

Livelihood Continuity and Change: Adaptation to Climate and Environmental Change in Northern Unguja, Zanzibar 1916-2016

Khatib, M.M¹⁸, William, C.P¹⁹, Shaghude, Y.W²⁰. Kangalawe, R.Y.M²¹.

Abstract

Coastal community continuity and change in livelihoods become a prime adaptation strategy worldwide because of climate and environmental change. The changes in climate and environment along the coast have been associated with natural and human induced factors. This paper analysed the livelihood continuity and change as adaptation measures in northern Unguja, in relation to temperature and rainfall change. Archival and current reviews, interview and observation which represent the livelihoods change over last 100years were used. The paper also, analyzed how local community processes of continuity and change have interconnected with local climate events and changes over last 100 years. The results reveal that there were societal change both North Western Zone and North Eastern Zone in livelihoods activities as an adaptation mechanism due to gradual environmental changes, such as coastal erosion, coastal floods, unreliable rainfall and droughts. Such scenario increases the risk and vulnerability to the local community. The study also reveals that the identification of risks and vulnerability depends on the local community perceptions of what functions the coastal and terrestrial land should provide, as they informed by past experience, histories and current situation. Therefore, the successful adaptation from the local perspective should go beyond protecting what is already there and allow for future development of the village.

Keywords: Livelihood, Climate change, Coastal Change, Adaptation

Introduction

Climate and environmental change are among the influenced factors in livelihood change and shift or continuity in North Western Zone (NWZ) and North Eastern Zone (NEZ) for over a century. However, economic and socio-political processes also play a major role on livelihood dynamics (Sheriff and Ferguson, 1991). The northern Unguja history is characterized by coastal natural resources extraction and export of coconuts and spices, where fishing is followed by agricultural activities. More recently, tourism and aquaculture such

¹⁸ Department of Geography, University of Dar es Salaam, Tanzania

¹⁹ Department of Geography, University of Dar es Salaam, Tanzania

²⁰Institute of Marine Science, University of Dar es Salaam, Tanzania

²¹ Institute of Resource Assessment, University of Dar es Salaam, Tanzania

as seaweed have been pursued as an economic development strategy (Msuya, 2012; Lange and Jiddawi, 2009). The historical overview and development in coastal areas of NWZ and NEZ such as the development of tourism and the establishment of coastal and marine protection strategies have significantly altered communities livelihood in NWZ and NEZ over the past 100 years and led to change and diversification in the livelihoods activities (Middleton, 1961; Sheriff and Ferguson, 1991; Gilbert, 2004; Makame, 2013). The resulting livelihood activities have caused patchy transformation of livelihoods, with local communities dependence on agriculture and fishing being increased (Makame, 2013, Makame et al., 2015; Kyhayo et al., 2015).

Increasingly, coastal management strategies, diversification, transformation, shift and change of livelihood activities are among the means promoted for climate and environmental change adaptation (Mustelin et al., 2009; Magigi and Ramadhan, 2013; Makame, 2013, Makame et al, 2015). Evaluation of climate and environmental change risks, vulnerability and adaptation is commonly the identification of current conditions and exposures, and the past and present strategies the local communities have used to deal with changes (Sheriff and Ferguson, 1991; Makame et al., 2015).

Since adaptation to climate and environmental change considered urgent in northern Zanzibar, (Mustelin et al., 2009; Makame et al., 2015), it is important to extend the understanding of livelihood adaptations and transformation beyond present concerns. Adaptation to climate and environmental change cannot work without inclusion of livelihood activities, because livelihood activities shape local communities way of life. Hence, socio-economic and cultural processes intersect with people, local events and environment in profound ways, where historical contexts can improve analysis of connections between past and presents effects and adaptation measures.

This paper therefore examines and analyses how processes of livelihood continuity, shift and/or change as a processes of adaptation have unfolded in the coastal communities in Unguja over last 100 years. The study contributes to current debates on adaptation by underlining the change characteristics of livelihoods, and emphasising the influence of history and socio-economic in shaping adaptation measures.

Materials and Methodology

This study was undertaken in ten villages in northern Unguja, in Zanzibar. Data collection was undertaken using interviews, observation and literature review. Household Interviews involved collection of socio-economic data, including the status of the local community and their perception of climate change risk, vulnerability and adaptation processes. Interviews also involved consultations with key informants that included village elders and Shehas, staffs from the Department of Forestry and Non-renewable (DFNR) and NGOs operating in the study area. Field observation provided supplementary information acquired through direct observation in the field. Direct observation was undertaken together with selected members of local communities to provide an in-depth account of the population under study as described in Bryman (2004). Secondary data was collected through review of various publications to support and/or complement the information collected from the primary sources in relation to the climate change impacts, people's perception on risk, vulnerability and adaptation in the study area. Secondary data included among others, climatic data from the Tanzania Metrological Agency (TMA) and Zanzibar National Archive (ZNA).

Various approaches were used in data analysis. Climate parameters such as temperature and rainfall data acquired from TMA and ZNA was used to analyse the patterns of change for different periods over the 100 years data. Extreme events of temperature and rainfall changes and long time departure from the mean were also analysed using time series graphs, and points showing climate shifts (changes) were also detected. Trend analysis for different time scales (100 and 50 years) was done to clearly demarcate the extent of which climate was changing for a given period of time (trend line slopes were used). Socio-economic data was analysed using content analysis, Statistical Packages for Social Sciences (SPSS) software and Excel. The analysis was used to differentiate various opinions of which people perceived over time based on their livelihood activities.

Results and Discussion

The section broadly presents the livelihood adaptations to climate and environmental change and depicts the main trends and changes. Around 1920s NWZ and NEZ livelihoods activities had been divided between officially recognised sectors centred on export of spices such as cloves, copra, coir, and chillies. The second set of livelihood activities directly descended over time in involving production of subsistence crops such as cassava, rice, yams, maize, and vegetables (Middleton, 1961; Gilbert, 2004; Ingrams, 2007). In 1920s NWZ

and NEZ indigenous communities' settlements were long-settled in clusters, with streets; whereas, in these settlements shifting subsistence agriculture and fishing were economically important (Middleton, 1961; Ingrams, 2007). However, their economies were largely based on the export of cash crops and seasonal labour contract (in clove plantations), and a considerable proportional of their food was imported (Ingrams, 2007; Middleton, 1961).

The Influence of Population Trend in Livelihood Activities Change

The results revealed that there were profound changes in population growth and livelihoods in the study sites. Figure 7.1 represent the population trends in North Unguja over last 100 years, where the trends has experienced a fairly steady population increase over time. The increment of the population are associated with indigenous births and immigrants from various areas of mainland and Indian ocean travelers (Sheriff and Ferguson, 1991). For instance between 1923 and 1930 at total of 21, 699 mainlanders immigrated into Zanzibar of whom 3,876 never returned, either because of death or because they settled down as squatters (Sheriff and Ferguson, 1991). During the colonial period the population of the rural areas of North Unguja are sparsely distributed and much of them remained land consists of uninhabited coral land to the NEZ and deep fertile soil in NWZ (Middleton, 1960). The population increase over time influenced on livelihood activities in various ways, such as subsistence cultivation and fishing activities.

Furthermore, the population increase associated with land use land cover (LULC) change in the area, which driven by increasing of supply and demand to the local communities and nearby areas. For instance, Middleton (1960) noted that during 1950s plots near the settlements are cultivated on an average for three years, then left to rest for two to five years; whereas, more distant fields are cultivated for three years and left to rest for anything from eight to fifteen years. While currently due to population increase the shifting cultivation have changed by reducing the period from eight to fifteen into two or three years which are used to make the soil rest and regenerate. This practice done mainly in NEZ where the soil are richer in nutrients but are thinner, low water retention and are found in some pockets of earth (Klein, 2008; Ingrams, 2007). In NWZ are changed mainly by practiced intercropping and crop rotation in the same area due to the deep and fertile soil and rainfall are more reliable than NEZ (Middleton, 1960). Whereas, timeline of livelihood activities, population growth, LULC change and climate changes and variability provides an outline of history of adaptation in the study sites (see Figure 1, 2, 3 and 4).

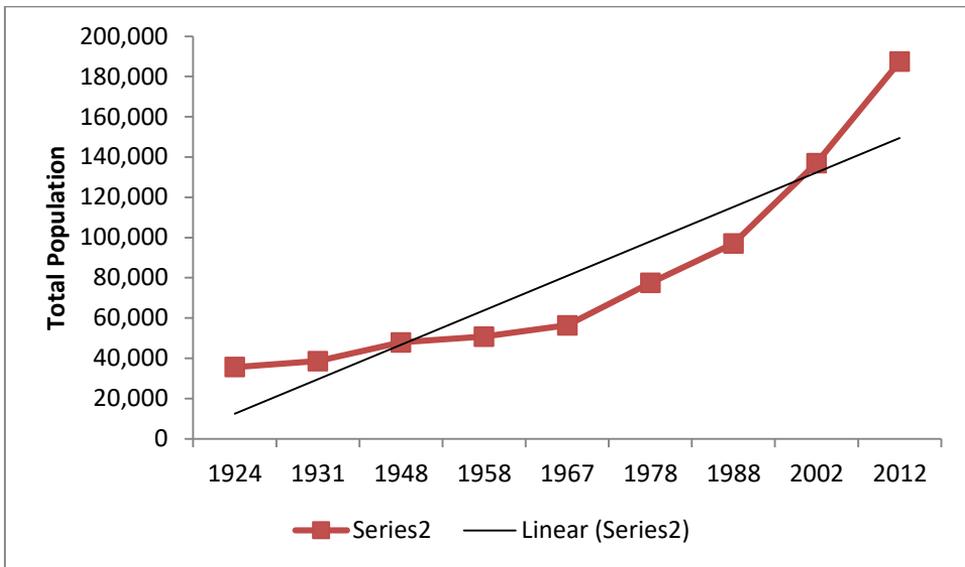


Figure. 1 Population Trends in North Unguja Over 100 years. B: Data Derived from ZNA (2016) and National Statistics of Zanzibar (NSZ)

3.1 Vulnerability of livelihood activities to extreme weather events

Livelihood activities such as small-scale cultivation was vulnerable to extreme weather events, evidenced by severe drought in 1918-1923, 1933-1934, 1943-1946, 1949-1951, 1953, 1958, 1983, 1987, 1996, 2001, 2003, 2009, and 2012/2013 as depicted from the Standardized Precipitation Index (SPI) (Figure 2). In addition, there was a severe drought during 1946 which caused shortage of food and led to famine (Sherriff and Ferguson, 1991). The famine of 1946 led the rural population to require additional incomes by harvesting massive mangrove bark to sell to merchants and opening farms for subsistence farming, which ruined the mangroves and impacted in its generation (Sherriff and Ferguson, 1991). In the local historical narrative, this way of life was disrupted by different factors including climate variability, poor economic development and/or colonial policy which granted land alienation for cash crops like cloves and coconuts (Sheriff and Ferguson, 1991). The land alienation to large plantation such as cloves and coconuts reduced the amount of fertile land available to local communities for food crop cultivation, such as in the north-western parts of Zanzibar.

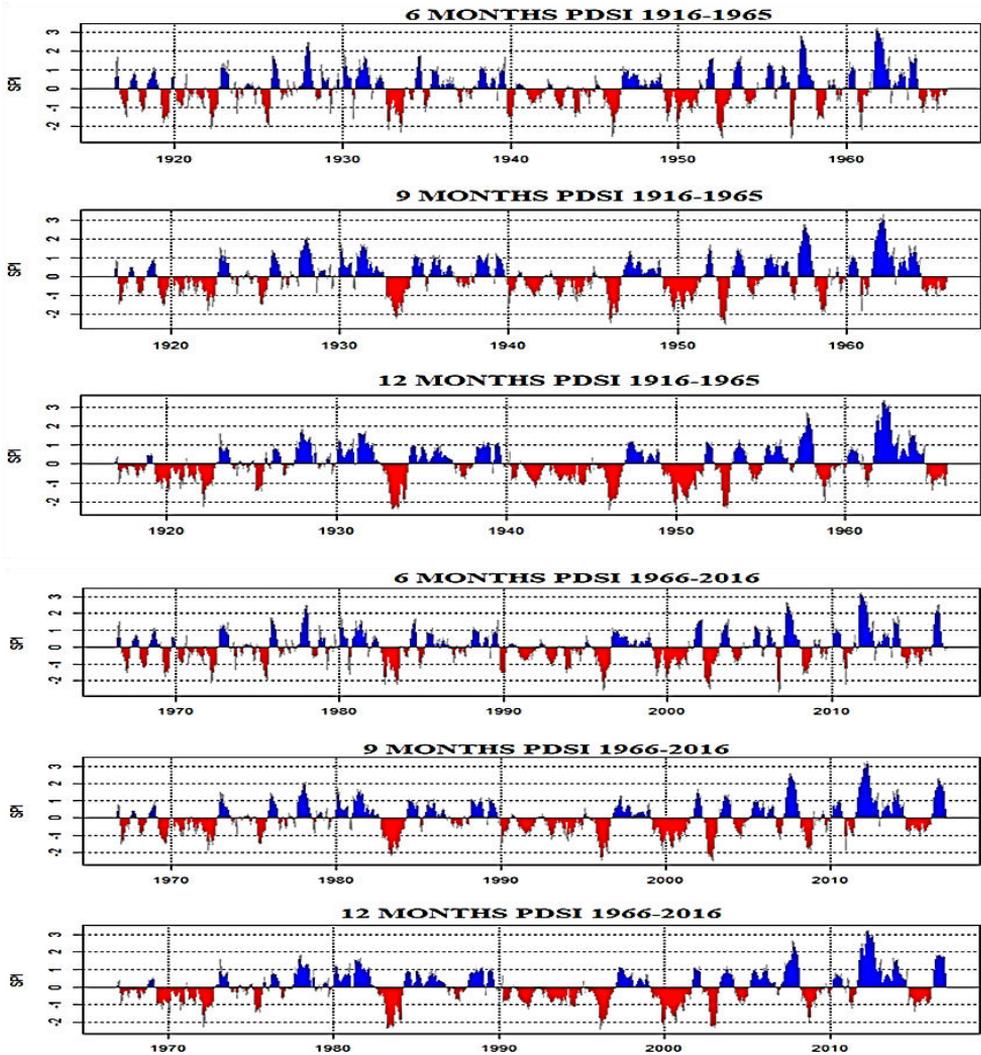


Figure 1: Standardized Precipitation Index (SPI) for the past 100years
N.B: Blue colour represent wetness; Red colour represent dryness

The hunger which was caused by droughts that struck the area frequently between 1946 and 1953, are collectively regarded as a historical markers. These drought events were also associated with maximum and minimum temperatures increase between 1940s and 1950s (Figure 3). The period was followed by a cooling phase (low temperature) especially in drier seasons, which reduced the subsistence food production as noted by one elderly man (aged 81 years).

"I remember in previous days when we were young, there was drought and severe food shortage in our village. The food shortage was associated with drought called "Kigubi". The food shortage was due to the lack of rain and

the crop plants failed to produce food as it was expected. I remember there was a day when I fell asleep while starved and our late mother cooked stones until we got asleep while waiting for food. For long periods we continued to experience the shortage of food, while previously we owned substantial foods and we enjoyed for eating and drinking without fear".

The above quotation exemplifies how the local community related the climate events to changes in their livelihood practices, especially cultivation. As a response to drought which led to declining of food production and subsequent food shortages, the local community that were adjacent to mangroves vegetation (such as NWZ communities) diversified their livelihood activities by cutting mangrove poles and bark for sell to the merchants. This was a market response to an increasing demand for mangrove trees in the United States, India and Arabian countries (Gilbert, 2004; Sheriff and Ferguson, 1991). Gilbert (2004) noted that by the middle decades of the 20th century, the mangrove wood had become the single most important product carried to Arabian countries by long distance traders. While in NEZ communities diversified their livelihood activities by increasing demands in fishing activities between 1928 and 1961 (Sheriff and Ferguson, 1991), the number of fishermen was double to 9,500 and fishing activities changed from subsistence to commercial (see Figure 1). Another livelihood activity that was commonly practiced in the NEZ was lime production. However, this activity faced competition from imported cement, which caused the price of lime to decline in the 1940s (Middleton, 1961).

Furthermore, the droughts during mid-1940s to 1950s were followed by a decline of clove prices in 1958 (which served as the monetary income that helped people to import rice from far east), and the change of policies and struggling for independent movements led to local communities finding it difficult to improve their farming practices. For instance, apart for climatic events, the policy during the colonial period led the subsistence food production to gradually decrease due to the local communities being forced out from fertile land to the coral rag land where land allows only shifting cultivation, but due to intensive cultivation followed by very short periods of recovery of land, made the crop yields to become gradually smaller which eventually led the food shortage to be greater during those periods (Sherriff and Ferguson, 1991).

Education and socio-economic development

Social development and the livelihood activities are associated with educational development (Ellis, 2000), where the human capital is widely considered as a key to successful livelihood by diversification and delivery of quality of

education and skills acquisitions. During the colonial era, the education system which was virtually confined by the state promoted education to the privilege groups only, which entrenched the status quo (Loimeier, 2009; Bhagat and Othman, Un). As such, by 1948 out of the 265,000 people in Zanzibar, 190,000 had had no access to schools. In the rural areas of Unguja only 7,900 out of 56,900 children under 15 years of age had attended or were attending school (Sherrif and Ferguson, 1991). This situation shows that most of the local communities have limited educational opportunities. This position changed a little in the period before independence where various strategies were put in place in order to achieve quality education (RGZ, 2016). However, educational level in the study sites is generally still low, and is among the factors that inhibit socio-economic development in the area.

Livelihood shifts/changes

Figure 3 presents the livelihoods change trends in the two communities over the last 100 years.

During the colonial era and the early years of independence era the export market constituted the export of fisheries products, cultivated products and dietary products (Gilbert, 2004). Domestic cooperatives such as fishing, copra, and milk processing industries were established during the colonial era and continued during the independence period to ensure that revenues remained within local communities and business men. However, the cooperatives did not provide appropriate incentives for local communities to become skilful for what they produced and, therefore, did not bring significant social development to many local coastal communities (Sheriff and Ferguson, 1991).

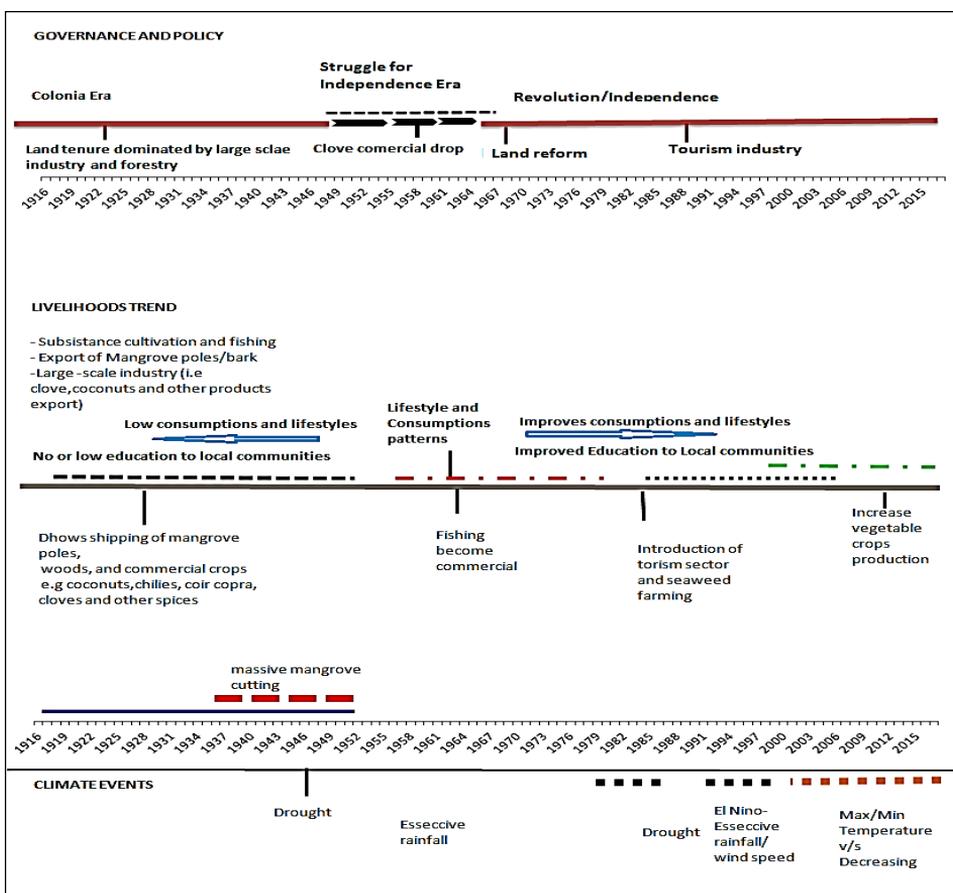


Figure 3: Timeline of livelihood patterns over the last 100 years in northern Unguja, Zanzibar Source: Field survey

The livelihood shift from large-scale cultivation of cloves and coconuts to commercial fishing and mangrove pole/bark cutting was considered to have contributed to exacerbation of poverty and ecological disturbance of many mangrove areas. As noted by Sharriff and Ferguson (1991), the development of capitals of production has cut the life strings of smallholder production in agriculture, destroy the peasants' self-sufficiency and impoverished him. The dismantling of the clove price control led to further poverty to local communities, who continued to practice subsistence cultivation on their land that did not constitute an important source of income. Instead, local communities increasingly relied on commercial mangroves poles/bark and small-scale fisheries (Gilbert, 2004; Sherrif and Ferguson, 1991).

For fisheries activities, the local production of fish declined as imported outboard motors and fishing gears, which many local fishermen could not afford

to buy, which led the larger merchants began to dominate the fishing business (Sherrif and Ferguson, 1991). The average catch and revenue per fisherman and per fishing boat decreased considerably, indicating the dwindling resources, which could be associated with over-fishing, resulting from increased fishermen population and/or unsustainable fishing practices (Kangalawe and Lyimo, 2010). Local respondents in the study currently being reported also frequently cited increasing population led to increasing numbers of fishers (from our communities and elsewhere) as a contributing factor to declining of fish catches. Sheriff and Ferguson, (1991) argued further that the shortage of rainfall also affected the clove harvest, which has led the local community to divert to frantic mangrove bark gathering for sale, which has ruined mangroves for generations.

In the beginning of the 1970s the economic situation in the study area was described as a hand-to-mouth existence (Gilbert, 2004). With the emergence of tourism industry and exportation of seaweed to Europe, Asia and North America in the mid-1980s, the local communities' livelihood activities began to experience some moderate incomes from tourism and living standards nearby coastal areas gradually started to change. The changes were due to economical development from tourism, seaweed farming, improvement of fishing industry and commercialisation of many farm products (Quinn and Philip, 2017; Sherriff and Ferguson, 1991). As the development based on natural resources, it fuelled coastal resources degradation that turned around to impoverish these same local communities.

Today most of the local communities combine multiple livelihood activities such as fishing, cultivating, small business and tourist activity for income generation (Figure 3) as adaptation strategies to climate change. However, climate change related challenges have led to decreasing capabilities of local communities to diversify their livelihood activities. For instance, the tourism sector is under stresses due to coastline erosion, temperature increase, environmental pollution and increase of strong winds during the monsoon periods. Invasive diseases to mariculture like seaweeds also reduce the economic development of the local communities.

Farming has involved a diverse set of crops (Figure 5). In the study sites, alternative livelihood projects intended to diversify local communities' incomes include small business, tour guiding, introducing of fruits and vegetable cultivation such as watermelon, okra, tomatoes, eggplants and cucumbers which seem as highly profitable compared cultivating traditional foods crops such as yams, sweet potatoes, cassava and rice. However, the diversification of crop

production is based to age group. Many younger communities prefer to grow water melon and vegetable crops rather than elderly people (Figure 4) because it can generate quick money, while middle and elderly people consider food security in their households.

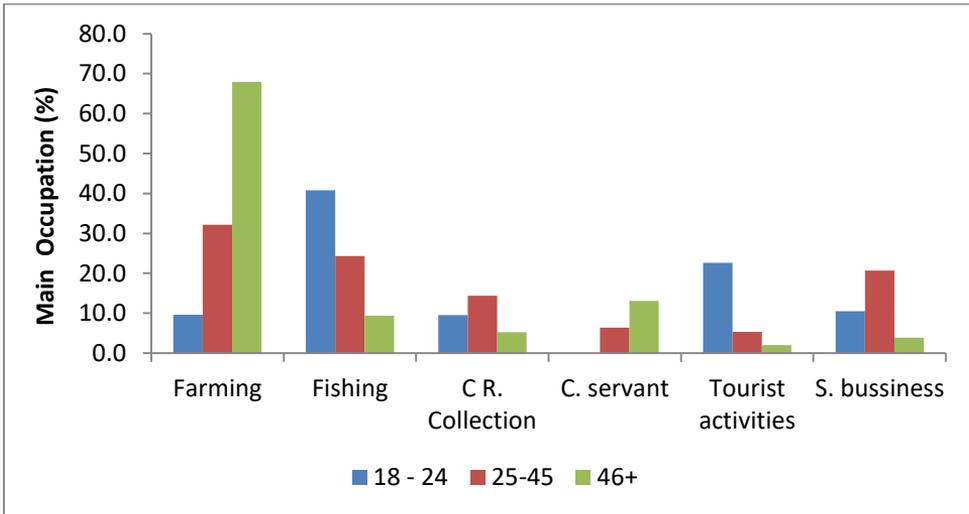


Figure 4: Combination of multiple livelihood activities as adaptation mechanism v/s age group

Since farming and fishing remain the main livelihood activities of local communities, challenges to subsistence cultivation and fisheries sector have direct impacts on the community livelihoods. Local farmers and fishers have experienced a decline in crop production and fish catch and many of the informants considered the future of the subsistence cultivation and fisheries industry as being not promising.

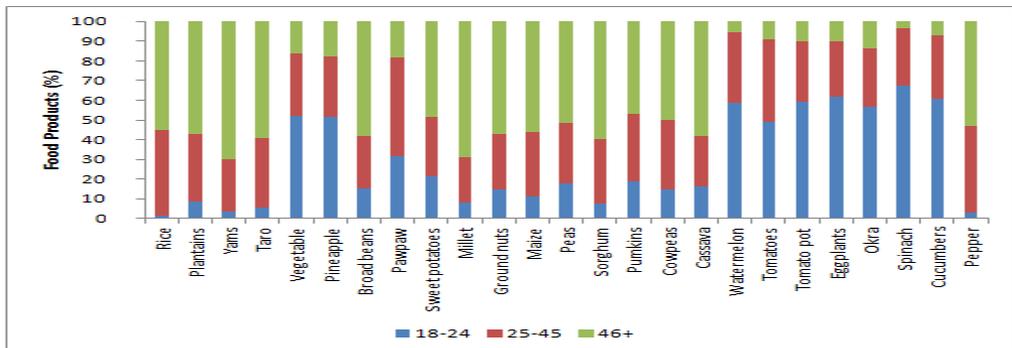


Figure 5: Crop diversification based to age group

Apart from articulated factors for fish catches and food production reduction, the prices for marine and subsistence crops are locally considered to be lower when compared to the amount of labour input during productions. Findings from this observation are similar to the study by Anderson and Juma (2011) who noted that the locals have inadequate capital from their cultivated products, which in turn has led to local communities to be not satisfied with what they earn from agriculture. Farmers commonly claimed to respond to decreasing market prices by diversifying their subsistence products and by engaging in the production of short term crops rather than long term crops.

Decline of coastal resources and its impacts on local livelihoods

Destruction of coral reefs due to human induced factors and coral bleaching due to climate impacts associated with increasing temperature are also considered to impact fisheries based livelihood. Fishers and coastal resources collectors are vulnerable to climatic events such as strong winds and temperature increase. This is mainly due to their dependency on fisheries based incomes. For instance, during strong winds fishers are forced to stay ashore and cannot earn any income. Adaptation strategies often entail fishing in different areas during periods of low productivity or adverse weather conditions. Furthermore, the coastal resources collectors reported to experience a decline in marine resources over time as a lady noted hereunder:

It is not many years ago we are collecting so many coastal resources such as oyster, mussels, conchs, prawns, squids, octopus and crabs adjacent of the coast, we just used few hours to fill up our baskets. Even the climate was harmonious to us even in "Kusi" and "Kaskazi" we found the "Bavua" days and collected so many coastal resources. But in recently years during the Kusi and Kaskazi there have been strong winds which have led us to cancel our plans for collection of the resources. Also, we have observed a tremendous decline of those resources; some days we come back home without anything and other days we come with little products which are too little for our own subsistence.

The above quote signify that the declining state of the coastal resources such as mangrove, coral reefs and increasing climatic events has led to negative impacts on the welfare of the local communities dependent on coastal natural resources for their livelihood. The observations above are similar to the findings by study by Quinn and Philip (2017) who noted that in Zanzibar there have been significant negative impacts as incomes of local people rely on coastal

resources. Diets are affected by a reduction in availability of food from marine and other coastal resources, and reduction in the tourism values.

Most of the young men commonly responded to decreasing fish stock by increasing their effort and complementing their fishing activity to other income generating activities such as sand extraction, gypsum extraction and sculpture of stone bricks (Figure 6 and 7). Diversification into sculpture of stone bricks was observed both at NWZ and NEZ, whereas the sand extraction was common in the NWZ whose physical landscape is formed of deep soil (Middleton, 1961). Gypsum extraction and sculpture of stone bricks are common in the NEZ because the landscape is mainly formed by coral rag. Figure 7 presents some houses under construction using the sculptured stone bricks.



Figure 6: Matemwe (NEZ) sculpture stone bricks area (left) and Dongemchangani sand extraction area (NWZ) (right).

Source: Field survey, 2016



Figure 7: Some new houses built of stone bricks in Matemwe village.

Source: Field survey, 2016

Sand extraction, gypsum extraction and sculptured stone bricks are sold both within the villages and outside the villages, and most of the young men commented that those activities provide quick incomes, as one young man claimed:

"...We sculpture the stone bricks and extract gypsum for income generation, because these products are very useful in our village as many people need them for building materials. the stone bricks are very strong and live long when you compare with cement bricks, ... as you may know our environment is harsh somehow especial during the hot season - it become very dry and very hot, so people choose to build their houses from these materials in order to reduce the heat within the houses, and the houses that are built from stone bricks are very strong and resistance to diverse conditions. For instance, you cannot see any house built of stone bricks being degraded or make faults due to temperature change, while the houses built with cement bricks do that".

Some young people have invested their efforts in gypsum extraction (Figure 8) as a diversifying activity, which is viewed to broaden their livelihood options similar to sand extraction and sculpture of stone bricks. Yet, this specialisation has rendered the village vulnerable to environmental degradation.



Figure 8: Gypsum extraction sites at Matemwe (top) and Kiwengwa (bottom)
Source: Field survey, 2016

Shifts of livelihood trends due to changing climate

Historically, the local communities in the study area rely much on food crop production, including rice, cassava, and bananas to mention some. These local communities have also diversified into short term vegetable crop production. Since 2010s the local communities have also been involved in the production of water melon and other vegetables to further complement their livelihoods.

Farmers claimed that as a result of climate variability and change they have also experienced changes in the types of crops produced (Figure 9). For instance, following the drought of 2009-2010 local communities have shifted to planting resistant crops such as sorghum, peas, bulrush millet and yams instead of rice and cassava. When the climate variability continued to persist in the following years, farmers diversified their crop cultivation by planting water melons and diverse vegetables. It was argued these fruits and vegetables are managed in small plots, which with irrigation they are highly productive. Eventually they get good profit because such products are readily marketable. This local community adaptation strategy shows that they have improved their awareness on their environment by working out more appropriate and are manageable livelihood options for them.

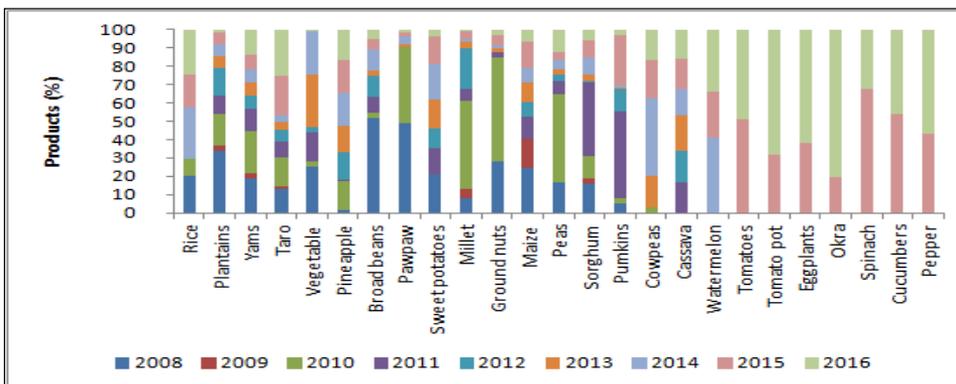


Figure 9: Variations in types of crops produced over time due to climate variability

The vegetable and fruit production provide considerable profit, and increasingly providing sustainable livelihood to farmers. This observation is also acknowledged by the RGZ (2008) who noted that fruits, vegetable and spices are increasingly being profitable and providing livelihood to several farmers. However, climate related events such as increased crop plant diseases, shortage of rainfall and droughts in some years has reduced the levels of production. This seems to challenge the Zanzibar Agriculture Transformation Initiative of the

2000s that was established with the aim to increase food production (RGZ, 2008).

Fishers have been responding to decreasing price by diversifying the sell market. For instance, instead of send their fish to Unguja seaport for sells, they send them Dar es Salaam.

Tourism sector is increasingly having a major impact on livelihoods of the local communities in northern Zanzibar due to increasing of demands on fruits, vegetables and fish in local and urban markets. For example, the production of water melon and vegetable is increasing due to their demand in hotels and in urban areas. Thus, the tourism industry has a positive impact in increasing profitability of farmers' and fishers' produce.

Changes in climate, access to natural resources and their implications

Changes in climate and access to natural resources over time and processes such as market price fluctuations emerged as important factors influencing livelihood adaptations in the study area. For instance, the drought episodes of 1919, 1933, 1941, 1946, 1983, 1987, 1996, 2001, 2003,2009, and 2012/2013 combined with excessive rainfall episodes such as in 1925, 1927,1938,, 1951, 1957, 1961, 1986, 1997/1998 and 2006/2007 (Figure 3), resulted in forced diversification of livelihood activities, which occurred through land use/cover changes in mangrove resources of the study sites. Over the 100 years time period studied, subsistence cultivation and fishing livelihoods have evidently been highly vulnerable to climate events, and it appears that their capacity to recover from episodic climatic events has been unmanageable as resources became more scarce.

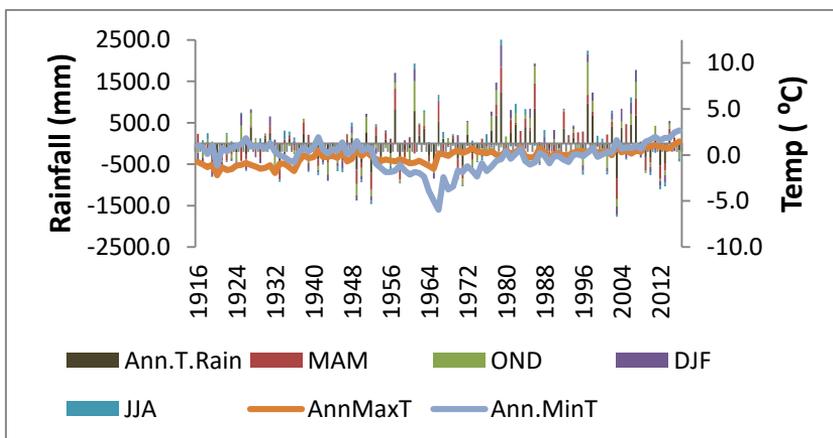


Figure 10: Maximum and minimum temperatures between 1940s and 1950s

Coral bleaching due to temperature increase and marine resources extractions are spatially increasing. However, as livelihood resources have a wider distribution, they are also subject to a larger range of climatic events. The cumulative impacts of threats to subsistence farming and marine resources, such as shoreline erosion, coastal developments for construction of hotels (Quinn and Philip, 2017), climate change and decreasing rainfall constrain current livelihoods, and are likely to compress future adaptation options. Among the contemporary major impacts of climate change in the study sites include salt water intrusion (Figure 10), shoreline erosion (Figure 11), unreliable rainfall and increasing temperature (Figure 3 above).



Figure 11: Salt water intrusion in farm land and near homestead ground in Mtowa Pwani

Source: Field Survey, 2016

The above mentioned climate related impacts have been significantly influencing adaptation and/or mitigation the northern parts of Unguja. The impacts have resulted in what Ellis (2000) referred to as enforced diversification of livelihood activities. The adaptation process also occurred through relocation of cultivation areas by moving more inward away from the ocean, and change location of seawalls that were built as a buffer for coastline erosion more inwards side (Figure 12).



Figure 12: shoreline erosion where new seawall is built inward compared to the former at Pwanimchangani (left) and cliffs fall due to wave erosion at Matemwe (right)

Source: Field Survey, 2016

Historically, during the colonial period, rural local communities' land was mainly dominated by clove and coconuts plantations, which clearly restrained the local adaptation options which somehow led to livelihoods insecurity (Sheriff and Ferguson, 1991). However, the availability of marine resources such as diversity of fish types may explain why local communities, could shift from subsistence to commercial fishing, which enable improved livelihood adaptations. Thus, local communities' socio-economic and development were closely linked to environmental and socio-cultural aspects that enabled accessibility of resources. These were coupled with development of the tourism sector (Lema, 2017). The tourism sector led to new dynamics for the local communities who sold their lands to foreign investors for building hotel apartments. On the other hand such developments have resulted in deterioration of the coastal environment and accelerated coastal erosion (Lange and Jiddawi, 2009).

Changes in life style and consumption pattern have also influenced livelihood adaptations. Local communities during the colonial era consumed less and merely sustained family food needs through farming, and simple clothes (just *Kaniki*), but, as noted earlier, they had low education (Girlibert, 2004; Sherrif and Ferguson, 1991). While the contemporary lifestyle and consumptions of the local communities mimic other parts of the world, which is imbedded with cultural globalisation. This has led to the endorsement of a more consummative lifestyle, which implies more desirable livelihood needs to enable these people

to acquire modern goods such as phones, motorcycles/motor vehicle, good houses, the need for modern clothing and even engaging in educational attainments (Sumich, 2002; Magigi and Ramadhani, 2013). Local consumption patterns demand continued dependence on natural resources base, which play an important role in the conservation of the resources.

Livelihood vulnerability as a dynamic process

The findings of this study underline that vulnerability is a highly dynamic process where livelihood adaptation also creates new sources of vulnerability. For example, during colonial and early independence eras commercial crop production varied based on the fluctuation of global markets, while subsistence food production declined, making the villagers susceptible to hikes in imported food dependence (Sheriff and Ferguson, 1991). Following the decline of food crops production, the local communities and government increased the importation of rice and other products from Asian countries. However, the prices of the imported foods were, in some years, very high. Importantly, the observed wide range of uncertain and unpredictable climatic, environmental and socio-economic factors affected the vulnerabilities in the study sites. These factors have frequently occurred as episodic events with considerable variations over time. Thus, constructing stable and appropriate livelihoods in order to cope with climatic and environmental changes emerges to be inconsistent with historical representation of change, where livelihoods instability is the normal condition which is not easy to alleviate over time.

Challenges to community adaptations to climate and environmental changes

Community members interviewed as part of this study considered that lack of environmental awareness, economic disturbance, and inadequate government support to be the factors that discouraged the success of livelihood options/projects. Subsistence cultivation was reported to be practiced by about 80% of the local community, but it constituted a minor livelihood activity that could not primarily meet local needs. The amounts produced do not meet local needs at times, thereby creating general scarcity of localised food security. Respondents in this study claimed that contemporary subsistence cultivation has been impacted by climate change. They argued that lower and/or excessive rainfall levels have been observed over the last 40 to 20 years, which are also associated with changes in the timing and strength of rain and temperature patterns.

Most of the local communities claimed to have failed to invest their capital derived from fishing and farming into the basic needs such as to education for their children; and they fail to broaden their livelihood options. These observations are similar to many low income developing countries (Dixon et al, 2001; Quinn and Philip, 2017). However, subsistence farming and fishing as the main livelihoods have rendered local communities vulnerable to climate and ecological changes as well as changes in market and policies. Regardless of challenges with subsistence farming and fishing activities, local people claimed that out of the options available to them, crop cultivation and fishing were still the most preferred and enjoyable activities due to the fact that they are familiar with those activities and can earn the little income without disturbance. They noted, however, that cutting wood in the forest or in the mangrove was more profitable but that activity was not a favourable adaptation option to due to government policies and regulations.

Subsistence cultivation was self-sufficient before the introduction of large-scale export products, where the land was more used for food crop production. Furthermore, the climatic conditions in the first half of 20th century was not harsh as compared with the climate events of the second half and beginning of the 21st century where rainfall has become more severe in frequencies and intensities. The changes in temperature have led to subsistence cultivation being insufficient for local livelihoods. This observations concur with other studies indicating that processes of change in subsistence cultivation need to consider the natural resources base, climate and population increase as factors in rural transitions (Dixon et al., 2001; Makame, 2013; Quinn and Philip, 2017).

Conclusion

Livelihood change/shift and/or continuity are associated with climate and environmental changes and resultant livelihoods adaptation options. Climate change impacts uncertainty such as coastal erosion, sea level rise, temperature increases and unreliable rainfall have the potential to physically and economically alter coastal communities. Therefore, adaptation options should consider climate and environmental changes, which are more contingent on how well local communities are able to respond to changes that they faces in their life.

Therefore, the history of society, environment and livelihoods are an important vantage point towards understanding contemporary interactions between climate, people, environment and political economic of the particular studied communities. The historical analysis of livelihood change/shift and/or

continuity contributes to current adaptation debates by underlining the dynamic characteristics of livelihoods, which influence the understanding of adaptation options.

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The Impact of Population Growth on Managing Forest Resources in West Usamabara, Tanzania

Simon Charles Lugazo²² and Reguli B. Mushy²³

Abstract

This paper assessed the impact of rapid population growth on forest resource management in West Usamabara, Tanzania. It determined the trend of population growth in Tanzania over the past thirty years, socio-economic factors affecting forest resource uses and evaluated intervention measures on forest resources management. Surveys were conducted in four wards Mayo, Baga, Mgwashi and Bumbuli and assessed the impact of rapid growth of population on forest resource management. The study revealed that the population of the study area has almost doubled from 246,049 in 1978 to 492,441 in 2012 with population density of 120.4 persons per square Kilometer which is above the national population density of 51 persons per square Kilometer. Furthermore, 84% of the respondents collected fire wood from the forest while 96% revealed to depend in forest for different forest products like fire wood, vegetables, fruits and medicine. About 96% revealed to practice PFM which is underperformed due to different challenges mentioned. The study concluded that population growth contributed highly to the forest destruction. Finally, it is recommended that awareness rising on family planning should be promoted, land use plan developed and Participatory Forest Management actively established with equal benefit sharing among the actors. Likewise, the policy and regulations should be reviewed to favour forest adjacent *community's needs*.

Key words: Population growth, Forest management, forest resources.

Introduction

Population increase has resulted to high pressure on natural resource in Tanzania. In many areas, there is an increase in local pressure to extend agricultural activities at the expense of forests and wildlife resources (Madulu, 2001). About 38 percent of Tanzania's total land area is covered by forests and

²² Postgraduate Student Open university of Tanzania

²³ Lecturer, Geography Department, The Open University of Tanzania

woodlands that provide wildlife habitat, unique natural ecosystems and biological diversity, and water catchments (World Bank, 2001). However, the existence of these natural resources is threatened by human disturbances of the ecosystem. Experiences from Forest Reserves in Tabora Region (Shishira and Yanda, 1998), Coast Region (Shishira *et al*, 1998) and Dodoma Region (Madulu, 2001) demonstrate clearly the dwindling biodiversity in most protected areas due to human interference in the ecosystems. Moreover, Estimates of forest losses in Africa (FORMECU, 1999) were observed to be higher in the past two decades. For instance, between 1990 and 2000, the continent lost about 52 million hectares of the forest, accounting for about 56 percent of the global reduction of forest cover (Nwoboshi, 1987).

Rapid population growth has been associated with various aspects of resource degradation, including deforestation, overgrazing, soil erosion, soil nutrient depletion, and other problems (Scherr and Hazell, 1994; Kates and Haarmann, 1992). As population density increases, the supply of people who clear trees increases (Kang and Wilson, 1987; Southgate, 1988; World Bank, 1992) and the demand for products from forest grows too. As a result of it, a larger forest area become deforested and leads to biodiversity loss. In addition to these forest changes, both the number of producers who use degrading agricultural or grazing practices increased (Repetto, 1986). Likewise, the demand for crops and livestock produced with degrading practices increase (Brown and Wolf, 1984).

Overpopulation is the major problem influencing sustainable natural resource management in the West Usambara Mountains. High growth rates now estimated at 2.2 % (Lushoto District, 2010) have led to populations being higher than the carrying capacity of the district. Coupled with this is the inheritance system and ownership of parcels of land in different catchments. The impact of this is seen in increasing land scarcity, fragmentation of lands into small uneconomical plots, limited attention of parcel of lands located away from the households, wide spread cultivation on marginal lands and encroaching into forest lands (84 % of the original forest has been cleared). Based on species-area relationships such loss of original forests suggests that approximately 34 % of the species in the West Usambara have become extinct or are in a danger of extinction (Newmark, 2000).

Agricultural expansion is probably the most important human activity that causes deforestation. Between 300,000 and 400,000 hectares of forest and bush land are estimated to be cleared annually for agricultural expansion (UN, 1993). An elaborate example of the Usambara Mountains suggests that almost 70

percent of the rain forests have been destroyed since 1954. While in areas like Tabora and Songea, tree felling for tobacco cultivation and curing is rampant (Shishira and Yanda, 1998), agricultural expansion in forested areas is very common in Kondoa, Iringa, and Mufindi Districts (Madulu, 1998a, 1998b). Slash-and-burn cultivators set in motion a series of events of fires leading to the destruction of forests. These trends have several adverse consequences that include accelerated soil erosion, fuel wood scarcity, high rates of evaporation, and climatic change.

Despite the efforts made by Tanzania government for introducing various methods of family planning to control population growth and Participatory Forest Management methods to manage the forest resources. Large influx of population growth has becoming the big challenge on managing the protected forest found in West Usambara. Therefore, the study was conducted to analyse much on the scenario of population growth on forest resources management systems to fill the information gap of proper forest management system in Tanzania.

Research Methodology

The Study Area

The study was carried out in Lushoto district found in West Usambara Mountain in 10 villages surrounding Baga catchment forest reserve. Lushoto District located in the Northern part of Tanga region between latitude 4° 25' and 4° 55' south of the Equator and longitude 30°10' and 38°35' East Greenwich. According to 2012 population census, the District had a population of 492,441 People, of which 230,236 were males and 262,205 were females. The district has an overall sex ratio of 88 males for every 100 females with the average household size of 4.7 (URT, 2012). It has the population density of 120.4 persons per square Kilometer (Lushoto District Council, 2013).

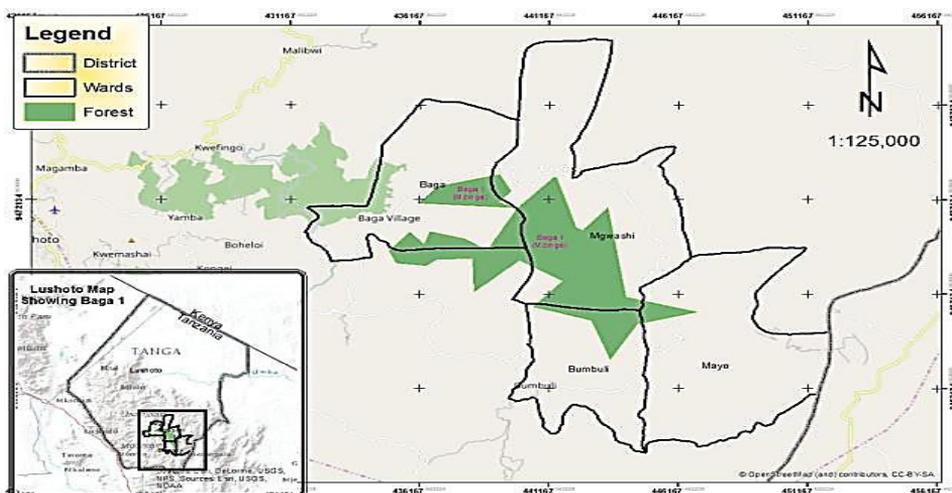


Figure 1: Baga Forest Reserve and the Ward Surrounding the Forest

Source: Field Survey 2016

Data collection and processing

The sampling units for this study were heads of households in the 10 selected villages selected. Since the average households' size varies in ten villages, computation to obtain the total number of households and the sample size needed to be representative of the given population was made. Simple random sampling was deployed to pick household to match the number of households selected for the administering questionnaire. Also, with the help of village leaders, ten informants' respondents from each village were purposely selected for FGD and key informant interviews, respectively.

Findings and discussion

Household Size of the Study Area

The study revealed that the mean households' sizes were 7 people per household and the highest household size was found within a range of 5 -9 people (73%) (Table 1). According to National Population and Housing census of 2012 (URT, 2012), the mean household size in Lushoto District was 5 people. Hence this means that there is a high number of people per household which increases the demand for forest products.

Table 1. Household Size of the Study Area

Household Size	Respondents	Percent
2-5	19	19
5-9	73	73
10+	8	8
Total		100

Source: Field Survey Data (2016).

Economic Activities

The study revealed that respondents in the study area were engaged in different economic activities such as crop production, wage employment casual labour and petty business. Data on occupational activities showed that 94% of the respondents were engaged in crop production as their first main economic activity (Figure 2). This implies that the majority of the households depended on farming as their main economic activity. Due to the presence of high numbers of farmers in the study area this can lead them to cultivation fragile soils such as wetland, highlands, and forests. When farmland expands toward fragile lands in order to keep pace with the needs of a growing population, it leads to deforestation, erosion, and desertification. Agriculture remains the main economic activity in West Usambara (Nambiza and Lyatura, 2013). Furthermore, casual labour, wage employment and petty business constituting of 3%, 1% and 2% respectively (Figure 2). This implies that very few people are employed in the study area or engaged on business this had significant effect on forest management as many people depended on forest due to lack of alternative employment. The similar study has been conducted in West Usambara whereby it was revealed that 11% owned kiosks, 2% masonry, 2% food vending business, 2% were selling alcohol (Nambiza and Lyatura, 2013).

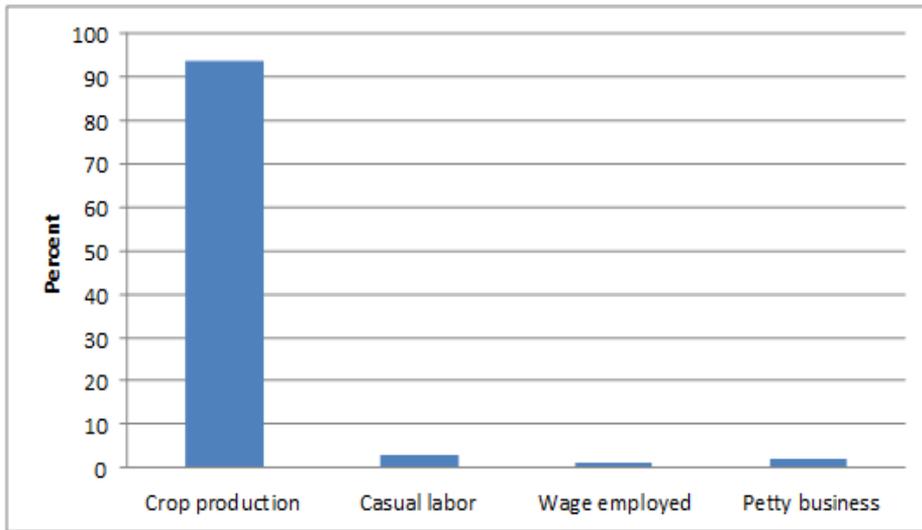


Figure 2: Major Economic Activities of the Respondents

Source: Field Survey Data 2016

Trends of Population Growth in the Study Area

Tanga region as revealed by the 1988 Population and Housing Census was one of the regions with the highest population growth in the country and Lushoto district with land area of 3,500 Sq. Kms is the second highly populated district in Tanga Region with population density of 120.4 persons per sq km. Furthermore, Maro (1983) observed more marked variations at district and ward levels with a higher concentration of people in some regional, districts and wards than others. Figure 3 revealed that the population of Lushoto District had increased from 246,049 in 1978 to 492,441 in 2012 almost doubling the number people in twenty years. The district has high population density of 120.4 persons per square Kilometer which is higher than the national population density of 51 people per Square Kilometer (Lushoto District, 2013).

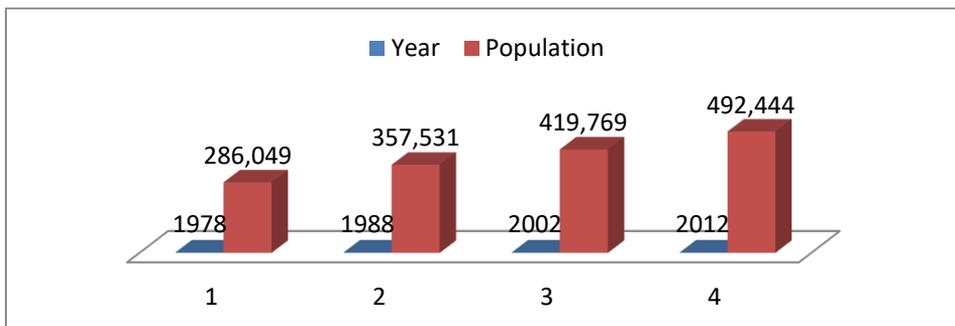


Figure 3: Population trend in Lushoto District from 1978 to 2012

Source: Census, (1978, 1988, 2002, 2012)

Population density in the West Usambara is high at 120.4 persons per square Kilometer (URT, 2012). This high population growth has led to the increase in demand for agriculture production and settlement hence leading to unsustainable management of the forest. The study is similar to Soini, (2002a) who revealed that densely populated areas had led to disappearance of ecological systems. This is also observed in the southern slopes of Mountain Kilimanjaro. A more recent study in Kilimanjaro indicated that land use change centered on vast expansion of agricultural production over marginal land downward the slopes, extending further into the uncultivated land leading to the disappearance of vegetation cover coupled with ecological disappearance of forests and land degradation. As a whole due to high population growth rate in Tanzania has led to a significant environmental implications in many areas, the environment has been degraded to the extent that it can no longer support ecological balance and the provision of necessary resources to the present and future Population (UNFPA 1991; Green, 1992).

Impact of Population Growth on Forest Resources

The study revealed that the impacts of population growth has resulted to several forest management challenges whereby the respondents (54%) mentioned that it resulted to illegal forest tree cutting in the study area (Figure 4). The study is supported by Zahabu and Malimbwi, (1997) who reported that the most common human activities triggering degradation in Mountane forests included clearing for new farm land, pit sowing, illegal timber harvesting, collection of building poles, cutting trees for medicine, collecting fuel wood, and mining activities. Likewise, Ndagalasi et al. (2007) conducted a study at Magamba Nature Reserve and found that forest degradation of tree species including *Ocotea usambaransis* and *Podocarpus usambaransis* was rampant due to illegal selective commercial logging, subsistence harvesting of tree for building poles and fuel wood collection.

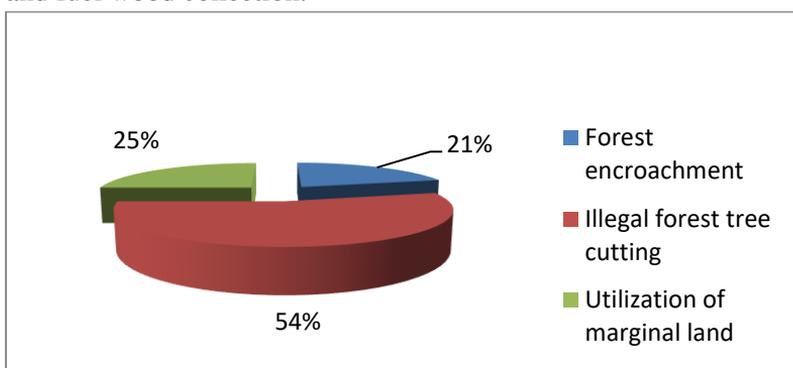


Figure 4: Impact of Population Growth on Forest Management

Source: Field Survey Data (2016)

Moreover, the study revealed that 25% of the respondents utilized marginal land for agriculture and grazing livestock due high population growth (Figure 4). The study is similar to that conducted by Shishira and Yanda (1998) and Madulu (2001) which reported that high population growth had resulted in increasing settlements of farmers in marginal areas and even in the protected area in an effort to earn a living. Furthermore, Saunders et al. (1991) reported that degradation of forest edges arising from small-scale agriculture inevitably leads to fragmentation and eventually deforestation. This deforestation results in isolation of forest patches causing a transformation of microclimate regimes.

Furthermore, the study revealed that the increase in population had led to forest encroachment by 21%. The study is supported by Shishira et al., (1998), who reported that the increasing population pressure around the forest reserve was likely to lead to encroachment into the forest reserve, hence threatening its sustainability. Likewise, Madulu, (2001) reported that forest clearing for agriculture expansion has been rampant around the Swagaswaga Game Reserve in Kondo District. Moreover, Kaale (1984) reported that in 1980, about 200hectares of Kilimanjaro forest reserve which is an important water catchment forest was encroached by farmers.

Measures Taken to Control the Impact of Population Growth on Natural Resources

Due to the increase in population and its effect in natural resource several measures had been taken to rescue the situation. The results revealed that 39% practiced improved agriculture and conservation techniques as the way of maximize crop production in small areas and reduced pressure to forest (Table 2). The result from end-line survey conducted by TFCG revealed that 42% of famers in West Usambara were applying conservation agriculture methods. The focus of conservation agriculture is on soil moisture management, crop rotation, permanent cover crops which apparently contributed to increased crop production (Nambiza and Lyatora, 2013). Moreover, about 32% mentioned that some of the villagers have been shifted to other Districts like Handeni where they can have enough land for cultivation (Table 2). Likewise, many people especially youth, from Lushoto district are migrtng to big cities like Dar-es-salaam and Arusha because they are landless due to overpopulation (Lushoto District, 2010). This is similar to Kilimanjaro whereby the region has high population density that increases pressure on land resources. Recently one of the study commented that 70% of the household in Kilimanjaro had insufficient quantities of land resources to sustain their livelihoods for agricultural activities and settlement expansion (Soini, 2002a). These forced the people of

Kilimanjaro to move to other areas looking for settlement and farm fields. Likewise, landlessness was also reported by Mwihomeke (2001) that it led to some people migrating to the lowlands (Johansson, 2001) and urban centres due to increased population. Moreover 27% revealed that they were using family planning methods to ensure the number of children matches with the available resources and 2% mentioned that there were no measures taken.

Table 2: Measure to Control the Impact of Population Growth on Natural Resources

Characteristics	Percent
Family planning	27
Shifting to other area	32
Improve agriculture and soil conservation techniques	39
No measure taken	2
Total	100

Access to Forest Products

The study revealed that 84% of the respondents collect firewood from the forest (Figure 5). This implies that firewood is the major source of cooking fuel in the study area. Firewood is the cheapest source of energy in Tanzania for approximately 90% of the population use firewood and charcoal for their cooking and heating needs (Monela, 1999). Even more so in the West Usambara where approximately 99% of the households use firewood for cooking and heating in their households (Kaale, 1993). Lusambo (2009) reported that Tanzania energy balance was dominated by biomass-based fuels, particularly wood fuel (firewood and charcoal) which account for more than 90% of primary energy supply. The findings is similar to Giliba *et al.*, (2010) who reported that 92% of NTFPs collected from the forest were firewood in Mbulu and Babati districts. Also the findings are similar to Msaliwa (2013) who reported that 98% of people in Kilolo district used firewood as the main source of energy. Furthermore, the findings are similar to Mainski (2008) who reported that in Malawi 97.0% of the rural houses uses firewood as the major source of cooking fuel.

Likewise, the study revealed that 9% of the respondents depend on forest for medicine (Figure 5). This implies that very few households depend on forest for medicine probably this is because of the availability of dispensaries and Bumbuli Hospital which are found nearby the villages or the medicine inside the forest have been finished due to over utilization. The findings are similar to observation done by Mogaka (1992) who reported that plants from forests have

significant proportion of medicine value that can be useful to surrounding population. This could probably be due to the reasons that firewood is the only cheaper, available and affordable primary source of energy in the study area.

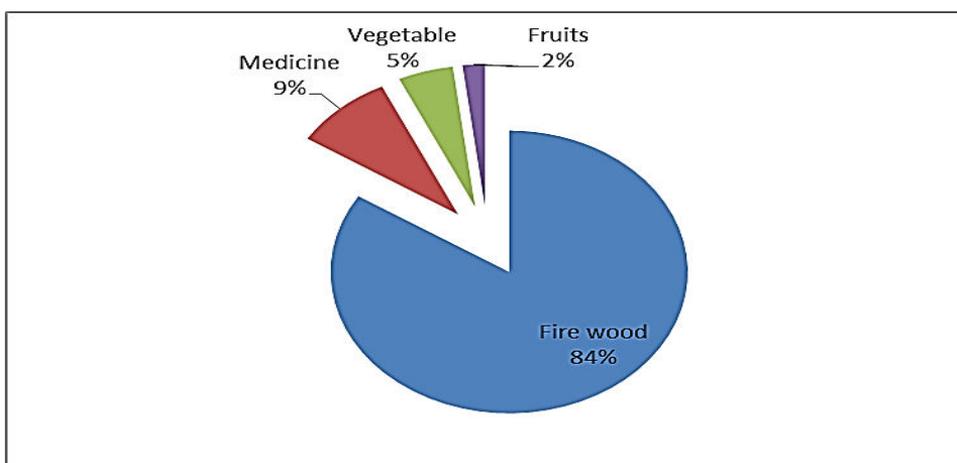


Figure 5: Access to Forest Products

Source: Field Survey Data (2016)

Furthermore, the study shows that 5% of the respondents depend on forest for vegetables. This implies that very few households depend on forest for vegetable probably because the majority of the villagers are practicing vegetable farming which have observed on the side of the river line. This study is similar to Katriina (2000), who reported that the most vegetables are collected and used in four days a week on average. 2% revealed that they collect fruits from the forest.

Demand for Forest Products

During the study, 93% of the sampled households reported that there is a high demand for forest products when they were comparing with 10 years back (Figure 6). The study further reviewed the reasons for high demand as the increase in population and illegal harvesting inside the forest reserve. The study is similar to NAFORMA (2015) who reported that forest areas in Tanzania have decreased from 3ha/capital in the early 1980s to 1.1 ha/capital in 2012 due to the increase in population. That means there is 1 m³ of woodland per person per year available from legal accessible sources in Tanzania. In additional more forest are degraded than were in the early 1980s. This implies that there will be more demand of forest products due the increased degrading of the forest.

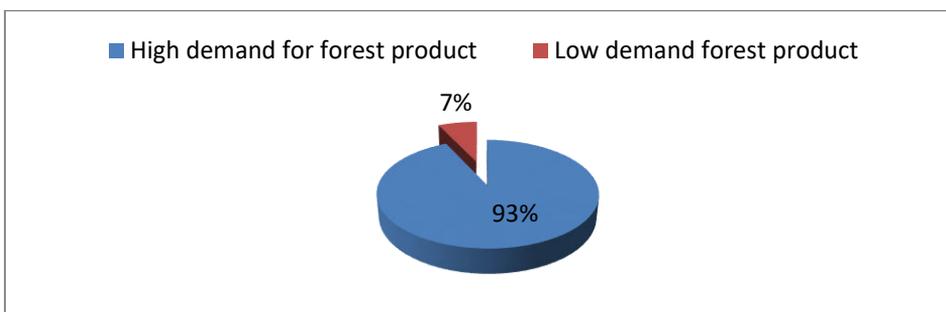


Figure 6: Community Forest Demand

Source: Field Survey Data (2016).

Alternative Sources of Forest Products

Apart from the forest other areas where they can get forest products were from own wood lots, small patches around their farm field and general land. The sample of respondents revealed that 72% owned small wood lots in an area of 0.5 to 3 acres while 28% of the respondents did not own any wood lots (Figure 7). The study shows that many households have woodlots in the study area. This is because the demand for forest products is very high in the area and a lot of awareness concern tree planting has been done in the study area. Most of the planted trees in woodlots technology were exotic species like *Gravillea robusta*, *Eucalyptus* and *Acrocarpus* species. Basically, these species were introduced in order to meet critical fuel wood demands for domestic uses and maintenance of conditions allowing for sustained agriculture and livestock production (Mnzava, 1980; Kaale, 1984). The study is similar to that of Indufo (2011) who estimated that there were about 80,000 to 140,000ha in total of village woodlots and farm plantations in Tanzania. Furthermore, FBD (2005) reported the similar study that tree planting became an entrenched practice by people and when seedlings were not available from local authorities' nurseries, residents used seedlings self-germinating under existing trees. A few individuals also established small nurseries to produce seedling for their own requirements and also for sale to other farmers. This implies the households in the study area highly motivated in tree planting to offset the challenges of forest products demand.

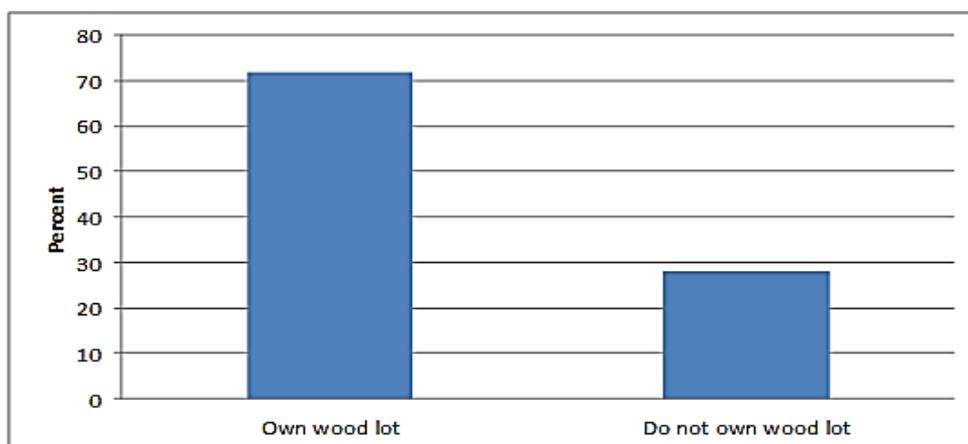


Figure 7: Alternative Sources of Forest Products

Source: Field Survey Data (2016)



Plate 1: Agroforestry Farm Field as Observed at Sagara village, West Usambara

Conservation Challenges Facing the Reserved Forest

The study area experienced conservation challenges on the reserved areas whereby 48% of the household respondent revealed that illegal tree cutting is the main conservation challenges (Figure 8). This implies that illegal tree cutting has greatly influenced the natural resource management in West Usambara. Apart from increased demand for agriculture practiced due to increase in population, shifting agriculture in the past and lack of traditional among the local people for protecting the trees are principle causes of illegal

tree cutting (Huwe, 1988). It also shows that the continuous illegal tree cutting in West Usambara has led to land degradation. This attributed to poor land husbandry, increase erosion and decline of soil fertility and no limited use of fertilizer. The impact of this is declining of crops yields, increased food insecurity and reliance of food aid, poor nutrition and increased dependence on forest for livelihoods (Mwihomeke, 2002).

Rapid deforestation in West Usambara has been driven by industrial logging, small scale logging, fire wood collection, subsistence agriculture, large scale agriculture such as tea plantations as well as monocultures of exotic Eucalyptus, pines or cypress; mining and other uses (Hall *et al.* 2009). With the estimated 57% deforestation in the East Usambara mountain and 73% deforestation in the nearby West Usambara mountains over the last 150 years (Newmark, 2002). This implies that the area experience high rate of deforestation due to high demand of forest for different uses.

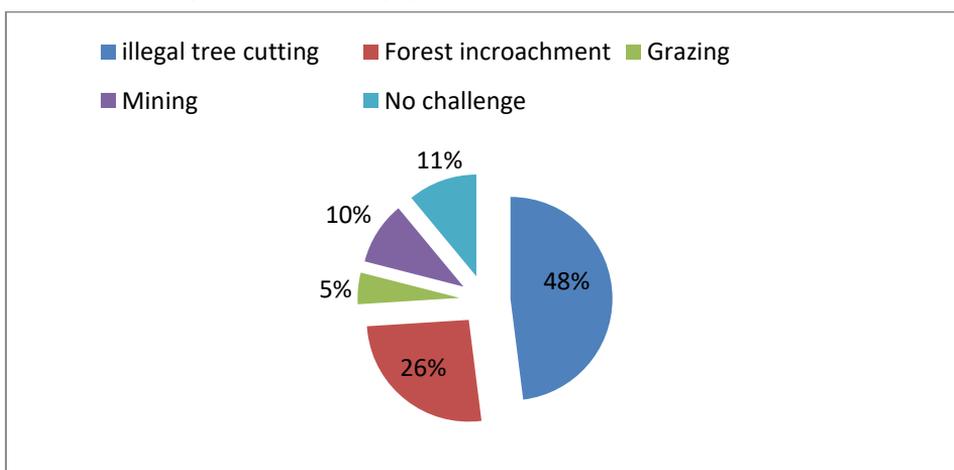


Figure 8: Conservation Challenges Experienced in The Study Area

Source: Field Survey Data (2016)

Likewise, the study revealed that 26% forest encroachment as one of the the management challenges which affect the forest reserve areas (Figure 9). This occurs probably due to high population growth and shortage of cultivation land. According to MNRT report the encroachment and over-utilization has been taking place in the forest reserves which are under jurisdiction of the central and local governments (URT, 1997). Moreover, local people considered protected or reserved areas as constraints to their livelihoods. Since it was not possible to create a rigid separation between land used by local people to obtain natural resource products and those designated by the governments as protected areas, encroachment, poaching, and degradation were inevitable (Primack, 2002).

This is also supported by Hoffmann (2002) who explained that agricultural expansion and consequent land degradation processes; that is, overgrazing and deforestation as experienced in the Southern Slope of Mount Kilimanjaro and West Usambara in Lushoto District explain why land degradation occurs in relation to population density.

The study also revealed that mining contributes to 10% of forest destruction in the study area (Plate 2). Small-scale artisanal miners have invaded the forests, causing severe environmental destruction by felling valuable old indigenous trees digging up for gold. Also it destroys water sources and wetlands. This is supported by Mafupa (2006) who reported that in Eastern Africa severe encroachment and exploitation of mining activities destroying the forest that occurs in fragmented patches.



Plate 2: Illegal Miners atTewe Village in West Usambara

Data from the Landsat image taken between 2002 and 2012 showed a vegetation cover change caused by deforestation by 0.87%, grassland change by 4.4% and Montane and Lowland forest by 94.73% (Table 3). From the analysis satellite data, deforestation rate is minimum in the study area as it is shown in the Figure 9. The data obtained from satellite image differ from the obtained surveyed data which show high deforestation rate in the study area.

Table 3: Forest Cover Change Baga Forest Reserve 2002-2012

Land cover name	Area (Ha)	% of the total area
Montane and Lowland forest	3409.29	94.7
Deforestation	31.41	0.9
Grassland	158.22	4.4
Total	3,598.92	100

This variation is due to the fact that satellite image shows only the above tree canopy cover. Likewise, field observation and discussion with the key informant revealed that that illegal harvesting are done by selective tree cutting whereby different tree species are selected according to the uses example timber, fire wood and poles which make difficult for satellite image to observe the effect under the tree canopy. This is similar to findings conducted in Eastern Arc explain eight of the top eleven most commonly cut species are known to be good sources of timber and fuel wood (Shulman et al 1998, Mbuya et al 1994).

Furthermore, according to Bumbuli Forest Officer about 20 illegal tree cutting has been reported from Baga forest and 1200cm³ of timber has been confiscated between 2015 and 2016. Likewise, Halter (2016) observed the stem cut density of 180 stems/ha (>20cm diameter) in Baga II forest reserve which also supported by (Schulman *et al.* 1998) who found that the stem cut density in montane forests to be 200-300 stems/ha. A study conducted by Newmark (1998) revealed that over 2000 year ago the forest cover for Eastern Arc Mountain has changed from 23,000 km² to 15,000km² by mid 1900s. Losses were greatest, relative to original cover in Taita Hills (98%), Ukaguru (90%), Mahenge (89%) and West Usambara (84%). Furthermore, based on Tabor *et al* (2010) the finding deforestation rate for Tanzania protected area are -0.05% per year whereas rate of outside the protected areas are -0.26% per year.12% of deforestation occurred inside the protected area.

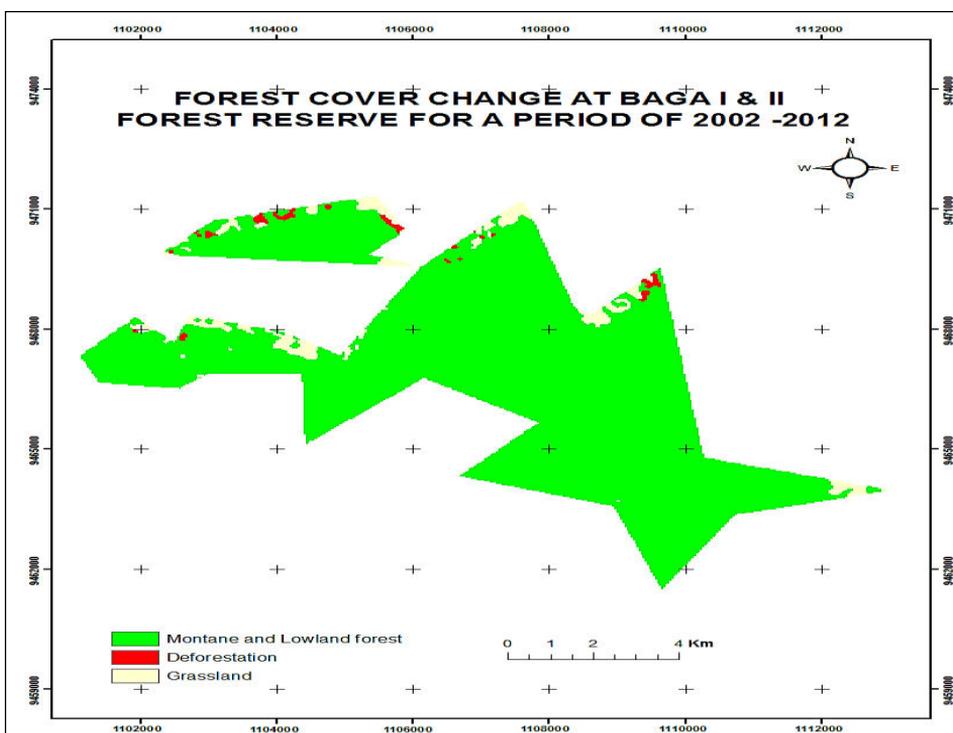


Figure 9: Forest Cover Change Baga Forest Reserve between 2002 and 2012

From the satellite image (Table 3 and Figure 9), it was shown that 31.41 hectare of forest has been degraded in Baga Forest Reserve between 2002 and 2012. This is similar to the study conducted by Temu and Mbwana (1984) who reported that in East Usambara for example, the Amani Forest has been reduced by about 50% while in the Western Usambara, an estimated average of about 7,000ha of forest has been cleared annually between 1960 and 1980. Likewise, NEMC, (1995) estimated that over 70% of the Usambara forests have been cleared since 1905. Finding by Kashaigilia *et al* (2013) in Tanzania revealed that during the period 1980-1995 and 1995-2010, closed forest decreased by 635.5ha (-11.9%) and 1674.9 ha (31.3%), respectively. Hansen et al (2004) observed that the tree cover of the world had decreased between 1984 and 1997 and the annual deforestation rate in tropical Africa was about 0.09%. In his study to identify and map deforestation using Landsat images and Global Inventory Modelling and Mapping Studies (GIMMS) data from 1980s to 2000s Wu (2011) found that Kenya still remained at the deforestation rate of about 0.3% per year. Large loss of forest area was indicated for Tanzania and Uganda, about 1.2% and 2.7% per year, respectively.

Forest Management System Practice

The survey revealed two types of management systems which are Joint Forest Management System and Community Based Forest Management System, Figure 10 shows that 71% of respondents practiced joint forest management system, 25% both community and joint forest management systems, 4% Managed by Government.

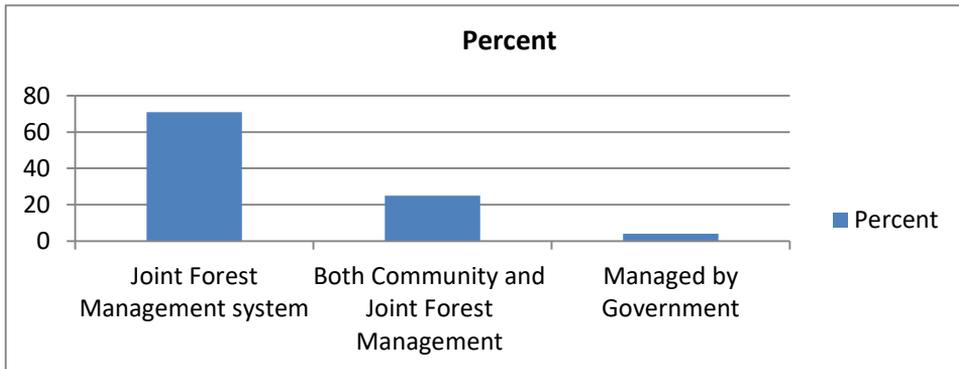


Figure 10: Forest Management System Practice

Source: Field Survey Data (2016).

In 1998, Tanzania approved a National Forestry Policy, the first new forest policy since 1963 which promoted substantial change in the way forests are managed (MNRT, 1998a). The policy aims to promote participation in forest management through the establishment of VLFRs, where communities are both managers and owners of forests, as well as through JFM, where local communities co-manage NFRs or LAFRs with central and local government authorities. As it was revealed the study area practiced both Joint forest management and community forest management as it was stipulated in the Forest Policy. Participatory forest management system involves a high degree of participation of villagers in all stages of forest management planning, implementation, monitoring and evaluation and also sharing of benefit (Bromley and Ramadhani, 2006). Participation of communities to forest management enables sustainable flow of forest products which improves the livelihoods of communities surrounding the forest through creating awareness to them (Iddi, 2002). According to Kessy (1998), recommended approaches in participatory forest management vary from one locality to another depending on group interests. Also it argued that local community interest in participatory management of forest is influenced by the need for forest product, by cultural factors and in the option of using forests as source of household food and income or employment (Kessy, 1998).

Forest Management Challenges

The study area experienced several challenges regarding forest management for about 36% of the respondents mentioned the management plan, Joint agreement and bylaws developed were not being approved by the government (Figure 11). The implementation of Joint Forest Management, legalized through the signing of Joint Management Agreements, management plan and bylaws which has been more uncertain to the study area. Only the management plan and bylaws for community and village forest reserve have been signed but none of the Joint agreement, management plan and bylaws in the forest reserve have been signed which cause problem on the implementation and management of the forest.

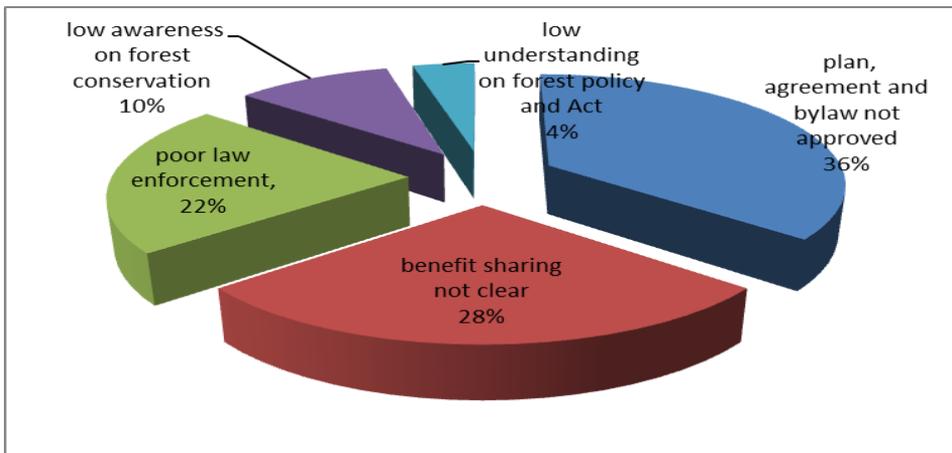


Figure 11: Forest Management Challenges

Source: Field Survey Data (2016).

Likewise, 28% of the respondents mentioned benefit sharing between Government and community not clear. The issue of benefit sharing is not clear on the joint management agreement this is largely because of the fact that the law remains silent on how the benefits of forest management can be equitably shared with participating communities. In many cases, benefit-sharing arrangements remain in a legal limbo – with *de facto* management at the local level taking place, in return for vague promises about benefits at a later date. Clearly, this is a situation that cannot be sustained indefinitely. Without benefits reaching a level that equal or exceed the costs being borne, in terms of local forest management, the long term future of Joint Forest Management remains uncertain (Blomley and Iddi, 2009).

Furthermore, 22% mentioned poor law enforcement (figure 11). The study also observed the existence of weak forest management systems (in particular the

lack of effective implementation of forest management laws), and the lack of a formal mandate to control the use of forest products within the village were reported to constrain the management of forest resources. For instance, it was reported by key informants (members of the VNRC) that district natural resource officers were unwilling to give them a formal mandate to enforce laws and control the use of forest products. Thus, this constrains efforts geared at the sustainable management of forest resources, in particular by controlling deforestation caused by cutting trees for building materials and timber. This concern is also reported by Blomley and Ramadhani (2006), who asserted that those responsible for disseminating and implementing laws, such as district technical staff, may be unwilling to divest themselves of power and give it to villagers. Also Shemdoe, (2003) reported the existence of governance structures with cultural background (Informal local governance structures) and those with political background (formal local governance structures) in his study villages around Lake Manyara National Park Tanzania. Therefore, good governance is needed in order to enable community to manage forest in sustainable way.

Moreover, 10% of the respondent mentioned low awareness about forest conservation practices. Community involvement in forest management need be enhanced through increasing awareness, education and empowerment (Paulo *et al.* 2007). Similarly, Anim (1999) reported that awareness on land degradation and perception of the benefits to accrue out of the forest management practices are crucial factors for investment and adoption of conservation measures. Kajembe *et al.* (2004) emphasized that to ensure full participation in PFM programmes, stakeholder at community level need essential skills and sensitization about their rights, responsibilities and expected return.

About 4% of the respondents mentioned low understanding about forest policy and Act which contributed to poor management of the forest. According to National Forest Programme (NFP) of Tanzania it emphasizes the need for awareness creation in forest management among all stakeholders to ensure effective involvement in the implementation of the National Policy and Forest Act (Iddi, 2003).

Conclusion and reccomandations

The finding revealed that forests in the study are poorly managed and community do not adhered to government laws, rules and regulation. Forest has been under pressure due to illegal activity such as tree cutting, fire wood collection, and forest encroachment and mining. The evidence showed that rapid

urban population growth has led to poor forest management in the study area because the demand and supply of the natural resource requirement do not balance.

The study has shown that population of Tanzania has doubled from 17.5 million in 1978 to 44.9 million in 2012 while the population of Lushoto District raise from 246,049 in 1978 to 492,441 in 2012 with a population density of 120.4 Square Kilometer which is higher than the national population density of 51 persons per Square Kilometer. High population density in the study area resulted to shortage of land for cultivation as the result lead to forest encroachment and illegal activity inside the forest. This has significance effect on resource utilization. The study assessed the factors affecting the resource uses in the study area and it has found that about 84% of the community depends on forest for fire wood while the 93% revealed that there is high demand for forest products like medicine, firewood, poles in the study area. The finding from the study area revealed high demand for forest product to support their social and economic needs which required attention from the conservationist to find the alternative solution for it. The study area is surrounded with reserved forest owned by the government, but due to adjacent community population growth; high demand of the forest products and poor forest management practices has led to high pressure to the forest. Some measure should be taken to resolve this such as introduction of agroforestry practices and woodlot establishment.

The finding revealed that proper forest management practices do not exist in the study area, although participatory policies have been adopted, JFM model does not adequately grant local actors the real decision making authority to participate actively and effectively in natural resource management. This is because the JFM model dictate the limit of local actors participation and the vision of resource management remains rather resource state-centric, with very little room for local actors to accurate their own interests. None of Joint forest agreement which explain the distribution of the benefit sharing has been signed, as the result community they don't fill as a part of management. The responds from the key informant revealed that the study area has weak forest management system, poor laws enforcement and lack of cooperation between the community and Forest departments. This has resulted on continuously uptake of the forest products from the forest reserve.

The study recommends that family planning education and campaign should be strengthened in Lushoto District Council, so as to reduce human population

pressure over the land. Likewise, the district should re-mobilize, re-encourage and sensitize people to move to unoccupied/vast land especially in Handeni and Kilindi or to establish employment opportunities that will attract people to settle and work on these suggested areas. The district should develop land use plan to each village which will show equal distribution land according to the use. Furthermore, the community should be trained on optimal utilization of available land using improved agriculture practices.

Social economic benefit of the forest should be considered during the initial stage of the development of the management plan, this includes high cultural, spiritual, or recreational value, employment, value generated from the processing and trade of forest products, and investments in the forest sector. Maintaining and enhancing these functions is a part of sustainable forest management, hence information on status and trends in socio-economic benefits is essential.

Ministry of Natural Resource should ensure that PFM is actively implemented and the challenge of benefit sharing between government and forest adjacent community is resolved. Active Joint Forest Management will control harvesting and utilization of the forest product and maintained sustainably. Community forest management should be promoted because it gives community responsibility to protect their own forests and the right to use them in sustainable manner which lead to improvement of forest condition.

The study recommended that government could develop the mechanisms whereby National and international beneficiaries of the environmental services of forests have to pay for such services. There has been some success in devising schemes to collect payments for environmental services like carbon sequestration, biodiversity conservation and catchment protection. This success can further be more realized by integrating participatory mode of management with these collection schemes to ensure rights and tenure with equity in resource and benefit sharing for improving the livelihood of the rural poor who actually are the primary stakeholders of conservation and management. All parties with an interest in the fate of the forest should be communally involved in planning, management and profit sharing.

Wide variety of policy statements and legislative and regulatory measures have been established to protect forests but need to be effectively enforced. New modifications/adjustments are of course needed for site specific conditions. Laws, policy and legislation should be such that they encourage local people

and institutional participation in forestry management and conservation along with safeguarding indigenous people's traditional rights and tenure with rightful sharing of benefits. Many formal and informal enforcement/compliance mechanisms can be used to protect forest. These approaches include negotiation, warnings, cancelling work orders, notices of violation, fines, arrests and court action.

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