The Effects of Deforestation in Mlola Forest Reserves, Mafia District, Tanzania

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Abstract

This paper focused on the assessment of the effects of deforestation in Mlola Forest Reserve in Mafia District in Coast Region. It identified socio-economic activities conducted in Mlola Forest Reserve, examined effects of deforestation in Mlola Forest Reserve and measures taken against deforestation in the study area. Mlola Forest Reserve was used as a case study in the Cost Region. Data were collected using questionnaires and interviews from a sample size of 30 respondents composed of 47% males; and 53% females. Focus Group Discussions and field visits were also used in data collection. The results revealed that socio-economic activities contributed highly to the deforestation of Mlola Forest Reserve. Results showed that, 53% of the respondents were engaged in charcoal making and selling; while 30% and 17% depended on the forest for firewood and timber respectively. About 90% of the respondents revealed that deforestation leads to climate change or global warming. Moreover, 83% and 70% of the respondents revealed that, deforestation leads to habitat fragmentation and increased soil erosion, respectively. The study concluded that human activities contributed highly to forest destruction. It recommended that, awareness rising on tree planting should be promoted, encouraged alternative energy use, adhere to land use planning and Participatory Forest Management. Likewise, the policy and regulations should be enforced to reduce illegal deforestation activities.

Keywords: Charcoal, Deforestation, Firewood, Mlola Forest Reserve, Timber

1.0   INTRODUCTION

Globally, around 13 million hectares of forests were converted to other land uses such as farming, settlements and pasture land or lost through natural causes like climate change, drought, earthquakes and landslides each year between 2000 and 2010 as compared to around 16 million hectares per year in 1990s (FAO, 2010). According to Ademiluyi *et al.* (2008), Africa has the highest rate of deforestation in the world. Africa is losing more than 4 million hectares (9.9 million acres) of forest every year; twice the world's average deforestation rate (Alister, 2018).

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Emmanuel Patroba Mhache

Tanzania like other developing countries is facing serious problem of deforestation due to high demand of forest products. Tanzania is losing about 300,000 hectares of forest a year (Kideghesho, 2015). The amount of forest lost in a year is equals to one percent of Tanzania's forest area. Forests and woodlands are disappearing due to overexploitation to satisfy human needs such as charcoal, firewood, construction wood and medicinal herbs to list a few. In the course of overexploitation of forests and woodlands leads to deforestation.

Various efforts have been executed to combat deforestation in Africa and in Tanzania in particular such as tree planting campaigns, cut tree plant trees; policies, laws and by-laws were enforced but still, deforestation is on increase. Also various studies have explored factors leading to deforestation (Mhache, 2007; Milledge *et al*., 2007; Blomley *et al*., 2008; Gwalema, 2015). Governments and NGO's from different regions are in the struggle to and some have already developed comprehensive environmental policies and laws, that support the management of forest resources; despite of all these efforts, the problem of deforestation is on increase in many parts of Tanzania including Mafia Island. According to the URT (2018), Mafia Island district was among the areas seriously affected by deforestation caused by high demands of forest products, population increase and urbanization. These factors have increased effects of deforestation in Mlola Forest Reserve in Mafia Island District. People are encroaching forests in Mafia Island including Mlola Forest Reserve for different needs such as fuel wood and construction wood. These activities have increased the effects of deforestation in the area. This paper intended to address three issues: to identify socio-economic activities; examine effects of deforestation; and respective measures taken against deforestation in Mlola Forest Reserve, Mafia District.

2.0   LITERATURE REVIEW

Forests play a critical role in enhancing the quality of life, guaranteeing the existence of endemic species and the functioning of the planet's natural systems. It supports the poor in reducing their vulnerability to economic and environmental shocks (Ellis, 2000). Forests natural or planted offer firewood, construction wood and charcoal among others. The livelihoods of about 1.6 billion people, over 25% of the world population living in extreme poverty are sustained by forests (Agrawal *et al.,* 2013; FAO, 2014). There data testify that, deforestation denied livelihoods of many people in the world including Tanzania.

Deforestation is the direct human-induced conversion of forested land to non-forested land (FAO, 2010; Kideghesho, 2010). FAO (2001) defined deforestation as the conversion of forest land to another land use or the long-term reduction of forests below the minimum of 10% threshold. Deforestation implies the long-term or permanent loss of forest cover and implies

transformation of forests into another land use (Mhache, 2012). It refers to the loss or destruction of naturally occurring forests, primarily due to human activities such as logging, cutting trees for fuel, slash-and-burn agriculture, clearing land for livestock grazing, mining operations, oil extraction, dam building, and urban sprawl or other types of development. Deforestation is the conversion of forest to an alternative permanent non-forested land use such as agriculture, grazing or urban development (van Kooten and Bulte, 2000).

Deforestation is primarily a concern for the developing countries of the tropics (Myers, 1994); as it shrinks areas of the tropical forests (Barraclough and Ghimire, 2000); it caused loss of biodiversity and enhancing the greenhouse effect. It is obvious that, deforestation results when forest is replaced by another land uses including shifting and permanent agriculture as well as non-agricultural use such as mining and settlements. This deterioration can be temporary or permanent which can be termed as degradation. Forest degradation occurs when the ecosystem functions of the forest are degraded or compromised.

International organizations such as United Nations and the World Bank have developed number of programs aimed at curbing deforestation. The programme with the name Reducing Emissions from Deforestation and Forest Degradation (REDD) describes these sorts of programs. It uses direct monetary or other incentives to encourage developing countries to limit and/or roll back deforestation. However, the increase of population and development of social facilities like schools, army barracks and small industries, the needs of forests products have also increased.

Deforestation rates in Tanzania is very high, between 1990 and 2005 an estimated 412,000 ha per annum were cleared, equivalent to about 1.1% of the total forest area (Blomley *et al.*, 2009). It is estimated that, the rate of deforestation is 300,000 hectares to 400,000 hectares per annum (Kideghesho, 2015). The risk is high as the country's entire forests can be depleted within the next 50 to 80 years if the current trend remains unabated (Kideghesho, 2015). There are different factors causing deforestation in Tanzania. The main major causes of deforestation are overgrazing, expansion and clearing of forests for agriculture, overgrazing, wild-fires, felling trees for fuel wood (charcoal making and firewood), persistent reliance on wood fuel for energy and lack of or poor land use planning (Blomley *et al.*, 2008). Other factors contributing to deforestation are felling trees for building poles, indiscriminate bush clearance and bush fires for various reasons (Makunga and Misana, 2017). Relying on firewood and charcoal for energy supply have been identified as a key driver for deforestation and degradation, and it presents a real challenge as almost all domestic (rural and urban) energy consumption is derived from these sources (Miles *et al.*, 2009).

Emmanuel Patroba Mhache

3.0   MATERIALS AND METHODS
3.1   The Study Area
This study was carried out in Mafia Island District in Pwani Region, Tanzania. Mafia Island District was established in 1959 with two divisions North and South, 8 wards, 23 villages and 136 suburbs. This district is among the eight districts forming Pwani Region; other districts are Kibaha, Rufiji, Kisarawe, Mkuranga, Kibiti, Chalinze and Bagamoyo. Mafia District geographically is an island in the Indian Ocean situated on the Southern part of Dar es Salaam Region about 195 km away. Mafia District is located on the South Eastern part of the Coast Region and lies between Longitudes 39^0E - 40^0 E and Latitude 7^0.38's. The district is bordered by Mkuranga District on the North Western Part, Rufiji and Kilwa District on the South Western Part, in the East and South Eastern part bordered by Indian Ocean. Mafia District cover an area of 972 km^2 of which 407 km^2 are covered with land mass and 565 km^2 is covered by water. Mafia district is a strategic location since it provides sites for fishery industry and tourism activities. The district encompasses other small islands such as Chole, Jibondo, Juani, Bwejuu, Nyororo, Mbarakuni and Shungimbili.

3.2   Research Design
This study adopted case study research design where only one forest was covered in this study. The target population for this study was local people, staff working in the Mlola Forest Research and government officials. In this study both qualitative and quantitative data were collected. The target villages for this study were Kanga, Bweni, Jimbo, Kirongwe, Kifinge and Kungwi. While the target population for this article was Forest Officer, Ward Executive Officers (WEO), Ward Chair Persons (WCP), Village Environmental Committee Members, Village Executive Officer (VEO) and villagers i.e. heads of households. The sample size of this study was thirty respondents (Table 3.1).

Table 3.1: Target Population and Sample

S/n	Respondents	Number of respondents
1.	Forest Officer	1
2.	Ward Executive Officers (WEO)	2
3.	Ward Chair Persons (WCP)	2
4.	Village Environmental Committee Members	6
5.	Village Executive Officer (VEO)	2
6.	Villagers (Household)	17
Total		**30**

Source: Researcher survey, 2019

3.3   Sampling Techniques
Random sampling technique was used in drawing the sample from the target population. Random sampling was used to select 17 heads of households (Table 3.1). The list of heads of households was obtained from the village offices in which the sample was picked. Random numbers was used to select samples from

the village registry. One ward namely Kanga was purposively selected because it surrounded Mlola Forest Reserve. Notably, 13 out of 30 respondents apart from the 17 heads of households appearing in Table 1 were purposively selected based on their rich knowledge and experience over the study problem.

3.4   Data Collection Methods
Data were collected using interviews, questionnaire, observation and documentary literature review. Questionnaire was the main tool used in this study for data collection. It was administered to the heads of households who are the main users and beneficiaries of Mlola Forest Reserve. In-depth interviews were carried out to key informants to extract much inner information over deforestation. Interview guide comprising structured and unstructured questions was administered to key respondents in order for the respondents to express themselves in length and provide in-depth data/ information about the problem under investigation. Other methods which were used for data collection were observation and documentary literature review. Documentary literature review was conducted to justify that deforestation is an environmental problem widespread at global, regional and local level.

3.5   Data Analysis and Presentation
The information collected using questionnaires, interviews and observation was coded and analyzed. Quantitative data collected were analyzed using Statistical Package for Social Sciences (SPSS) where simple descriptive statistics were computed and presented in frequencies, percentages, tables and in figures. Qualitative data were analyzed using content analysis where the results were presented in narratives to meet the specific objectives of the study.

4.0   RESULTS AND DISCUSSIONS
This section presented the findings with focus on characteristics of the respondents, causes of deforestation, effects of deforestation and challenges facing the process of curbing deforestation. Finally, measures to curb deforestation were also proposed in this paper.

4.1   Characteristics of Respondents
The characteristics of respondents include parameters such as gender and education level of the respondents (Table 4.1). These variables were important to provide the basis for comparison with other variables studied on the use of forests and its effects on deforestation. The result indicated that 47% of the respondents were males while females were 53%. In this study more females were interviewed compared to males because they were at home during the interviews. Both males and females were involved in forest management in the study area. It was also supported by 47% of the interviewees who explained that females in the study area were fully involved in the whole process of forest management thus, addressing deforestation. Findings of this study agreed with

Emmanuel Patroba Mhache

the argument of Mona and Katunzi (1992) that, strengthening development and improving the standard of living in the Third World Countries cannot be attained without involving women in the whole process.

Table 4.1: Gender of the Respondents

Gender	Frequencies	Percentages
Male	14	47
Female	16	53
Total	**30**	**100**

Source: Field survey, 2019

Education level of the respondents was also solicited in this study (Table 3). Those who achieved primary education were 58%, ordinary secondary education (32%); advanced education level (3%), diploma (3%) and bachelor degree (3%). This finding was also supported by some of the interviewees that, majority of the people in the study area were literate, able to read and write (Table 4.2). The checklist was used to collect information regarding the ability of the respondents' ability to read and write. It was possible to draft forest management plan and by-laws which are working and understood by the people to address all activities leading to deforestation. This finding agreed with Means (1992) who observed that, basic efficient management of any activity including addressing deforestation depends on literacy of the people.

Table 4.2: Education level of the respondents

Education levels	Frequencies	Percentages
Standard VII	17	58
Form IV	10	33
Form VI	1	3
Diploma	1	3
Bachelor degree	1	3
Total	**30**	**100**

Source: Field survey, 2019

4.2 Identification of the Socio-Economic Activities c Conducted in Mlola Forest Reserve

The study was to identify socio-economic activities performed in Mlola Forest Reserve. Findings from interviewed conducted to respondents revealed there were three main economic activities executed by the people residing close to Mlola Forest Reserve. These were charcoal making, timber making and firewood business (Table 4.3).

Emmanuel Patroba Mhache

Table 4.3: Activities conducted in Mlola Forest Reserve

Socio-economic activities	Frequency	Percentage
Making and selling charcoals	16	53
Collecting and selling firewood	9	30
Timber making and sell	5	17
Total	**30**	**100**

Source: Field data 2019

Table 4.3 showed that charcoal was the main economic activity for livelihood around Mlola Forest Reserve and the study area in particular as source of income. The study established that, 58% of the respondents were primary level of education had no formal employment except they self-employed in charcoal making (Table 4.2). In another development, 53% of the respondents said that charcoal making was done in almost all part of the forest (Table 4.3). According to Malimbwi *et al.* (2007), charcoal was produced in woodlands or dry forests that were under open access regime with no or little harvesting control. The majority of the respondents (76%), declared that charcoal making was prominent activity in Mlola Forest Reserve, This argument was supported by Abdullah, 58 years old, male, of Kanga Village who asserts that, "*Charcoal is simple to make, no large starting capital is required and market is available* (Plate 1), *every people use charcoal*". The second interviewed man at Bweni Village commented that, "*Charcoal gives high return compared to farming, grown crops until you harvest it take too long. Making charcoal you get returns in a short period*". Amina, 66 years old woman at Jimbo Village said this, "*No high education is required in making charcoal, just your energy and elementary knowledge of counting money and returning change when selling charcoal*".

Figure 4.1: Charcoal Selling Point

Firewood was another source of energy widely used in rural areas (Figure 4.1). It was obtained from the forest for free or for some payment (Haapanen and Mhache, 2013). But some activities such fish drying, cooking in barracks, in schools and in institutions require large quantity of firewood. The great demand for income forced excessive tree cutting for firewood. It was evidenced by thirty percent of the respondents commented that; firewood was another economic

activity performed in the Mlola Forest Reserve (Table 4.1). Informed further, people involved both in the preparation and the selling of firewood were money. Mponda slang name) of a 49 years old male from Kirongwe Village said; "*Selling firewood is my economic activity. It gives me money which I used to feed my family, paying school fees of my children and paying for treatment cost of my family*". Another respondent from Kifinge Village said: "*With this business of firewood, have managed to build brick (block) house and other money I used to settle my family activities*". Forest degradation and deforestation have been caused by extensive production of charcoal, collection of live firewood for cooking and extracting wood for construction and carpentry (Mhache 2010; Ylhäisi 2010a, 2010b; Haapanen, 2011). The opposite argument is that, the collection of firewood as dead branches, naturally drying wood tree and wasted material from harvested trees for other purposes is not a major cause of deforestation (Luoga, 2000).

Figure 4.2: Firewood Collected from the Mlola Forest Reserve

About 17% of the respondents said that, timber harvesting was another economic activity performed in the forest (Table 4.3). All households in Mafia Island used timber in one way or the other basically in construction. The process of making timber was labour intensive, time consuming and costly. It involved cutting the tree (Figure 4.3), slicing it to make timber, and transporting it to the market or to users. A 61 years man named Eliatosha selling timber in Mafia Island had this to say, "*I have started selling timber long time ago. Timber business gives money which is used to take care of my family such as buying food, pay treatment of my family members and others for building and repairing my house*". Another youth found slicing the timber said this, "*I am given this lumbering work by my neighbor who wanted to use it for roofing his house. We agreed to do this activity for 100,000/= Tshs. I am supposed to make 100 slices or pieces of timber. This activity can take two to three days*". The third people were observed roofing a house using timber at Kungwi Village said: "*Almost all houses in Mafia have used timber in some point such as making furniture, doors and windows; timber is also used before corrugated iron sheets are put on the roof*".

Figure 4.3: Tree Cutting for Timber Making

Charcoal making, firewood collection and timber making were the three main activities conducted in the Mlola Forest Reserve. It was found out that, all these activities were not allowed in Mlola Forest Reserve as they depleted the forest. As explained above, the motive of these activities was income generation. People were not concerned with the results of these income generating activities to Mlola Forest Reserve, they only consider fulfilling their income generation desire. There was a need to introduce income generation alternatives which do check deforestation such as introduction of beekeeping in the forest, fish farming in the forest ponds and dry wood collection from the forest. It was further observed that, there was a weak enforcement of by-laws whereby even community leaders in one way or the other were involved in illegal cutting down of trees. The study also learned that, law enforcers against deforestation did not give alternative livelihood options to households (Mhache, 2002). It supports Darkoh's (1990) observation on the failure of conservation projects that, some of conservation laws overlooked people's needs by not offering realistic alternatives.

4.3   Effects of Socio-Economic Activities to Mlola Forest Reserve

The study observed that, deforestation was the major threat to forests. Deforestation converted forests to non-forest land use such as arable land, urban use, logged area or wasteland (FAO, 2010; 2014)). Deforestation led to loss of biomass, habitat destruction and fragmentation, caused global warming and desertification. Forests in the tropics are home to a vast number of wildlife species (Gwalema, 2015) both animals, plants and micro-organisms. As forests are destroyed, the habitats of some animals and plants are destroyed completely or degraded (Gwalema, 2015). The 75% (majority) of the respondents said deforestation was part of human activities intended to meet human wants.

Emmanuel Patroba Mhache

During the focus group discussion, Mwamposa, 77 years old, female of Mafia Island asserted that, "*The main sources of energy for cooking in our village are firewood and charcoal, thus people cut down trees in earning income from selling charcoal and firewood"*. An interview with one of the forest officer revealed that, "*The community members are cutting down trees for sale without replacing it. The income motive is what motivates people in rural areas to cut trees*". Unwillingness of people on planting trees in the study area (Mlola Forest Reserve inclusive) is also a challenge to the forests. This result concurs with those of Mang'enya and Makupa (2017) who observed in Kondoa District that, there was a reduction of forest size due to forest clearing and cutting of trees in extraction of firewood and charcoal for sale. There was a need to provide all households around the forest reserve with free tree seedlings to plant trees at tree replacement level; and motivate them to attend forest conservation awakening seminars.

Table 4.4: Effects of Deforestation (n=30)

Effects	Frequencies	Percentages
Climate change/ global warming	27	90
Habitat fragmentation	25	83
Increased soil erosion	21	70
Losses of biomass	15	50

Source: Field survey, 2020

Table 4.4 summarizes effects of deforestation as collected in the study area. The study recorded 90% of the respondents commented that, deforestation led to climate change. It agrees with the fact that, trees remove carbon dioxide from the air and release oxygen. Massive removal of biomass reduces its capacity to absorb carbon and release oxygen which contributes to global warming. Mwendamseke, 97 years old, female of Kirongwe Village asserts that, *"During the independence in 1960s, climate of this area was good, not hot as it is now; we used to get high rainfall which is not the case today"*. Probing more to why rainfall is less today, she said, "*This new generation has cleared forest which was attracting rainfall without replacing trees. Big tree which we used to see in the forest is no longer there*". According to Gwalema (2015), human activities cause deforestation thereby lead to changes in natural ecosystems including global warming.

Deforestation caused habitat destruction or fragmentation. The study revealed that, deforestation damaged habitats and breeding grounds of animals. 83% of the respondents agreed that, deforestation involved clearing of the forest leading to destruction or fragmentation of forest. Amani, 60 years old, male, of Kungwi Village lamented that, "D*eforestation destroy habitat of wild animals and availability of fodder or pasture for wild animals. It also destroys ways or paths for animal movement*". However, forest officer interviewed in Kanga Village commented that, *"Deforestation involved burning of forests as a way of chasing*

dangerous animals like snakes. Fire kills targeted and untargeted animal as the results destroy habitats".

Increased soil erosion was another consequence of deforestation. Soil erosion is the removal or blowing away of the upper or top part of the soil not covered with vegetations, i.e. a bare land. Bare land is susceptible to soil erosion. Tree roots act like glue binding soil together. Erosion sweeps the soil to water bodies like rivers, lakes, seas and oceans. Soil erosion as an effect of deforestation was said by 70% of the respondents (Table 4.4). According to Gwalema (2015), if the vegetation cover is removed, the area is exposed to erosion and the washing out of minerals and nutrients, leaving a poor soil. Deforestation also leads to loss of biomass as said by 50% of the respondents (Table 5). Loss of biomass reduces the ability of the forest to retain moisture. Biomass is burned to clear land for other activities. Of forest burning, about 80 percent results in permanent deforestation meaning the land is now used for some other land uses such as grazing, agriculture or buildings.

4.4 Measures to Address Effects of Human Activities to Mlola Forest Reserve

The survival of rural people to a large extent, depends on natural resources such as land for farming and grazing; water for fishing; forests for charcoal, firewood and timber and so on. Some of the households close to Mlola Forest Reserve got their means of survival from the forest. In the course of meeting such forest oriented needs, households found themselves destroying the forest reserve necessitated law enforcers to intervene. Table 4.5 presents measures taken to address effects of human activities to Mlola Forest Reserve as revealed by the respondents.

Table 4.5: Measures taken to safeguard Mlola Forest Reserve

Measures	Frequencies	Percentages
Improvement of forest security	11	37
Provision of forest education	7	23
Strong enforcement of forest rules	4	13
Tree planting (campaign)	8	27
Total	**30**	**100**

Source; Field data, 2019

It shows that, 37% of the respondents suggested that one of the measures to check human activities against deforestation was to improve forest security including daily forest patrol. It was underlined by a 67 years old man who was also a member of the Jimbo Village Forest Committee he said: "*Forest guards must be empowered with training and weapons to enable them patrolling the forest in 24 hours and arrest all people found harvesting forest products illegally*". The same point was supported by a resident of Kanga Village by saying: "*Most of the illegal activities are performing in the forest in the night*

when forest guards are at home or not on duty, thus, I suggest forest guards to work on 24 hours patrolling the forest; they can have shift. This will reduce illegal activities performed in Mlola Forest Reserve". However, alternative livelihood activities could reverse the situation by reducing illegal activities in the forest (Mhache 2012). A similar observation was noted by Luoga (2000) who suggested that; diversification of income generating activities could reduce pressure on forests. In this way, residents might be allowed to undertake bee-keeping and fish farming in the forest reserve ponds. Also, residents could be allowed to collect dry wood and fodder in the forest under the Forest Management supervision.

The second measure of reducing effects of human activities to Mlola Forest Reserve was provision of forest conservation education to people. About 23% of the respondents agreed that, provision of forest conservation education was an effective tool to rescue Mlola Forest Reserve from deforestation (Table 6). This is important since several respondents said that they did not know the problem of misusing the forests; thus with education people could know the importance of forest conservation and preservation. Mgohamwende, 58 years old, male, of Bweni Village asserts this, "*Some villagers not honest, entered the forest clandestinely in the night and cut trees for charcoal and timber making, by doing so, their damaging the forest. With education on the impact of what they're doing, they can stop this habit*".

The next measure was serious and strong enforcement of forest rules and policies. The study noted that, the agency for forest management had transformed itself to a military kind of operation know as *Jeshi USU* (paramilitary) to control poaching and illegal encroachment to the forest. It appeared that the measure was yet to be effective due to various shortcomings. In another development 13% of the respondents suggested that, enforcement of by-laws enforcement could be an effective solution to the problem facing Mlola Forest Reserve. "*If people are fined heavily or imprisoned can stop habit of illegally harvesting forest resources*", this argument was supported by one member in the Focus Group Discussion held in Kirongwe Village who proporsed that, improvement of forest security and forest regulations could safeguard the Mlola Forest Reserve from natives destroying the forest. Amakubu, 67 years old, woman, of Kifinge Village asserted that, "*Regulations ought to be taken into consideration without favoritism. If by-laws are instituted rationally can rescue the forest but sometimes people supposed to take measures against culprits are unable to do so because the victims are their friends or relatives as the results cases ended in vain, without judgment*". Forest official in the same village added that, "*Any cases related to illegal activities in the forest should be reported to Tanzania Forest Services Offices for decision*".

Tree planting was another proposed measure which could rescue the damage caused to Mlola Forest Reserve. Results in Table 6 revealed that 27% of the respondents indicated tree planting as a solution to deforestation that will ensure the survival of the forest. When the Village Executive Officer was interviewed by the researcher he emphasized that the introduction of tree planting program in form of Participatory Forest Management (PFM) would help in addressing the deforestation taking place in the forest. Danish International Development Agency (2002) recommended PFM as proper management style for rescuing forest from degradation. Tree planting program enabled people to satisfy their needs of firewood, charcoal and timber. This study revealed that, people depends direct on forest resources for their livelihood. They cut trees for timber, firewood and charcoal for domestic use and for commercial use. These activities reduce the size of the forest leading to deforestation which affects food security. Tree planting can be done in the forest and in the private land. People can plant trees in their farms and stop depending on forest for their wood needs. In addition, trees can be planted in the forest to cover the patches or bare areas, areas, without trees. Secure tenure and increasing demand of wood have led to substantial tree planting on homesteads and in countries such as Kenya, Rwanda and Burundi (FAO, 2003) where home gardens and private woodlots have become important source of wood (Mhache, 2004).
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4.5   Discussion

This paper has empirically showed that there were diverse activities that took place in the study forest. In 1980s and 1990s, rural dwellers only used the stumps and twigs collected from agricultural lands to produce little charcoal they could use in their households (Amous, 2000). But the situation changed due to population increase which then forced people to alter their life styles (Mhache, 2012). Instead of relying on stumps and twigs, people started cutting trees in the forest for making charcoal. Within the last two decades, 2000s and 2010s charcoal production has taken a new dimension, with increase in the number of producers and the quantity produced (Haapanen and Mhache, 2013). In Nigeria, the need for rural energy development has been on the increase in the last two decades (1980 to 2000) (Akinbami, 2001). Despite the laws promulgated by the Federal Government prohibiting illicit felling of these trees, charcoal producers keep increasing with an increase in the quantity of charcoal produced.

5.0   CONCLUSIONS AND RECOMMENDATIONS

The finding from the study revealed that extracting forest resources for socio-economic activities has been a main reason for deforestation in Mlola Forest reserve. This requires appropriate strategies like sensitizing communities on the effects of deforestation. With deforestation soil erosion increase; trees for timber, charcoal and firewood making disappeared. People must not be involved in the activities that are not environmentally friendly which includes tree cutting. There is a need of strengthening and enforcing the existing institutions such

laws, by-laws, policies and regulation which are responsible for forest conservation. Based on the findings, the recommendations below are to be applied in order to save Mlola Forest Reserve from deforestation.

i)   Provision of cottage industries and soft loans to rural people mainly those depending on forests and nature for their survival. This will reduce unemployment and reduce total dependence on the forest. This can be done by Cooperative or Agricultural Banks by providing soft loans to rural people for establishing cottage Industries; Small Scale Industrial Development Organization (SIDO) can provide machines and techno-know how.

ii)   Government should use her colleges like Sokoine University of Agriculture (SUA) and other organs like Tanzania Forest Society (TFS) to provide forest conservation education, raise awareness and knowledge to all communities residing proximity to the forests.

iii) The government should also provide education to small scale tree growers in rural areas. This can be done by increasing the number of agricultural and forest officers to oversee the progress of tree farming activities in rural areas. With knowledge, tree growers can sell trees and use the remains as firewood and reduce dependence on forests.

iv)   Other livelihood activities which are environmentally friendly such as bee-keeping and fishery, among others, should be promoted among rural dwellers and people can be allowed to keep bees in the forest as this activity is compatible to forest.

v)   Campaigns should be set up which could emphasis on tree planting for different uses such timber, charcoal and firewood. Rural people should be encouraged to participate in tree planting campaigns through supply them with tree seedlings to plant in their private farms, public land and in the forests.

vi)   People should be encouraged to use alternative household energy sources such as kerosene, solar energy, gas, and electricity as a way of reducing dependence on forests for charcoal and firewood.

vii) Regular trainings and workshop should be organized for rural dwellers on proper management of the forest and its future implications on the environment and human lives. This will enhance persons' participation in forest management.

viii) The government under the forest authority should make forests part and parcel of the people living close to it; because people are there all the time, thus it will be easier for them to safeguard forests and to provide any secret information or bad practices leading to forest deforestation.

REFERENCES

Ademiluyi A., S, Okude S., and O, Akanni C. (2008). An Appraisal of Land use and Land cover Mapping in Nigeria. *African Journal of Agricultural Research* Vol.8 (2009), 581-586.

Agrawal, A., Cashore, B., Hardin, R., Shepherd, G., Benson, C. & Miller, D. 2013. *Economic Contributions of Forests.* Background paper prepared for the tenth session of the United Nations Forum on Forests held in Istanbul, 8-19 April 2013. (available at www.un.org/esa/forests/pdf/session_documents/unff10/EcoContrForests.pdf).

Akinbami, J.F.K (2001). *Renewable energy resources and technologies in Nigeria: present situation, future prospects and policy framework, mitigation and adaptation strategies for global change*. The Netherlands, Kluver Academic Publisher pp. 165-181.

Alister, D. 2018. *Africa's Deforestation Twice World Rate.* U.N. Environment Programme (UNEP) about the 400page atlas, a meeting of African environment ministers in Johannesburg. South Africa. (https://www.reuters.com/article/us-africa-environment/africas-deforestation-twice-world-rate-says-atlasidUSL1064180420080610).

Amous, S. (2000). *Review of wood energy reports from ACP African countries*. EC-FAO Partnership Programme Working Document. Rome, Italy

Barraclough, S. and Ghimire, K. B. (2000). *Agricultural Expansion and Tropical Deforestation.* New Jersey: John Wiley & Sons Ltd.

Blomley, T., Pflienger, K., Isango, J., Zahabu, E., Ahrends, A. & Burgess, N. (2008). Seeing the Wood for the Trees: An Assessment of the Impact of Participatory Forest Management on Forest Condition in Tanzania, *Oryx, Fauna & Flora International*, Vol. 42(3): 380–391.

Blomley, T., Ramadhani, H., Mkwizu, Y. & Böhringer, A (2009). *Hidden Harvest: Unlocking the Economic Potential of Community Based Forest Management in Tanzania.* In German, L., A. Karsenty and A.-M. Tiani, (Eds). Governing Africa's Forests in a Globalized World. Earthscan. London, UK.

Danish International Development Agency. (2002) *Participatory Forest Management (2003-2007)*, Dar es Salaam, Tanzania.

Darkoh, M. B. K. 1990. Trend in Natural Resources Use and Prospects for Sustainable Resource Management in Kenya's Arid and Semiarid Lands in *Land Degradation Development* Vol. 2. Pp 177 -1990.

Ellis, F. (2000). *Rural Livelihoods and Diversity in Developing Countries*. Oxford, Oxford University Press.

FAO. (2001). *The State of World's Forest* (SOFO), Food and Agriculture Organization of the United Nations, Rome.

FAO. (2003). *Forestry Outlook for Africa. Regional Report Opportunities and Challenges Towards, 2020.* Paper 114, FAO, Rome.

FAO. (2010). *Global Forest Resources Assessment 2010: Main Report.* FAO Forestry Paper No. 163. Food and Agricultural Organization of the United Nations, Rome, Italy.

FAO. (2014). *State of the World's Forests 2014: Enhancing the socioeconomic benefits from forests.* Rome. (available at http://www.fao.org/3/a-i3710e.pdf).

Gwalema, S. R. (2015). Deforestation and Forest Restoration Efforts in Africa: A Focus on Tanzania in *The African Resources Development Journal* Vol. 1, Issue No. 2, March, 2015 Page 45 – 60.

Haapanen, T. (2011). *Rural food system change in Tanzania during the Post-Ujamaa Era; A case Study from Western Bagamoyo District.* Turun Yliopisto, University of Turku, Turku, Finland.

Haapanen, T. and Mhache, E. P. (2013). From farming to charcoal production: Food system change and deforestation in rural Tanzania. *Tanzania Journal of Forestry and Nature Conservation.* June 2013, Vol. 82 (2). Sokoine University of Agriculture, Morogoro.

Kideghesho, J. R. (2015). *Realities on Deforestation in Tanzania: Trends, Drivers, Implications and the Way Forward.* Open Access Peer-Reviewed Chapter. DOI: 10.5772/61002. https://www.intechopen.com/books/ precious-forests-precious-earth/realities-on-deforestation-in-tanzania-trends-drivers-implications-and-the-way-forward. Accessed on 7/4/2010.

Kothari, C. R. (2004). *Research Methodology*, *Methods and Techniques*. New Delhi: Wesley Eastern.

Luoga, E. J. (2000). *The Effects of Human Disturbances on Diversity and Dynamism of Eastern Tanzania Miombo Arborescent Species.* PhD Thesis, University of the Witwatersrand, Johannesburg.

Makunga, J. E. and Misana, S. B. (2017). The Extent and Drivers of Deforestation and Forest Degradation in Masito-Ugalla Ecosystem, Kigoma Region, Tanzania. *Open Journal of Forestry,* 2017, 7, 285-305; ISSN Online: 2163-043**7;** ISSN Print: 2163-0429. Scientific Research Publishing; http://www.scirp.or.

Malimbwi, R. E., Zahabu, E. and Mchome, B. (2007). *Situation Analysis of Dar es Salaam Charcoal Sector: Charcoal Supply and Consumption.* Department of Forestry and Mensuration and Management, Faculty of Forestry and nature Conservation, Sokoine University of Agriculture, Morogoro, Tanzania.

Mang'enya, E. H. & Makupa, E. (2017).The contribution of REDD pilot Project to Community Livelihoods: A Case Study of Kondoa District, Tanzania. *Journal of the Geographical Association of Tanzania,* Vol.36 No2:89104.

Means, R. (1992). *Direct and Indirect Uses of Wealth Ranking in Mongolia.* PRA Notes 15, 29-38.

Mhache, E. P. (2004). *Impacts of Tree Planting on the Livelihood of Communities in Unguja, Zanzibar.* Masters Dissertation, University of Dar es Salaam, Tanzania.

Mhache, E. P. (2007). Deforestation an Obstacle to Sustainable Development: The Role of Higher Learning Institutions in Sustainable Responses. In *Huria Journal* Vol. VII No. 1 of June 2007: 112-124.

Mhache, E. P. (2010). Ongezeko la watu na athari zake katika misitu magharibi mwa Bagamoyo, Tanzania. In Sokoni, C.H. (ed.). *Maendeleo ya makazi*

vijijini baada ya ujamaa, magharibi mwa wilaya ya Bagamoyo, Tanzania. Turku University Department of Geography Publications B Nr 15, 25–36.

Mhache, E. P. (2012). *Impacts of Population Change on Forests and Woodlands in Western Bagamoyo, Tanzania.* PhD Thesis, University of Dar es Salaam, Dar es Salaam, Tanzania.

Miles L., Kabalimu, K., Bahane, B., Ravilious, C., Dunning, E., Bertzky, M., Kapos, V., and Dickson, B. (2009). *Carbon, biodiversity and ecosystem services: exploring co-benefits. Tanzania.* Prepared by UNEP-WCMC, Cambridge, UK & Forestry and Beekeeping Division, Ministry of Natural Resources and Tourism, Dar es Salaam. UNREDD Programme, Tanzania.

Milledge, S. A. H., Gelvas, I. K., and Ahrends, A. 2007. *Forestry, governance and national development: lessons learned from a logging boom in Southern Tanzania.* TRAFFIC East/ Southern Africa/Tanzania Development Partners Group /Ministry of Natural Resources of Tourism, Dar es Salaam, Tanzania, 2007;252pp.

Mona and Katunzi. 1992. *The Female Locomotive Drive.* 123 pp.

Myers, N. (1994). *Tropical deforestation: Rates and Patterns.* Chicago: UCL Press.

URT. 2018. *National Environmental Statistics Report 2017*. Tanzania Mainland. National Bureau of Statistics, Dar es Salaam, Tanzania.

Ylhäisi, J. (2010a). Sustainable land privatization involving participatory land use planning in rural areas: An example from Tanzania. *Land Tenure Journal* 1, 91–120.

Ylhäisi, J. (2010b). Uhakika wa umiliki wa ardhi, mpango wa matumizi ardhi wa kijiji na raslimali ya misitu magharibi mwa wilaya ya Bagamoyo. In Sokoni, C. H. (ed). *Maendeleo ya makazi vijijini baada ya ujamaa, magharibi mwa wilaya ya Bagamoyo, Tanzania.* Turku University Department of Geography Publications B 15, 37–54.

Your Dictionary. 1996. Where is deforestation in South Africa? 1996-2012 Love to Know. http://answers,yourdictionary.com/answers/science/deforestation-south-africa.html 15-6-2012