo, Gabon, and Republic of Congo) concluded that protected areas are failing to reach their own conservation objectives (Pyhälä et al., 2016). On the other hand, IUCN (2017) affirmed among others the following: —1) Conservation needs the capacities, concerns and engagement of society as a whole, not of expert professionals or government officials only; 2) More attention must be paid to the crucial ties between biological and cultural diversity, as well as the conditions that allow indigenous peoples and local communities to be empowered for conservation. Muhumuza and Balkwill (2013) suggest that future conservation approaches in protected areas e.g. National Parks in Africa should place more emphasis on the human dimension of biodiversity conservation than purely scientific studies of species and habitats in National Parks. Some workers e.g. Volunteer for Africa (VA, 2009) have proposed community based conservation as an alternative. Our argument here is that for the role of PAs to be a success, the commitment of local people which is mostly shaped by their needs should be taken aboard. According to Hayes and Ostrom (2005), where residents do not believe that the government has the right to regulate their resource use, they will often find ways to resist or sabotage park regulations. In that case the role of PAs will fall short of their expectations. In fact, according to Hoffman et al. (2010) and Butchart et al. (2010), PAs coverage alone will not prevent all losses of forest biodiversity or reduce the increased threats.

Conclusion

The positive perception of Pares in Mwanga and Same districts towards the role of PAs to conserve forest biodiversity especially in Same DISTRICT is contradictory. The extent of biodiversity loss in Same District is comparatively higher; higher consequences of biodiversity loss and the participation in forestry husbandry activities are lower. Thus despite the existence of protected areas, forest biodiversity continues to be threatened by human activities whereas clan forests are comparatively well protected. This probably suggests that although general perception seems to be supportive, in actual fact, in Same District people have not fully supported the role of PAs. In other places similar situations have led to sabotage or resistance of local people to PA authorities which have led to their failures. Therefore, deeper understanding and accommodating the need of people in ensuring success of PAs is crucial. On the other hand, criminalizing or restricting all human activities in PAs in the midst of needy people may not necessary work for PAs. We thus strongly recommend that establishment of PAs should foremost obtain the commitment of the people founded on genuine understanding.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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