ASSESSMENT OF SOCIO - ECONOMIC AND ECOLOGICAL VALUES OF HALFMILE STRIP BUFFER ZONE TO THE ADJACENT COMMUNITIES OF KILIMANJARO NATIONAL PARK

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A DISSERTATION SUBMITED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OF ENVIRONMENTAL AND NATURAL RESOURCE ECONOMICS OF SOKOINE UNIVERSITY OF AGRICULTURE. MOROGORO, TANZANIA.

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ABSTRACT

In many developing countries people have viewed buffer zones as a way to accommodate the needs of national parks and other categories of wildlife protected areas and in sustaining livelihoods of the local communities living adjacent to these protected areas. This study was done from September 2015 to April 2016 in eight villages adjacent to Kilimanjaro National Park in order to assess the impacts of annexing Kilimanjaro Half Mile Forest Strip (HMFS) to KINAPA. Household survey questionnaires, key informants interview, focus groups discussion, field observations and secondary data from different sources were used to collect information. The data were analyzed using SPSS computer programme, Graph Pad InStat and descriptive statistics. The findings revealed that 64% of respondents reported that they get firewood from their own home gardens and only 25% from HMFS. It was further observed that collection of fodder and firewood is performed by women while beekeeping activities are undertaken by men. Further, approximately 35% of respondents mentioned water to be the most significant ecological value and the forest cover has declined from 47.14% to 12.14% the period between year 2001 to 2014. Nearly 63% of respondents revealed poor relationship with the park management. Local community's livelihoods were perceived to be affected by the new management of HMFS, which denied them accessibility to forest products and water services. Thus, from this study, annexation of HMFS had a positive impact to KINAPAs ecosystem and negatively affected neighbouring local community socio-economically. The study recommend communities to be allied with eco-tourism to minimize dependence on natural resources only.

DECLARATION

I, Batiho Theodora, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work done within the period of registration and that has neither been submitted nor concurrently being submitted in any other institution.

_____ _____

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DEDICATION

This work is dedicated to my beloved late mother Monica Mbuga whose guidance is the result of my achievement and my beloved sons Alex, Jordan and Allen for whom education is vital to their lives.

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LIST OF ABBREVIATIONS AND ACRONYMS

DFO	District Forest Officer
FAO	Food and Agriculture Organization of the United
FBD	Forestry and Beekeeping Division
FORESC	Forest Research and Survey Centre
GFW	Global Forest Watch
GN	Government Notice
HMFS	Half Mile Forest Strip
IGT	Income Generating Project
JFM	Joint Forest Management
KCFR	Kilimanjaro Catchment Forest Reserve
KINAPA	Kilimanjaro National Park
LCD	Least Developed Countries
MNRT	Ministry of Natural Resources and Tourism
MPAs	Management of Protected Areas
NGOs	Non-Governmental Organizations
NP	National Park
PAs	Protected Areas
PFM	Participatory Forest Management
PRA	Participatory Rural Appraisal
SNAL	Sokoine National Agricultural Library
SPSS	Statistical Package for Social Sciences
SUA	Sokoine University of Agriculture
TANAPA	Tanzania National Parks Authority
VNRC	Village Natural Resources Committee

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Buffer zones are conceived as relatively narrow strips of land on park boundaries within which sustainable use of natural resources are permitted (MacKinnon *et al.,* 1998). Many people have viewed buffer zones as a way to accommodate the needs of both protected areas and local communities (Kremen *et al*., 1999; Bajimaya, 2003). Shifting emphasis from exclusionary protected areas (PAs) where human use of land and resources was prohibited, to more inclusive strategies where utilization is considered an integral aspect of conservation (Lele *et al.,* 2010; Büscher and Dressler, 2010). However, this socio-ecological relationship has been interfered by the establishment of protected areas (PAs) such as shifting from human inclusion to total protection (Zahabu *et al.,* 2009).

Half Mile Forest Strip (HMFS) is the buffer zone demarcated in 1941 under Chagga Council to be managed as a social and a buffer forest, with emphasis on production of wood and non-wood forest products for economic purpose (Kivumbi and Newmark, 1995). In 1962, soon after the independence, the management of the HMFS was transferred to the district councils which placed greater emphasis on managing the area as a commercial forest. In 1972, the central government took control with the primary goal of soil and water conservation. In 1987, the management of the HMFS was transferred to the district councils of Hai, Rombo and Moshi whose management goal was forest products for social well - being and watershed protection (Newmark, 2001). In 2005, the area was annexed to KINAPA and came under the management of Tanzania National Parks in accordance to the Act of Parliament Cap 412 of 1959.

1.2 Problem Statement and Justification of the Study

1.2.1 Problem statement

HMFS is an important strip in conserving KINAPA ecological area, while at the same time addressing the development issues of the local people surrounding it. The area also has been regarded as a way to accommodate the needs of both protected areas and local communities by preventing households from falling into abject poverty (Vedeld *et al.,* 2007). Despite its perceived potential, increased degradation in the HMFS forced the rule of total protection which is governed by the national parks by GN of 9 September 2005. As a result HMFS cannot supply the forest products to the adjacent communities who live adjacent as it was previous intended. Accessibility and availability of resources such as firewood and fodder was very easy in the last thirty to forty years (Kinabo, 2014). However, accessibility and availability of resources has been very difficult after annexation of the HMFS zone to KINAPA. Yet there are still conflicts between the communities and park management (William, 2002).

1.2.2 Justification of the study

The study primarily intended to come up with the consistent data on the socio-economic and ecological values of HMFS to livelihoods of adjacent communities to Kilimanjaro National Park. The findings will provide basic and appropriate information to assist stakeholders in improving new livelihoods strategies to address the existing challenges facing communities adjacent to HMFS. Results from this study are important to TANAPA in carrying out prudent management. Furthermore, the results from the study will inform the policy maker and park management with regards to HMFS and consequently regarding its management enable the government to make rational decisions and arrest this spiral of degradation.

1.3 Study Objectives

1.3.1 Overall objective

The overall objective of the study was to assess the socio-economic and ecological values for HMFS to the livelihoods of adjacent communities at Kilimanjaro National Park.

1.3.2 Specific objectives

The specific objectives of the study were to:

i. assess socio-economic activities carried out by the communities in HMFS
ii. assess impact of annexing HMFS to KINAPA on community's livelihoods
iii. assess the ecological effects of annexing HMFS to KINAPA
iv. investigate management implications resulting from perceptions of adjacent local communities toward annexing HMFS to TANAPA

1.4 Possible Limitations of the Study

1.4.1 Inability of respondents to recall the past information

In some cases, the respondents were unable to recall some of the information from the past. Sometimes it was difficult for them to remember everything that was intended to be captured. Also respondents thought the researcher was one of the KINAPA's employees who wanted to spy them. This made the situation a bit difficult because some respondents feared to respond to the researcher's questions. However, this problem was minimized by triangulating data collection techniques and building rapport.

1.5 Conceptual Framework for the Study

A conceptual framework is schematic illustration of the study that provide guidance towards collection of appropriate data and information and binds the facts together Graham *et al*., 2006. The framework of this study (Figure 1), it is centered on the

following factors, namely Management biodiversity loss, governance, local community's livelihoods, ecological sustainability, socio-economic development, natural resources depletion, poverty and existence of natural resources. It is postulated that sustainability of natural resources, its habitat and local community's welfare is very much dependent on good governance as far as natural resources management is concerned (Sowman and Wynberg, 2014).

Governance could be defined as the interactions among structures, process and traditions that decide how authority and accountability are exercised, how judgments are made and how citizen or other stakeholders have their say (Graham *et al*., 2006). The presence of good governance from both park management and local community ensure sustainability of natural resources as well as local communities' livelihoods (Hayes, 2006).

Where there is poor governance in natural resources management natural resource and their habitats are likely to vanish. Bad governance is not only affecting ecological system but also community livelihoods adjacent the National Parks. Therefore, sustainability of natural resources and its habitat in KINAPA can be achieved when adjacent community socio-economic developments are sustainably and natural resource governance is good.

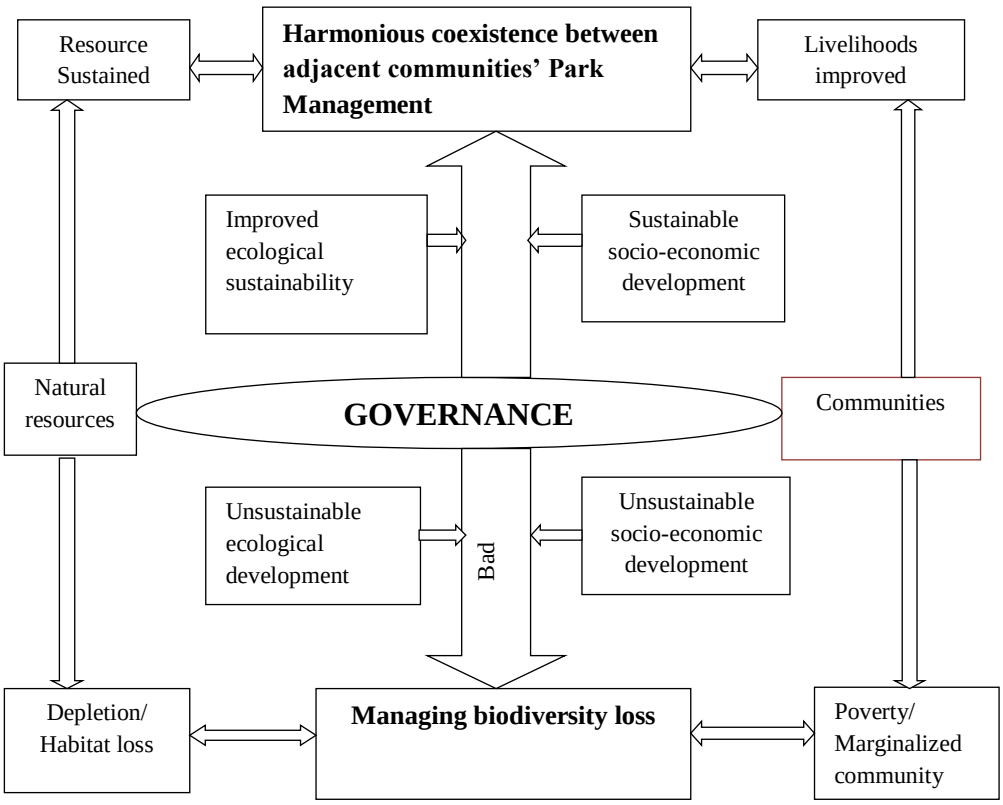

Figure 1: Conceptual frame work for the study

1.6 Structure of the Dissertation

The dissertation has five chapters. Chapter 1 deals with introduction of the research. Chapter 2 covers literature review relevant to the present study. Chapter 3 is covers the overall methodology used in pursuit of the study. Chapter 4 presents the results and Chapter 5 highlights the conclusions and recommendations of the study.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Overview of Buffer Zone Strip

A Buffer zone is an area surrounding the nominated property which has complementary legal and / or customary restrictions placed on its used add development to give an added layer of protection to the property (World Heritage Centre, 2008). Buffer zones are designed to protect the core protected area while allowing some compatible uses (Gardner, 2009). A buffer zone reduces conflict by keeping wild animals away from humans' settlements maximize connectivity of protected areas with natural ecosystems in landscape (Martin and Piatti, 2009).

Buffer zones in conservation terms can be defined as areas peripheral or adjacent to protected areas (PA) such as National Park or a managed resource protected area, on which land use is partially or totally restricted to give an added layer of protection to the PA itself, while providing valued benefit to neighboring rural communities and where sustainable utilization of resources is permitted in order to reduce pressure and enhance the conservation value of the reserve (FAO, 1998). In forestry, these areas are meant to provide forest related products at a minimum price and near the communities' habitats, with the main aim of enhancing the positive and reducing the negative impacts of conservation on neighboring communities.

Buffer zone can either be internal or external and the main difference is based on who has the jurisdiction (Gardiner, 2009). An internal buffer zone may have the pragmatic advantage of common jurisdiction (with the PA), but have the disadvantages of losing the opportunity to involve other segments of society in conservation with potential

magnification effects. Common forest buffers adjoining the forest or forest strips around forest reserves are set aside for the said purpose (Hylander *et al*., 1997).

2.2 Importance of HMFS role at Kilimanjaro National Park

HMFS is the zone which has direct and indirect values to local communities' livelihoods and ecological functions; also UNDP upgraded the KINAPA as biosphere reserve in 2001 with the condition of HMFS inclusion. The forest has a very high water catchment value and water from the reserve supplies traditional furrow irrigation systems on the southern and eastern slopes for coffee and other crops. Many permanent rivers fed by several rivulets and streams flow from the slopes of the mountain to the lowlands where the water supports agricultural production through irrigation. Water is also supplied to the sugarcane plantations of Arusha chini and large-scale rice project South East of Moshi and contributes to the Pangani river system for hydroelectric power production at Nyumba ya Mungu and Hale dams (Katigula, 1992; Kashenge, 1995; Kivumbi and Newmark, 1995; Misana, 1995). It is an icon of climate change in the world.

2.2.1 Management under forestry and beekeeping division

Prior to 2005, the HMFS was managed as catchment forests and was part of Kilimanjaro Catchment Forest Reserve (KCFR), under the jurisdiction of the FBD. The main function of the reserve was to protect the mountain's values and water sources (MNRT, 2008; Iddi and Blomley, 2009). The FBD managed HMFS through forest policy and forest management plans that were revised to reflect change(s) in management objectives (Brockington, 2007). The increase in demand of forest products and limited government management capacity led into revision of the Tanzania forest policy in 1998 and Forest Act No.14 in 2002 (Luoga *et al*., 2005). The revised National Forest Policy emphasized

both exploitation and the environmental roles of forests through participatory forest management (PFM). In 1998, a new concept of joining hands with local people on forest conservation popularly known as Joint Forest Management (JFM) was announced in some area of HMFS (Louga *et al*., 2005, 2006). In JFM approach, ownership of the forest reserves remained with the state but the local people adjacent to the reserves were involved in the management and they were granted limited access to some products such as firewood, beekeeping, fodders, fruits and medicines and non-consumptive uses such as recreation and ritual activities (Luoga *et al*., 2005; Iddi and Blomley, 2009).

2.2.2 Management under Tanzania national parks authority

The mandate of TANAPA is to manage and regulate the use of areas designated as National Parks by such means and measures to preserve the country's heritage, encompassing natural and cultural resources (URT, 1994; TANAPA, 2007), by controlling poaching, maintaining ecological functions and promoting tourism (TANAPA, 2007). To ensure that goals are achieved, National Park Policies in Tanzania prohibit human activities such as subsistence hunting, agricultural activities, grazing of livestock and human settlements in all National Parks (URT, 1994).

Other extractive activities might be allowed as deemed fit by park management, under the condition that no park resource should be transported outside of the park boundaries for use or consumption (URT, 1994). According to TANAPA the change of HMFS legal status was instituted due to increasing threats from a growing population and its changing lifestyle (Akitanda and Mongo, 2003). The transition from FBD to National Park (KINAPA) raised the conservation status of the forests, which favour ecosystem of the natural resources than socio economic values for livelihoods (Njabha, 2011).

2.3 Rural Households

2.3.1 Key concepts

2.3.1.1 Household

A household is a social unit consisting of the members of a family who live together along with nonrelatives (i.e. servants) under the same roof, share the same hearth for cooking and a common stake in improving their socio-economic condition (Ellis, 2000).

2.3.1.2 Sustainable livelihoods

Balancing conservation and development continuing measurement and evaluation of the effects of conservation and livelihoods interventions, through suitable theory to conservation practice and various methodologies, is an important consideration for harmonizing community and environmental benefits (Walpole *et al.,* 2007). Supporting biodiversity conservation in protected areas could be strengthened through economic incentives, strengthening alliances, reforming environmental laws and regulations and increasing political support (Harvey *et al.,* 2008). Using participatory approaches to identify hotspots, address threats, protect habitats, conserve areas, and utilize traditional knowledge might support biodiversity conservation (Harvey *et al.,* 2008).

Mainstreaming of biodiversity in development and poverty alleviation efforts, further examination of how various disaggregated aspects of biodiversity functions can benefit rural poor and enhance their livelihoods. Creating strong partnerships with the private sector, increasing education on the effects of depletion on biodiversity and further realistic and relative research with improved methodologies might increase local benefit from biodiversity conservation (Dinerstein *et al.,* 2013). Networks of community MPAs might be most effective in supporting conservation goals and community advantage (Leisher *et al.,* 2007).

The sustainable livelihoods theory to Conservation Practice (Figure 2) in relation to the protection of the HMFS could be useful in several ways. It offers a broad framework for researchers, conservationists and protected area managers to look at the micro to macro level influences on livelihood assets, activities. And outcomes and particularly the ways that conservation related guidelines, establishments and procedures are impacting local peoples. For livelihoods development to be achieved from conservation of HMFS, it is important to consider the concept of sustainable livelihoods in which HMFS is categorized as a natural capital. The application of the Theory to Conservation Practice in this manner might give both initial and ongoing insight into ways that livelihoods outcomes and biodiversity conservation might be balanced (Andrade and Rhodes, 2012).

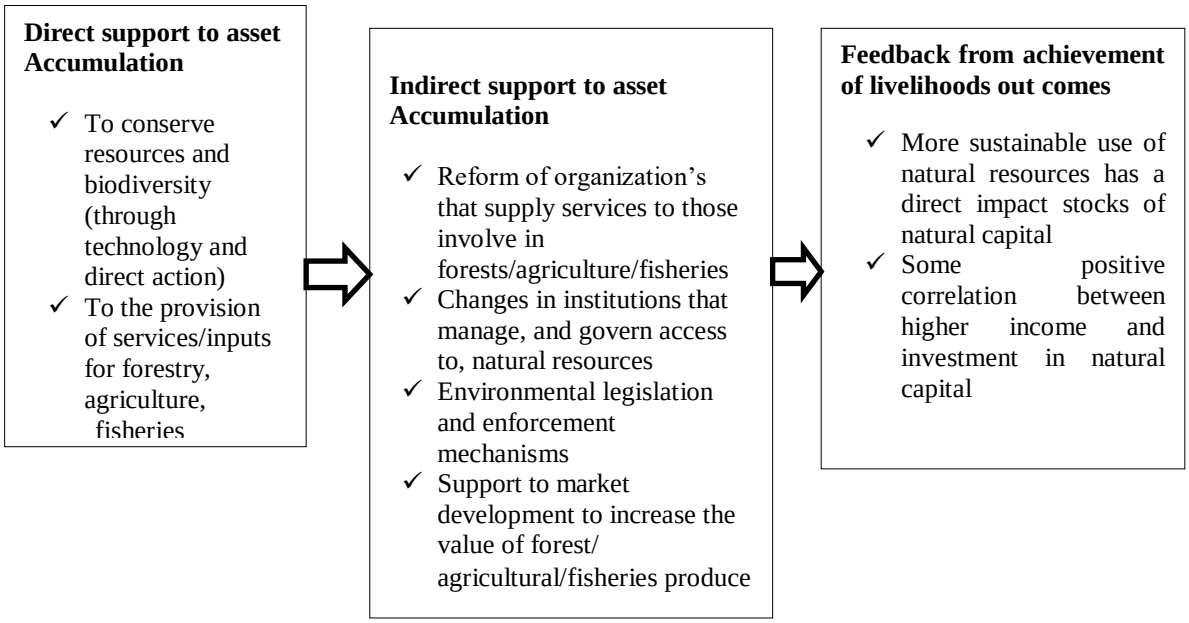

Figure 2: Sustainable Livelihoods from Theory to Conservation Practice

Source: Bennett (2010).

2.3.2 A household economic model

Economic and technological changes have been reported as major causes of natural resources degradation in developing countries. Economic development and use of

modern technologies speeded up the rate of deforestation up to 1.3% annually, (between 1978 and 1991) in Terai Region, Nepal (FORESC, 1994). This has pushed wild animals into the isolated patches of habitats within the existing protected areas.

A household economic model is used to investigate local livelihoods based on sources of entitlements each household has in the study area. The underlying assumption here is that households control endowments, including land, labor capital and forest resources and each household can have various sources of entitlement which comprise its livelihood. Lusambo (2009) define endowments as a person's original bundle of legally owned resources. Entitlements constitute a set of commodities a person can legally generate through various transformation processes of the endowments (Ditiro, 2008). Entitlement mapping (E-Mapping) consists of a set of rules and processes needed for transforming endowment bundle into entitlements. These processes create possibilities for consumption, savings and investments. Both access and mapping relate to processes of inclusion. According to De Haan (2005) "endowment is right in principle and entitlement is what one actually gets".

2.3.3 Income contribution from different livelihoods activities

Subsistence agriculture and animal husbandry typically provide the greater part of household incomes for many rural households in developing countries (Alkire, 2007). Activities performed in the HMFS are often important to such households which provide forest and non-forest products.

These products are important for cash generation, cooking energy, animal fodder, construction, food security and health. The total household income comprises the total

income generated by a household by combining all livelihood activities available. Vedeld *et al.* (2004) noted that forest income contribute significantly to the total share of incomes generated through non-farm activity.

2.3.4 Legal provision, tenure and boundary question

Legal change, tenure and boundary disputes in most cases go hand in hand with the denial of access to important natural resources which communities have enjoyed since time immemorial (Kideghesho, 2010). The denial of access to resources by the local communities as a result of the creation of protected areas is often linked to be debate of power and the role of the State (Sirima, 2010). The exclusion of local communities from their traditional lands has been widely questioned in the literature and is associated with the toothless of local communities versus the State in decision making (Raik *et al*., 2008). In Uganda, a legal change of Mount Elgon Forest Reserve to the national park had negatively affected the adjacent local communities (Ditiro *et al*., 2008). The changes in the management system in this reserve restrict local people's access to resources and thus affecting their subsistence, income generation and socio-cultural needs that they previously enjoyed.

2.4 Global Forest Watch Satellite Technology

Global Forest Watch is an online forest monitoring and alert system that provides the most current, reliable and actionable information about what is happening in forests worldwide (Hansen, 2013). For sustainable natural resource management to be achieved for the HMFS, it is important to consider the theory GFW in which how forests are changing, who is using them and take action, monitoring and be on the position to help sustain for future generation. It shows what is happening to forests on the ground,

contribute data or suggest improvements and find out how you can help protect forests land cover change and trends assessments are essential for ecosystem productivity (Nash *et al*., 2006). Land cover change and trends offer the most comprehensive way to track and evaluate the consequences of surface change on a wide range landscape processes affecting important ecological goods and services positively or negatively (Griffith *et al*., 2003). Understanding the processes that act as driving forces of land cover dynamics is useful to predict trajectories of change and future impacts that may otherwise have a negative effect on the provision of ecosystem services (Sertel and Omeci, 2009).

2.5 Natural Resources and Socio-economic Development

Tanzania fully recognizes the role of natural resources in attaining socio-economic development. In order to increase tangible benefits of conservation the concept of participatory or community - based natural resources management was adopted in 1970s though has taken time for the surrounding communities to feel a sense of ownership of these resources and their benefits (Homewood *et al*., 2001). The HMFS is very potential to the socio-economic activities to livelihoods of local communities who live adjacent the Kilimanjaro National Park. Peter and Sankhayan (1994) asserted that while formulating and implementing the economy reforms, no special attention was paid to their effects on the natural resources use and the quality of the environment (Mariki, 2015). Thus the challenge to achieve integral conservation and development goals in PAs has therefore, been combined: to include interest of stakeholders and to ensure tangible benefits for the society involved in the implementation of local conservation actions (Bonilla-Moheno and García-Frapolli, 2012).

A land on the slopes of Mt. Kilimanjaro is arable and useful for agricultural activities, making agriculture the main economic activity. Therefore, clearing of land for

agricultural activities is a salient feature in this area. This, consequently, leads to change in land cover in the HMFS zone around the park alongside with wielding pressure on the resources as population increases.

2.6 Ecological Factors which Contribute to Forest Degradation

Understanding the drivers of change in forest condition at different temporal scales is vital. The changes in forest condition are a superimposition of the anthropogenic and biophysical progressions (Pisarenko and Strakhov, 2004). Geist and Lambin (2002) identified human activities and social progressions as drivers of forest disturbance and forest degradation. The authors particularly cited agricultural expansion and wood extraction as major factors directly affecting forest condition. Illegal logging is also a major concern in many tropical countries (Pisarenko and Strakhov, 2004; Luoga *et al*., 2005). Minja (2015) pointed out that elephants may also damage forest woodlands while escaping from hunting, during feeding processes and social displays and therefore cause lead degradation and loss of ecological services.

2.7 Perception of Adjacent Community toward Conservation

It is widely recognized that cooperation and support of local communities constitute the most important factors for a long-term integrity of national parks (Arjunan *et al.,* 2006). Due to the restricted access to resources communities adjacent to national park have negative attitudes toward protected areas as they carry out much of the conservation costs while deriving little benefits (Khatun *et al.,* 2012). Protected areas are usually perceived as restricting their ability to earn a living. In order to gain the support of local communities, a greater openness to their concerns, desires and necessities is required. In this regard, priority should be given to the assessment of individuals opinions because

different households within the same village may experience different levels of engagement (Hill, 2010).

Therefore, many approaches consider conservation along with upgrade of sustainable development by providing local people with substitute income sources, aiming at poverty mitigation through development activities. Household perception on conservation can be affected by socio-demographic variables such as age, gender, education and income. Various studies in US and in Africa show that illiteracy rate along with the age tend to impact negatively conservation, which means that the more educated and younger a person is, the higher is the positive conservation outlook (Buttel and Flin, 1974). Increased income was also found to positively correlate with conservation attitude. Definitely, involvement of local communities in decision-making is important both for economic achievement and to evade bias in perception of conservation.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Description of the Study Area

3.1.1 Size and location

The HMFS is a narrow strip of forest located south of Mount Kilimanjaro with estimated coverage area of 51.2 $km^{2.}$. It is aligned west to east forming a buffer of the Kilimanjaro forest reserve. The forest is part of the National Park and it stretches from Kikelelwa river on the northeast to Sanya river on the southwest, cutting across Hai, Moshi and Rombo districts. Its width varies considerably from several hundred centimeters to several meters but averages approximately 0.8 kilometres or one half mile, hence the name Half Mile Forest Strip. The main study comprised of Nsungu, Marua, Kyengia, Ngarony, Lukani, Nronga, Mashuba and Maharo villages, which are located in Moshi, Siha, Hai and Rombo districts respectively (Figure 3).

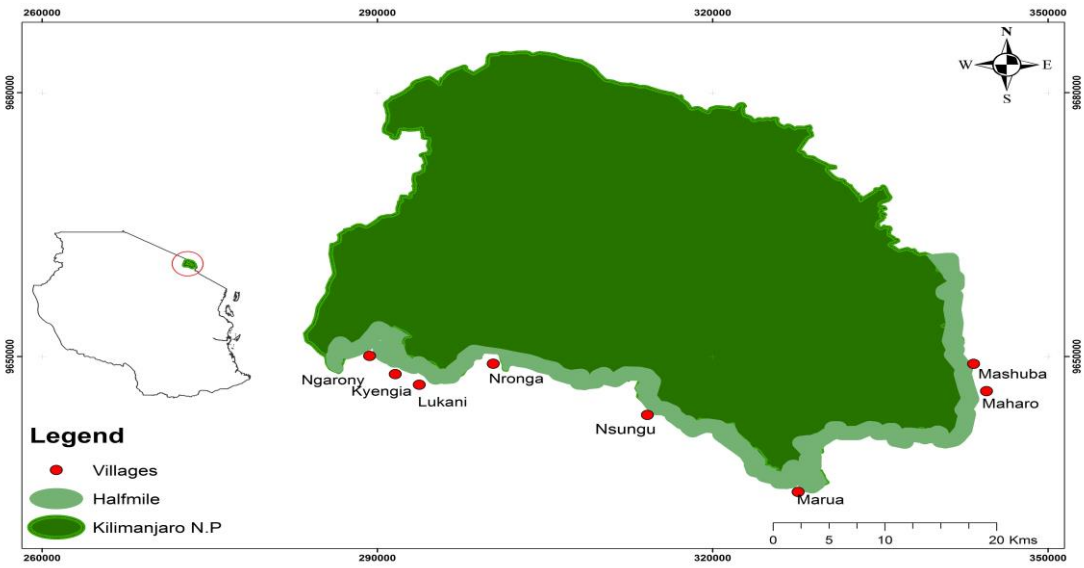

Figure 3: Location of study villages in Kilimanjaro Region Tanzania

Source: TANAPA GIS unit (2016).

3.1.2 Geology and soils

Kilimanjaro Mountain is one of many rift valleys associated volcanoes which poured lava and cinders, which characterize the current volcanic soils that are rampant within the HMFS and the land surrounding it. Close investigation into the complexity of the mountain, indicates that it is built around three volcanic centers to which there are many associated number of parasitic cones. There is Shira to the west, Mawenzi in the east and the largest-Kibo, being at the center. Parasitic cones of upper Rombo zone and Himo-Kilema ridge are situated in the south-east and their lava and tufts extend to the plains at Chala and Taveta (Katigula, 1992; Lovett and Poćs, 1993). The soils in the study area are andosols of volcanic origin, in nutrients developed on porphyry and basalt lava. At lower elevation deep ferralitic latosols have also developed, while on the rocky ridges of higher elevation acidic lithosols occur. Soils within the HMFS are derived from rocks of tertiary volcanic origin, are acidic with pH ranging from 4 to 4.6, under such edaphic conditions, leaching is common (Lovett and Poćs, 1993).

3.1.3 Physiography and climatic condition

Generally, the physiography of the area under study consists of an undulated terrain with a gentle slope (0-5) at lower altitudes. Above 1200m on the south and above1400m on the east, the slope steepens gently and often exceed 15^0C in excess of 25^0C are mostly restricted to river valleys or to the steeply sloping ash cones (Ngana, 2001). The altitude varies between approximately 1890 meters above sea level at the forest edge and <1400 above the sea level in the village. HMFS is located within montane forest between 1200 and 1800 m above sea level, the midlands between 900 and 1200 m and the lowlands extending up to 900 m above sea level (Soini, 2006). The HMFS area demarcates the beginning of cultivated areas up to the lower slopes, of which the valleys, together with some secondary vents, forms an important refuge areas for natural flora and fauna

(Lambrechts *et al.*, 2002). The rainfall pattern in Kilimanjaro Region is bimodal with short rains from November to December and long rains from March to May. The average annual rainfall ranges from 1000-1700 mm and it varies up to 250 mm with elevation and aspect.

3.1.4 Topography and vegetation

General topography of the HMFS is continuous hilly, but more often mountainous. The general gradient is normally very steep; interspaced with infrequent conspicuous fissures in the landmass forming canyons and ravines across the landscape (Lovett and Pośs, 1993). The vegetation on the mountain varies with rainfall and altitude. Lower elevation dry montane forest occurs on the southern and northern slopes below 1800 m with sub montane riverine forest in stream valleys from 1400 –1600 m dominated by *Albizia schimperiana* and *Newtonia buchananii.* Montane forests occur from 1600 to 2700 – 2800 m elevations. The forests were rich in *Ocotea usambarensis* but now are dominated by *Albizia gummifera*, *Macaranga kilimandscharica* and *Polyscias fulva*.

KCFR is rich in biodiversity having a number of endemic plants including *Senecio johnstonii* sub species *Kilimanjaro, S. cottonii, Lobelia deckenii, Impatiens Kilimanjaro* and *Ilota tanganyikae*. Valuable timber species found include *Ocotea usambarensis, Juniperus procera, Podocarpus* species and *Fagaropsis angolensis* (Katigula, 1992; Lambrechts *et al*., 2002; Luoga *et al*., 2005). The HMFS has exotic tree species beside the natural forest. Exotic tree species within the HMFS were geared towards meeting the ever growing demand for wood and wood products.

Most important tree species grown where the natural vegetation was cleared include black wattle (*Acacia mearnsii*), Japanese camphor (*Criptomeria japonica*), Pines

including *Pinus patula, Pinus radiata, Pinus kesiya,* Christmas trees (*Widdringtonia whyteii*), Cypress especially *Cupressus lusitanica, Populus alba* and a variety of Eucalypts such as *Eucalyptus saligna, Eucalyptus maidenii, Eucalyptus robusta, Eucalyptus citriodora* and *Eucalyptus camaldulensis* (Lovett and Poćs, 1993; Luoga *et al*., 2005*)*. Indigenous tree species have also been planted to supplement the exotics species and especially on water sources, these include *Pygium africana* and *Rapanea rhodondroides* (Katigula, 1992; Lovett and Poćs, 1993).

3.1.5 Wildlife found in HMFS

The HMFS reserve supports a large stock of wild game (Lambrechts *et al.,* 2002). Commonest observed being African buffalo (*Syncerus caffer*), elands (*Tauro tragusoryx*), bush-bucks (*Tragelaphus scriptus*), giraffe (*Giraffe camelo pardalis*), black and white colobus monkeys (*Colobus guereza*) sykes monkeys, olive baboons (*Papio anubis*), hyrax (*Hetero hyraxbrucei*), honey badgers (*Mallivora capensis*), bush-babies (*Otolemurcras sicaudatus*), grant's gazelle (*Gazelle granti*), elephants (*Loxodonta africana*), common zebra (*Equus quagga*), leopard (*Pathera pardus*) and a multitude of birds like spur-winged lapwing (*Vanellus spinosus*), quails, olive pigeons (*Columba arquatrix*), olive sunbird (*Cyanomitrao livacea*) African spoonbill, (*Platalea alba*), silvery-cheeked hornbill (*Bycanistes brevis*), marabou stalk (*Leptoptilos crumeniferus*), fischer'sturaco (*Tauraco fischeri*) and hornbills.

Each zone provides habitat for variety of species with the montane zone being the most diverse composing of nearly 69% of the parks flowering plants species, 78% of the bird species and 80% of the large mammal species. Most of the browsers rove far down to the HMFS in search of their natural feed. Incidences of poaching for commercial purposes

and for shear search for wild meat are common in HMFS buffer zone (Katigula, 1992; Kashenge, 1995).

3.1.6 Hydrology

About 96% of the water produced by the mountain comes from HMFS zone the forest has a very high water catchment value and water from the reserve supplies traditional furrow irrigation systems on the Southern and Eastern slopes for coffee and other crops. Many permanent rivers fed by several rivulets and streams flow from the slopes of the mountain to the lowlands where the water supports agricultural production through irrigation. Water is also supplied to the sugarcane plantations of Arusha chini and large-scale rice project South East of Moshi and contributes to the Pangani river system for hydroelectric power production at Nyumba ya Mungu and Hale dams (Katigula, 1992; Kashenge, 1995; Kivumbi and Newmark, 1995; Misana, 1995).

3.1.7 Ethnicity

The dominant ethnic group is the Chagga who inhabit the slopes of Mount Kilimanjaro in their tradition villages, they are believed to settle around the mountain from their ancestral home land in Taita and Ukamba (Mbonile, 1995; Luoga *et al*., 2005), although the current pressure upon the natural resources of mount Kilimanjaro is a result of the dramatic increase of human population on its slopes from human reproduction. Other parts as well, this is a result of population mobility and migration (Mbonile, 1995).

3.2 Research Design

A cross-sectional research design was adopted during data collection. This is due to the fact that this method allows collection of data at one point in time and is the most appropriate method in social studies facing limited time and little budget.

3.3 Reconnaissance Survey

Reconnaissance survey was conducted at Nsungu, Nronga, Ngarony and Maharo villages with a purpose of testing a validity and reliability of the questionnaire by conducting face to face interview that included 10 respondents. Minor challenges were observed which resulted to modification of some questions in order to collect the appropriate data from the existing situation.

3.4 Sampling Procedure and Sample Size Determination

Despite of purposive sampling being used, eight selected villages out of villages falling closer to the HMFS among 51 villages available in the study area were surveyed by considering the criteria that, the village is crossed by HMFS. The target population was number of households in the selected villages namely; the total numbers of households in the eight selected villages under study were 240. The provided list of household from the eight villages was used in sampling frame. Member selected were those people above 18 years knowledgeable with HMFS. The study used the sample size determination as guided by Yurdugül (2008) who argued that, 30 respondents per case are minimum number recommended to represent a population under study. Random sampling method was used to select the samples from sampling frame by using a random number table in MS Excel. A total number of 240 respondents were randomly selected and interviewed as shown in Table 1.

Table 1: Total number of sampled households

Name of District	Name of Village	Number of Residents	Total Number of Household (n)	Number of Sampled households (n)
Moshi	Marua	2364	338	30
	Nsungu	800	450	30
Rombo	Maharo	3063	884	30
	Mashuba	1800	444	30
Hai	Nronga	2999	750	30
	Lukani	1413	371	30
Siha	Kyengia	576	196	30
	Ngarony	1411	263	30

Total	**14426**	**3696**	**240**

3.5 Data Collection

3.5.1 Primary data

Qualitative and quantitative data were collected using semi-structured questionnaires. Semi-structured interviews are the most common form of assessing people's experiences, perceptions and feelings of reality. They use predefined questions which are in both closed and open-ended format. They are very simple, efficient and practical in getting the data (Minichiello *et al.,* 2009).

3.5.1.1 Household questionnaire survey

Both structured and unstructured questionnaires (closed and open ended questions) were adopted during primary data collection (Appendix 1). The questionnaire was designed in order to meet the specific objectives of this study by collecting the appropriate socio-economic data. The questionnaire covered issues related to energy service, effect on socio – economic activities, ecological condition and perception about HMFS.

3.5.1.2 Key informants interview

Key informants interview is a qualitative in-depth interview with people who know what have a varied knowledge about the topic in question. This face-to-face interview was done purposely in order to collect information from a wide range of people having knowledge and understanding of the subject in research. This included village executive officers', traditional leaders and forest officers from forest department and managers from Kilimanjaro National Park. Key informant's information was collected by using closed and open ended questionnaire having nine questions (Appendix 1). The questions on importance of HMFS to livelihood, socio-economic and ecological values to conservation and communities livelihoods were asked. Also alternative income

generating activities that should be provided to stop dependence on HMFS resources for their livelihoods improvement were assessed as well as the recommendations for solving the challenges was recorded.

3.5.1.3 Focus group discussion (FGD)

The focus group discussion (FGD) is a rapid assessment, semi-structured data gathering method in which a purposively selected set of participants gather to discuss issues and concerns based on a list of main themes drawn up by the researcher (Kumar, 2015). Eight focus group discussions comprising 6-10 people were carried out in the eight selected villages by using checklist of four questions which were developed by a researcher (Appendix 1). The number of participants in FGD was adopted from Lusambo (2009) and in addition, Liamputtong (2011) recommended that, focus group interviews involve a group of 6–8 people who come from similar social and cultural backgrounds or who have similar experiences or concerns, where they gather together to discuss a specific issue with the help of a moderator in a particular setting where participants feel comfortable enough to engage in a dynamic discussion for one or two hours. This approach have been more popular and encourages a range of responses which provide a greater understanding of the attitudes, behaviour, opinions or perceptions of participants on the research issues (Hennink, 2007).

3.5.1.4 Researcher`s field observations

Field observation was done by the researcher and the trained researcher assistants during data collection. The observation was mostly based on how people engage in various socio-economic activities which economic activities are performed in the HMFS are by who.

3.5.2 Secondary data

3.5.2.1 Vegetation cover change

The trend of vegetation cover change on the HMFS buffer zone was studied through on change acquired from Global Forest Watch (GFW), which is the soft ware provided by goole earth in this archive, the shape file of the HMFS was uploaded in GFW archive and the data for vegetation change was automatically produced. Through this approach the vegetation cover change data from GFW between 2001 - 2005, 2006 - 2010 and 2011 - 2014 were analysed in MS - Excel to produce histogram. The interest of the researcher was to determine the vegetation cover change up to 2016. The GFW however was able to generate the vegetation cover change only up to 2014 implying that by that time, data for 2015 and 2016 were not available.

3.5.2.2 Other source of data

Other secondary data were obtained through a review of literature on various topics and other works done in related studies from Sokoine National Agriculture Library (SNAL), Institute of Resource Assessment library, Tanzania Wildlife Research Institute, College of African wildlife management and electronic libraries. Topics of interest were the history and function of the HMFS buffer zone, management of buffer zones in other areas, economic investigation of forest undertakings. Other sources of secondary information included consultation with district natural resources authorities of the four districts and NGOs such as FLORESTA and KiLi project that plant trees on the HMFS. Relevant progress reports, 2012 reviewed general management plans, policy and legislative documents were also reviewed.

3.6 Data Analysis

3.6.1 Qualitative data analysis

Qualitative data were transcribed and analysed through content analysis and from which the researcher drew conclusion through triangulation of the generated information. Fundamental issues analysed included community's access to livelihood assets, institutions and social relations modifying access to livelihood assets, Perception of local community towards conservation. The detailed analysis of documents such as research and other reports, historical records, policy manuals and books were done so as to generate information that could be used to explain the situation in the field regarding socio-economic and ecological values of HMFS.

3.6.2 Quantitative data analysis

The data collected from structured household questionnaires were summarized and coded. Statistical Package for Social Sciences (SPSS) computer software was used for data analysis. Descriptive statistical analysis was used in exploring the data for distribution of responses and central tendencies. Cross tabulation was performed to ascertain responses and percentages and the chi-square test was also conducted. The chi-square test is used to examine the association between two categorical variables. While there are many type of chi- square tests, the two most often used are chi- square of independence and chi- square test of homogeneity (Waller, 2012). A chi- square test of independence was used to determine if two variables are related. A chi- square of homogeneity is used to determine if the distribution of one categorical variables is similar or different across the levels of a second categorical variable. The proportions of respondents who gave their perception on various aspects were tested to find if there is a statistically significant difference of responses across the villages in HMFS.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSIONS

This chapter presents and discusses findings based on the analysis of information obtained from the communities in the eight villages of the study area and various stakeholders, own experience and literature consulted. The information include assessment of socio-economic activities carried out by the communities adjacent to HMFS, effect of annexing HMFS to KINAPA on community's livelihoods and ecological function and perceptions of adjacent local communities on management of HMFS.

4.1 Socio-economic Characteristics of the Respondents

Out of the total respondents, males constituted 60% of respondents in the study area (n=204, Table 2). Traditionally males dominate the forest activity as a forest based practices, which are carried over from one generation to another. Similar reasons were reported in other African countries where traditional beekeeping is practiced (Van der Kleij and Simukoko, 2012). As it is common in LDCs, males have more access to information compared to females, the results on respondent's gender distribution forms the basis for a rational judgment particular on forest degradation since both male and female access HMFS though with differed desire. Moreover, the majority of respondents had access to formal education, 65% of respondents (n=240) had attended primary education, 18% secondary education, 18% tertiary education (vocation training) and 5% had non-formal education. The study shows that most of the household heads (61%) have attended school, at least to primary education level (Turyahabwe *et al.,* 2013). Generally, people here depend on forest products. Study findings (Figure 2) revealed that (95%,

n=240) of the interviewees were of the adult age cohort of the population. This implies that majority of the population interviewed were mature enough to understand the challenges facing management of HMFS and its importance similar to the finds of (Metta, 2013). Among the respondents occupation in the eight villages, crop cultivation constituted 53%, livestock keeping 20% and the rest of occupation groups had less representation below 12% of respondents (Table 2).

Table 2: Socio-economic characteristics of respondents (n = 240) in the communities adjacent to Kilimanjaro National Park

	Frequency	Percentage
Gender		
Male	144	60
Female	96	40
Education		
Never been to school	29	12
Primary	156	65
Secondary	42	18
High education	13	5
Age Category		
21-30	12	5
31-40	47	20
41-50	50	21
51-60	47	20
61-70	45	19
>70	39	16
Occupation		
Crop cultivation	128	53
Livestock keeping	48	20
Ecotourism	26	11
Milk sales	22	9
Employed	12	5
Lumbering	4	2

This signifies that the main activity is still agriculture and livestock keeping. Statistics on occupation further revealed that, despite the subsistence nature of production, households

in Lukani, Nronga and Nsungu villages often have some surplus to sell but no sufficient markets. During the dry season households cope with little water with the advantage of living on high altitude by producing vegetables in a small area. Respondent's reveal that livestock keeping is reduced compared to the past and that currently there is no access to pasture and land for grazing as before in all villages adjacent to HMFS, therefore, they are enforced to practice zero grazing.

4.2 Effect of Annexing HMFS to KINAPA on Community's Livelihoods

Results shows that 51% of the villagers use fuel wood as primary source of energy and 64% of the villagers gets fuel wood from their own farms and 25% get fuel wood from the half mile strip zone (Table 3).

Table 3: Source of energy and where it is obtained in the communities adjacent to Kilimanjaro National Park

Item	Frequency	Percent
Source of energy used		
Fuel wood	112	51
Kerosene	46	21
Charcoal	24	11
Saw dust	5	2
Gas	28	13
Electricity	5	2
Total	**220**	**100**
Source of firewood		
Half mile strip zone	56	25
Around own farm	140	64
Buying	**24**	**11**
Total	**220**	**100**

Responses from households regarding their access and use of resources from HMFS are indicated in Table 4. The results suggest that fodder and fuel wood are the major resources obtained from HMFS. Results also suggest that some households have more

than one resource use. It is clear that the frequency of access to and use of resources from the HMFS for a particular household has changed due to a number of reasons including: household source of income, availability of cooking fuel and fodder.

Table 4: Various products accessed in Half Mile Forest Strip, Kilimanjaro

Resource from reserve	Counts	Percent
Fodder	184	38.3
Fuel wood	204	42.5
Honey	24	5.0
Medicinal plants	2	0.4
Timber	18	3.8
Poles	16	3.3
Bush meat	32	6.7
Total	**480**	**100**

Valid cases 240

Table 5 shows that 70% of respondents agree that accessibility and availability of resources such as fuel wood and fodder was very easy before annexation compared to only 3% after annexation. The local communities surrounding the park used to get such resources from the half mile strip located on the southern and eastern edges before annexed into Kilimanjaro National Park. Almost similar percentage 69.81% responded that accessibility and availability of resources is very difficult after annexation of the half mile strip zone to KINAPA.

The following reasons explain such difference in accessibility and availability of resources. First in 1941, when the half mile zone was managed by the Chagga Council checks and balance and of utilization was controlled (Sebastien, 2010). Then by 1962 the mandate shifted to the District Councils of Hai, Moshi Rural and Rombo when resource degradation was observed as a result of commercialization of the forest resources found in the zone (Lambrechts *et al*., 2002). Increasing demand for natural resources,

particularly timber led to illegal harvesting of camphor and cedar species on the forest buffer zone of the national park over the years (Lambrechts *et al*., 2002).

Table 5: Availability of resources from the protected area (before annexation of HMFS into Kilimanjaro National Park)

Item	Very easy		Easy		Difficult		Very difficult		Total freq.	Total %
Access	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**		
Before annexation	76	70.37	20	18.52	4	3.70	8	7.41	108	100.00
After annexation	4	3.77	2	1.89	26	24.53	74	69.81	106	100.00

Forest decreased in the half mile strip zone of about 41 km^2 between 1952 and 1982 as reported by Yanda and Shishira (2001) did not differ with William (2002) reporting a decline in forest cover of 38.9 km^2. Coupled with this is the fact that 72.7% and 32.7% of all respondents in cruelty of the village come from mentioned uncontrolled tree felling and illegal timber harvesting respectively as the major cause of environmental degradation (Table 5). The survey that was done in 2002 indicated that, over 2100 logged camphor trees were counted with no signs of logging activities on the lower slopes bordering the half-mile forest strip as these areas had already been depleted (Lambrechts *et al*., 2002). The survey also recorded 19 cleared fields in the forest and a large number of livestock grazing 8 kilometers deep into the forest (Lambrechts *et al*., 2002).

The changes in management of the half mile strip changed from the Chagga Council Thus, increasing uncontrolled tree felling and illegal timber harvesting upset the Kilimanjaro ecosystem. This, consequently, influenced the requisition to annex half mile strip into KINAPA in 2005. Increased population in the highland zone had increased pressure on natural resources. Because of increased population around KINAPA,

strengthening of agricultural activities has expanded over time resulting in disappearance of wildlife previously found along the slopes of Mt. Kilimanjaro (Newmark, 1994). Elephants (*Loxodonta africana*), leopards (*Panthera pardus*), impala (*Aepyceros melampus)* and baboons (*Papiocyne cephalus*) were found up to the lowlands zone on the eastern, southern and western sides of Mt. Kilimanjaro

4.3 Ecological effects of Half Mile Forest Strip

The main ecological effects of HMFS in the study area includes increase water, rainfall, climate regulation (purifying air), increased ice on Mount Kilimanjaro and increased number of wild animals such as non-human primates and birds. Of the respondents interviewed, 35% mentioned water to have the most significant ecological value. Associated with HMFS is water catchment which discharges water downstream. The less important ecological benefit was determined being increase in number of wild animal (10%) and this is brought by local climate regulation done by Half mile forest in the HMFS (Figure 4). The HMFS is a source of many rivers such as Sanyajuu, Kikafu, Weruweru, Rau, Ona, Tarakea and Kikelelwa which are potential for irrigation activities down stream. The major value of the HMFS is to provide ecological services which in turn provide life line support to the people living contiguous and far from the mountain. Specific ecological values obtained from HMFS include rich natural resource base in terms of relief and drainage, climate, soils and vegetation, which jointly provide water catchment which delivers water for agriculture, hydropower and other water based utilities; medicinal and cultural benefits; bee keeping; fertile soils for agriculture; tourism; and World Natural Heritage Site.

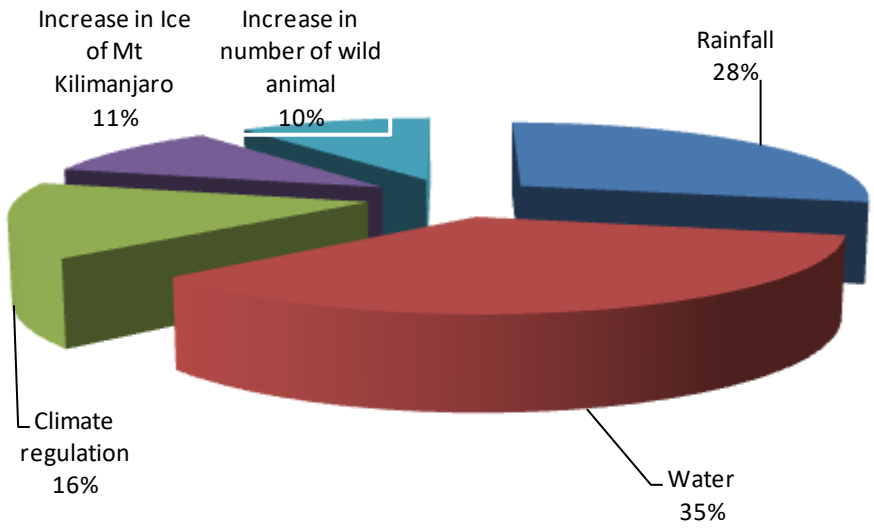

Figure 4: Ecological benefits of HMFS

It was observed that HMFS as a buffer strip has considerable dual functions of simultaneously conserving areas of ecological importance while at the same time providing various ecosystem services to adjacent local communities (Mahonge, 2010).

4.3.1 Trend in vegetation cover change in HMFS zone

Results from Global Forest Watch (GFW) show that forest cover deterioration has decreased from 47% between 2001 - 2005 to 12% between 2011 - 2014. The results tally with the statement of community that the forest cover has changed now and it is denser that it was before annexation. The community further asserts that even the route they used for entering in the park in search of fuel wood and fodder is now inaccessible. Also the number of problematic animals such as monkeys (*Colubus guereza*) and olive baboon (*Papio anubis*) has increased. The results reveal that forest management under TANAPA improved restoration taking place compared to the situation when the reserve was under

FBD. This means that TANAPA management favors more conservation than socio-economic activities of the adjacent communities.

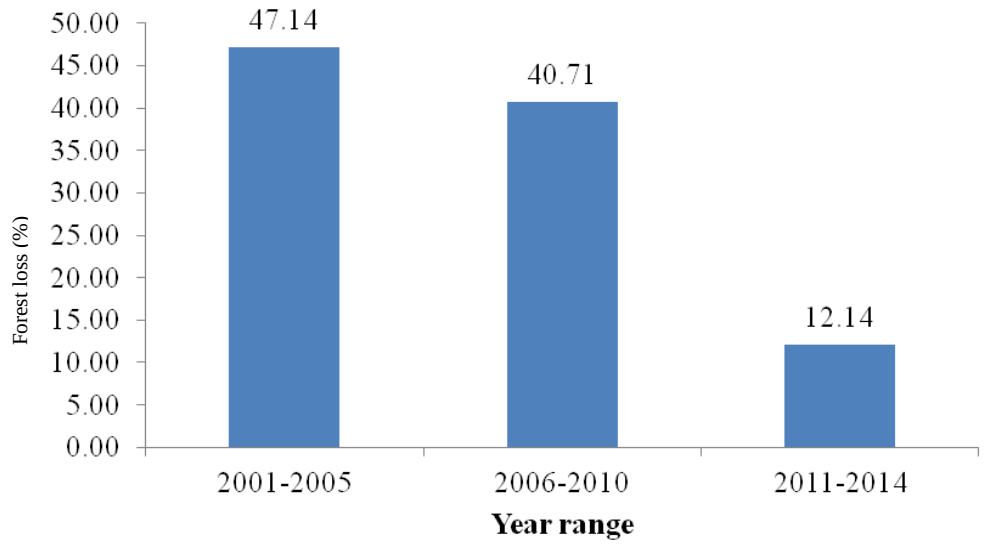

Figure 5: Trend of forest covers change

Source: Global Forest Watch Earth Google (2001 - 2014)

4.4 Local People's Perception towards the HMFS

4.4.1 Relationships between community and park management

The data on the relationship between local communities and KINAPA show that majority of the respondents' had poor relationship with the park. There was significant difference between the responses of the local people, indicating that the relationship with the park was not similar in all the villages. For example, respondents in Ngarony appeared to have good relationship with KINAPA while the majority of the other village had poor relationship. On the other hand, majority of the respondents in seven out of eight villages 87.5% claimed to have had poor relationship while few claimed to have neither good nor poor relationship. Further discussion with the respondents in Mashuba, Maharo, Marua and Nsungu villages revealed that good relationship between local people and the park was attributed to appreciation of permission to access some resources such as fuel wood

and fodder in the HMFS buffer zone given by KINAPA. The permission to resources access given by KINAPA included the water services, collection of fuel wood and fodder, and beehive installation. The 11% of respondents claimed to have had good relationship with KINAPA acknowledged that without KINAPA permission; they would be affected on their livelihoods. Majority of the (63.5%). Respondents, who claimed to have had bad with KINAPA, associated the prevailing situation with denied to access resources. Another reason was failure of KINAPA top officials to visit adjacent communities. Local communities in Lukani, Nronga, Ngarony and Kyengia believed that regular visits by KINAPA top officials could help to solve some of the problems facing the communities such as tapping water from water sources and beekeeping within the HMFS. Holmes (2003) attributed more personal contacts of a positive nature to the development of understanding and trust between wildlife staff and local communities around Katavi National Park, in West Tanzania.

Table 6: Relationships between community and park management

Relationship	**Lukani (n=30)**	**Nronga (n=30)**	**Nsungu (n=30)**	**Kyengia (n=30)**	**Marua (n=30)**	**Ngarony (n=30)**	**Maharo (n=30)**	**Mashuba (n=30)**	**Total N=240**
Good	16.7	6.7	3.3	3.3	3.3	26.7	16.7	13.5	11.275
Neither good nor poor	3.3	6.6	36.7	36.7	16.7	60	23.3	19.2	25.3125
Poor	80	86.7	60	60	80	13.3	60	67.3	63.4125
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Key: X^2=201.03df=14 P<0.001

4.4.2 Options proposed by community regarding the management of HMFS

Majority of the respondents (70.7%) proposed that HMFS should be managed together by TANAPA and community so that they can get access to the natural resource from the HMFS as it used to be. This can offer a new opportunity for KINAPA management and adjacent communities to collaborate in the management of natural resources in socio-ecological system such HMFS. Similar to the findings of Pomeroy *et al.* (2001) and Mahonge (2010), a key reason for ongoing success of co-management was found to be formal integration of the community actors and institutions such as KINAPA. However, 5% of the respondents proposed that the HMFS should be managed by TANAPA (Table 7).

Chi-square test revealed that there was significant difference ($p < 0.001$) among the respondent' opinions, the significant differences were mainly attributed to the annexation as the degree of perception differed from one village to another. Of the 83% of respondents interviewed felt that Park should be managed by KINAPA and communities they had perception that increase of rainfall and number of wild animal was due to KINAPA management accountability.

The 17% of respondents who suggested the HMFS should be managed by community based on grounds of lack of benefits from KINAPA; unfriendly relationship with park staff (Rangers); and deteriorating of local economy denied of harvesting forest products such as fuel wood, fodder and medicinal plants. Management under community could allow access to forest products such as fuel wood, fodder, honey harvesting. People at Lukani, Ngarony, Nronga and Kyengia proposed HMFS annexation to be managed by community in order to practice taungya system on which believes they can generate income to support their economy.

Table 7: Options proposed by community regarding the management of HMFS

	Village of respondent (%)								
Relationship	**Lukani (n=30)**	**Nronga (n=30)**	**Nsungu (n=30)**	**Kyengia (n=30)**	**Marua (n=30)**	**Ngarony (n=30)**	**Maharo (n=30)**	**Mashuba (n=30)**	**Total (n=240)**
The park to be managed by TANAPA	18	4	6.7	0	0	3.3	4.1	5.3	5.175
The park to be managed by community and TANAPA	75.3	79.3	72.3	68.7	66.7	60	61.2	81.9	70.675
HMFS to be managed by community	6.7	16.7	21	31.3	33.3	36.7	34.7	12.8	24.15
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Key: X^2=88.261 df=14; $p < 0.0001$

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The study results revealed that the demand for socio-economic activities before annexation of HMFS into KINAPA management was high and communities were allowed to collect fodder, fuel wood, medicinal plant, poles and beekeeping activities. Due to management change of the HMFS the finding of this study shows that the management of the HMFS was transferred to TANAPA to rescue the area from increased degradation. With the rule of total protection community are not allowed to access their socio-economic services as it used to be. This has resulted into rise of conflicts between adjacent communities and park management.

In order to understand the nature of the prevailing encounter, this study analyzes the primary effects which were essentially socio-economic and ecological. The primary effects were intensified by more strict and tight national park regulations vis-à-vis the regulation that prevailed during the FBD authority. Bearing in mind the prevailing climatic change around the world, the increasing demand for natural resources and insufficient buffer zone between village land and park area, it is clear that the HMFS can be threatened. Therefore, those problems related to boundary disputes and denied access to resources such as beekeeping, collection of fodders and fuel wood and water are likely to develop into severe clashes between KINAPA authority and adjacent communities. This is because the government has neither provided alternatives to livelihoods strategies to the local community nor accustomed some resources-use regulation. The study also revealed that regulation was softer to women who are allowed to collect fuel wood and

fodder and beekeeping activities is allowed within the forest strip, but this was done in some local community in the study area. Most of the local communities who were negatively affected by management change of HMFS were similarly poor. The poverty made these people incapable to venture into modern agriculture by utilizing small area and practicing zero grazing. Household food insecurity and loss of income are hindrances for local people to support conservation. The major value of the HMFS is to provide ecological services which in turn provide life line support to people living contiguous and far from the mountain. It was observed that HMFS as a buffer strip has considerable dual functions of simultaneously conserving areas of ecological importance while at the same time providing various ecosystem services to adjacent local communities.

5.2 Recommendations

Based on these findings, discussion held with KINAPA authorities and traditional leader, village leaders and my personal observations, the following suggestions should be observed and where possible implemented.

i. The park authority should formulate strategies for improving livelihoods of communities adjacent to essential ecosystems. Regardless of the park initiative, the park management should find a way(s) to incorporate with local communities' adjacent village in order to recover the interest of villagers in conservation and subsequently create a sense of ownership in park protection. Also effective participation of local community in policy planning and implementation for sustainable management of natural resources in protected areas.

ii. The communities surrounding KINAPA should be supported with alternative means of earning income sustainably so that they can venture into modern

agriculture by utilizing small area and practicing zero grazing. As well income generating projects such as beekeeping and butterfly projects.

iii. The communities should be encouraged to establish savings and credit facilities, to help them finance agricultural and tourist business related activities. Also eco-tourism should be affiliated to the adjacent community's by starting working safaris, cultural sites around their vicinity. Thus will minimize dependence on natural resources only.

REFERENCES

Akitanda, P.C. and Mongo, C. (2003). Unpublished Annual Report of Kilimanjaro Catchment Forest. 12pp.

Alkire, S. (2007). Choosing dimensions: the capability approach and multidimensional poverty. (Edited by Kakwani, N. and Silber, J.) *Many dimensions of poverty*. Palgrave Macmillan, New York, USA. pp. 89 – 119.

Andrade, G.S.M. and Rhodes, J.R. (2012). Protected areas and local communities: an inevitable partnership toward successful conservation strategies? *Journal of Ecology and Society* 17(4): 14.

Arjunan, M., Holmes, C., Puyravaud, J. and Davidar, P. (2006). Do developmental initiatives influence local attitudes toward conservation? A case study from the Kalakad–Mundanthurai Tiger Reserve, India. *Journal of Environmental Management* 79 (2): 188 – 197.

Bajimaya, S. (2003). Nepal's experience in participatory biodiversity conservation with emphasis on buffer zone initiatives. *Journal of Policy Matters* 12: 276 – 182.

Bennett, N. (2010). Sustainable livelihoods from theory to conservation practice: An extended annotated bibliography for prospective application of livelihoods approaches in protected area community research. 89pp.

Bonilla-Moheno, M. and García-Frapolli, E. (2012). Conservation in context: a comparison of conservation perspectives in a Mexican protected area. *Sustainability Journal* 4(9): 2317 – 2333.

Brockington, D. (2007). Forest, Community Conservation and Local Government Performance: The Village Forest Reserves of Tanzania. *Journal of Society and Natural Resources* 20: 835 – 848.

Büscher, B. and Dressler, W. (2010). Commodity conservation. The restructuring of community conservation in South Africa and the Philippines. Geoforum, [doi:10.1016/j.geoforum]. site visited on 10/06/2010.

Buttel, F.H. and Flin, W.L. (1974). The Structure of Support for the Environmental Movement 1968-1970. *Journal of Rural Sociology* 39: 56 – 58.

De Haan, L.J. (2005). How to research the changing outlines of African livelihoods. Paper presented at the 11th General Assembly of CODESRIA. Maputo. Ellis, F. 2000. *Rural Livelihoods and Diversity in Developing Countries*. Oxford University. pp. 97.

Dinerstein, E., Varma, K., Wikramanayake, E., Powell, G., Lumpkin, S., Naidoo, R. and Joldersma, D. (2013). Enhancing conservation, ecosystem services and local livelihoods through a wildlife premium mechanism. *Conservation Biology* 27(1): 14-21.

Ditiro, G., Vedeld, P. and Gombya – Ssembajjwe, W. (2008). From Forest Reserve to National Park: Change in Legal Status and Impacts on Livelihoods and Biodiversity Resources, Mt. Elgon, Uganda. Noragric Working Paper Number 44. Aas: Norwegian University of Life Sciences. 123.

Ellis, F. (2000). The determinants of rural livelihood diversification in developing countries. *Journal of Agricultural Economics* 51(2): 289-303.

FAO. (1998). Guidelines for the management of tropical forests. *Journal of wood production* (1): 135.

FORESC (1994). Deforestation in the Terai Districts 1978/79 - 1990/91. FSD Publication No. 60, Forest Research and Survey Centre (FORESC) / Forest Resource Information System Project/FINNIDA, Kathmandu.

Gardner, L.S. (2009). The use of Buffer Zone as an Adaption Measure for Anthropogenic and Climate Change Impacts in the Morne Trois Piton National Park and Morne Diablotin National Park. Technical Forum on Climate Change Adaptation in Dominica. 28pp.

Geist, H.J. and Lambin, E.F. (2002). Proximate causes and underlying driving forces of tropical deforestation. *Journal of Biological Science* 52: 143–147.

Graham, I. D., Logan, J., Harrison, M. B., Straus, S. E., Tetroe, J., Caswell, W. and Robinson, N. (2006). Lost in knowledge translation: time for a map?. *Journal of continuing education in the health professions* 26(1): 12-26.

Griffith, T. L., Sawyer, J. E. and Neale, M. A. (2003). Virtualness and knowledge in teams: Managing the love triangle of organizations, individuals and information technology. *MIS quarterly* pp. 265 - 287.

Hansen, B. (2013). "High-Resolution Global Maps of 21st Century Forest Cover Change." *Journal of Science* 342: 850–53.

Harvey, C.A., Komar, O., Chazdon, R., Ferguson, B.G., Finegan, B., Griffith, D.M., Martínez-Ramos, M., Morales, H., Nigh, R., Soto-Pinto, L., Van Breugel, M. and Wishnie, M. (2008). Integrating agricultural landscapes with biodiversity conservation in the Meso - American hotspot. *Journal of Conservation Biology* 22: 8 –15.

Hayes, T. (2006). Parks, people, and forest protection: An institutional assessment of the effectiveness of protected areas. *Journal of World Development* 34: 2065-2076.

Hennink, M.M. (2007). *International focus group research: A handbook for the health and social sciences*. Cambridge University Press.

Hill, C.M. and Weber, A.D. (2010). Perceptions of nonhuman primates in human-wildlife conflicts scenarios 72: 98 – 924.

Holmes, C.M. (2003). The influence of protected area outreach on conservation attitudes and resources use patterns: A case study from Western Tanzania 37(3): 305 – 316.

Homewood, K., Lambin, E.F., Coast, E., Kariuki, A., Kikula, I., Kivelia, J. Said, M., Serneels, S. and Thompson, M. (2001). Long-term changes in Serengeti-Mara wildebeest and land cover: pastoralism, population, or policies? *In: Proceedings of the National Academy of Sciences of the United States of America* 98: 12544 – 12549.

Hylander, K., Johnson, B.G. and Nilson, C. (1997). Evaluating Buffer Strips along Boreal Streams Using Bryophytes as Indicators. [http://.esajournals.org /esaonline/html] site visited on 26/10/2015.

Idd, S. and Blomley, T. (2009). Participatory Forest Management in Tanzania: 1993 – 2009. Lessons learned and experiences to date. Ministry of Natural Resources and Tourism. Forestry and Beekeeping Division. 71pp.

Kashenge, S.S. (1995). Catchment Management Plan for Kilimanjaro Forest Reserve. Forest Division, Tanzania. 18pp.

Katigula, M. I. L. (1992). Conservation of the Ecosystem on Mount Kilimnajaro. Reality in Experience Catchment Forests. Tanzania Catchment Forests. 97pp.

Khatun, M.U.H., Ahsan, M.F. and Røskaft, E. (2012). Local people's perception of crop raiding by common langurs (Semnopithecus entellus) and human-langur conflict in Keshabpur, Bangladesh. *American Journal of Primatology* 12 (2): 86 – 95.

Kideghesho, J.R. (2010). Wildlife Conservation and Local Land-use Conflicts in the Western Serengeto Corridor, Tanzania. *Conservation of natural resources: African /Asian Outlook.* (Edited by Gereta, E.J. and EivinRoskaft, E.). Norwegian University of Science and Technology (NTNU), Department of Biology, Realfagbygget NO 7491 Trondheim. pp. 86 – 101.

Kinabo, N.R. (2014). Stakeholder's perceptions on implication of urbanization on biodiversity: The case of Kilimanjaro National Park Dissertation 78pp.

Kivumbi, C.O. and Newmark, W.D. (1995). The History of the Half-Mile Forestry Strip on Mount Kilimanjaro. In: *The Conservation of Mount Kilimanjaro*. Awareness Drive on Mt Kilimanjaro Forest Reserve. (Edited by Newmark W). The Catchment Forestry Project. Dar es Salaam. Tanzania. pp 82 – 86.

Kremen, C., Razafimaahatratra, V., Guillery, P., Rakotomalala, J., Weiss, A. and Ratsisompatrarivo, J. (1999). Designing the Masoala National Park in Madagascar based on biological and socioeconomic data. *Journal of Conservation Biology* 13: 1055 – 1068.

Kumar, S. (2015). Dynamics of Human-Tiger Conflict in Corbett Landscape, Ramnagar Forest Division, a Current Scenario. *Asian Journal of Science and Technology* 06(10): 1925-1927.

Lambrechts, C., Woodley, B., Hemp, A., Hemp, C. and Nnyiti, P. (2002). Aerial survey of the threats to Mt. Kilimanjaro forests, UNDP, Dar es Salaam. Page, J.S. and Dowling, R.K. (2001). Ecotourism. Prentice Hall, Harlow pp. 338.

Leisher, C., van Beukering, P. and Scherl, L.M. (2007). Nature's Investment Bank: How Marine Protected Areas Contribute to Poverty Reduction. The Nature Conservancy, Arlington, USA. 89pp.

Lele, S., Wilshusen, P., Brockington, D. and Bawa, K.S. (2010). Beyond exclusion: alternative approaches to biodiversity conservation in the developing tropics. *Journal of Current Opinion in Environmental Sustainability* 2 (1): 94 – 100.

Lovett, J.C. and Poćs, T. (1993). Assessment of the Conditions of the Catchment Forest Reserves. Catchment Forest Project – FBD. 105pp.

Luoga, E.J., Kajembe, G.C., Shemweta, D.T.K., Zahabu, E. and Mwaipopo, C. (2005). Assessment of Tree Stocking and Diversity for Joint Forest Management (JFM) in Nkweshoo Village Forest Management Area, Kilimanjaro, Tanzania. *Journal of Forests Trees and Livelihoods* 15: 259 – 273.

Lusambo, L.P. (2009). Economics of Household energy in Miombo Woodlands of Eastern and Southern Tanzania. A thesis submitted in candidature for the degree of Philosophiae Doctor (in Ecological Economics). School of the Environment and Natural Resources University of Bangor LL 57 2UW. The United Kingdom. 493pp.

MacKinnon, K. (1998). Sustainable Use as a Conservation Tool in the Forests of South East Asia. *Conservation of biological resources* 174 - 194.

Mahonge, C.P. (2010). *Co-managing complex social- ecological systems in Tanzania, The case of Lake Jipe Wetland*. Environmental Policy Series 2: 47. Wageningen Academic Publishers, Wageningen. 47pp.

Mariki, S.B. (2015). Communities and conservation in West Kilimanjaro, Tanzania: Participation, costs and benefits Lokalsamfunn og naturvern I Vest-Kilimanjaro, Tanzania: Deltakelse, kostnaderognytte Department of International Environment and Development (Noragric) Norwegian University of Life Sciences. 99pp.

Martin, O. and Piatti, G. (2009). World Heritage and Buffer Zones, World Heritage Paper 25, United Nations Educational, Scientific and Cultural Organization (UNESCO). 201pp.

Mbonile, M.J. (1995). Population Mobility and Migration in Mount Kilimanjaro. In: *The Conservation of Mount Kilimanjaro.* Awareness Drive on Mt Kilimanjaro Forest Reserve. (Edited by Newmark, W.). The Catchment Forestry Project. Dar es Salaam. Tanzania. pp. 24 – 33.

Metta, C.O. (2013). Drivers and effects of human-wildlife conflicts around Saadan National Park, Tanzania. Unpublished Dissertation for Award of MSc. Degree at Sokoine University of Agriculture, Morogoro. Tanzania 186pp.

Minichiello, V. and Kottler, J. A. (Eds.). (2009). *Qualitative journeys: Student and mentor experiences with research*. Sage Publications.

Minja, G.S. (2015). Ecological and Socio-economic Implication of climate change and variability on tourism in Kilimanjaro mountain national park, Tanzania Department of Geography; Mwenge Catholic University (MWECAU), Moshi, Tanzania. *European Scientific Journal* 11(35): 1857 – 7431.

Misana, S.B. (1995). Importance of Mount Kilimajaro and the Need for its Integrated Management and Conservation. In: *The Conservation of Mount Kilimanjaro. Awareness Drive on Mt Kilimanjaro Forest Reserve*. (Edited by Newmark W). The Catchment Forestry Project. Dar es Salaam. Tanzania. pp. 103 – 110.

Nash, M.S., Wade, T.G., Heggem, D.T. and Wickham, J.D. (2006). Does an anthropogenic activity or nature dominate the shaping of the landscap in the Oregon pilot study area for 1990 – 1999? In: *Environmental Security. Desertification in the Mediterranean Region.* (Edited by Kepner, W. and Springer, G). The Netherlands. pp. 305 – 234.

Ngana, J. O. (2001). Water resources management in the Pangani River Basin: challenges and opportunities. 78pp.

Newmark, W.D., Manyanza, D.N., Gamassa, D.G.M. and Sariko, H.I. (1994). The conflict between wildlife and local people living adjacent o protected areas in Tanzania: human density as a predictor. *Journal of Conservation Biology* 8: 249 – 255.

Newmark, W.D. (2001). Conserving Biodiversity in East African Forests: A Study of the Eastern Arc Mountains. 67pp.

Njabha, L. (2011). Institutional re-arrangement on forest condition and livelihoods of communities adjacent to Kikelelwa and Nkweshoo forests, Kilimanjaro, Tanzania Unpublished, Dissertation. pp. 122.

Peter, H.K.N. and Sankhayan, P.L. (1994). Impact of Structural Adjustment Programs on natural resources use pattern at a household level in Tanzania: The case of Ulanga District. UTAFITI, *Journal of the Faculty of arts and Social sciences University of Dar es salaam*. 59– 68 pp.

Pisarenko, A. and Strakhov, V. (2004). Forest Management in Russia. From utilization to management, Jurisprudence, Moscow 551pp.

Pomeroy, R.S., Katon, B.M. and Harkes, I. (2001). Conditions affecting the success of fisheries co-management: lessons from Asia. *Marine Policy* 25: 197 – 208.

Raik, D.B., Wilson, A.L. and Decker, D.J. (2008). Power in Natural Resources Management: An Application of Theory. *Journal of Society and Natural Resources* 21(8): 729 – 739.

Sebastien, L. (2010). The Chagga people and environmental changes on Mount Kilimanjaro: Lessons to learn. *Journal of Climate and Development* 2(4): 364 – 377.

Sertel, E. and Ormeci, C. (2009). Impacts of land cover data quality on region climate Simulations. [www.Interscience.wiley.com] site visited on 18/07/2015.

Sirima, A. (2010). Protected Areas, Tourism and Human Displacement in Tanzania: Interests and Challenges behind Ruaha National park expansion. MSc. Leisure, Tourism and Environment 156pp.

Soini, E. (2006). Land use change patterns and livelihood dynamics on the slopes of Mt Kilimanjaro, Tanzania. *Journal of Agricultural Systems* 85: 306 – 323.

Sowman, M. and Wynberg, R. (2014). Governance for Justice and Environmental Sustainability [www.Interscience.wiley.com] site visited on 18/09/2016.

TANAPA (2017). Tanzania National Parks Ordinance cap 412, 1959. pp. 6 - 45.

Turyahabwe, N., Kakuru, W., Tweheyo, M. and Tumusiime, D.M. (2013). Contribution of Wetlands Resource to Household Food security in Uganda 2(5): 2048 – 7010.

URT (1994). Tanzania National Census Report. National Bureau of Statistics Government Prited, Dar es Salaam. 80pp.

Van der Kleij, C. and Simukoko, M. (2012). Women participation in Beekeeping in Zambia through the use of technological innovation: case studies 2012. SNV Netherland Development Organization. SNV Practice Brief, Issue 4.

Vedeld, P., Angelsen, A., BojØ, J., Sjaastad, E. and Kobugabe, G.K. (2007). Forest Environmental Incomes and the Rural Poor. *Journal of Ecological Economics* 9: 869 – 879.

Vedeld, P., Angelsen, A., Sjaastad, E. and Kobugabe, B.G. (2004). Counting on the Environment: Forest Incomes and the Rural Poor. Environment Economics Series Paper 98. World Bank. Washington. USA. 98pp.

Waller, J.L. (2012). How to perform and interpret Chi- square and T- tests. SAS Global Forum, Hands on Workshop.

Walpole, M., Wilder, L., Granziera, A., Thomas, D. and Elliot, J. (2007). Measuring the Impact of Livelihoods Initiatives in a Conservation Context. FFI/Birdlife International/AWF, Cambridge, UK. pp. 1- 36.

William, C.M. (2002). The Implications of Changes in Land Use on Forests and Biodiversity: A Case of Half Mile Strip on Mount Kilimanjaro, Tanzania. Working paper number 23. Department of Geography UDSM. [www.lucideastafrica.org/ publications.htm] site visited on 15/04/2016.

World Heritage Centre. (2008). Operational Guidelines for the implementation of the World Heritage Convention. United Nations Educational, Scientific and Cultural Organization (UNESCO). 163pp.

Yanda, P.Z. and Shishira, E.K. (2001). Forestry Conservation and Resource Utilization on the Southern Slopes of Mount Kilimanjaro: Trends, Conflicts and Resolutions. Dar es Salaam University Press, Dar es Salaam. 67pp.

Yurdugül, S. (2008). An evaluation of the retention of quality characteristics in fresh and freeze dried alpine strawberries. *International journal of food science and technology* 43(5): 863-869.

Zahabu, E., Eid, T., Kajembe, G., Mbwambo, L., Mongo, C., Sangeda, A., Malimbwi, R., Katani, J., Kashaigili, J. and Luoga, E. (2009). Forestland Tenure Systems in Tanzania: an Overview of Policy Changes in Relation to Forest Management 14: 6 – 24.

APPENDICES

Appendix 1: Questionnaire

Introduction

Greetings! My name is Theodora Batiho, I'm working on this research with the objective of assessing the implication Social- economic and ecological to livelihood of local communities within the Half Mile Forest Strip (HMFS) at Kilimanjaro National Park as partial fulfillment of master in Environmental and Natural Resource Economic Sokoine University of Agriculture. Data will be used for analyses and will remain confidential'.

Part A: Household identification

1. Date of interview…… 2. Contact……4. Village …….

Part B: Respondents Characteristics

1. Sex 1: Male ( ) 2: Female ( )
2. Age i) 21-30 ii) ( ) 31- 45 ( ) iii) 46-60 ( ) iv) Above 60 ( )
3. Educational level of respondent 1: No formal education ( ) 2: Primary education ( ) 3: Secondary education ( ) 4: College ( ) 5: High institution ( ) 6: Other ( )
4. Marital status 1: Single ( ) 2: Married ( ) 3: Widowed ( ) 4: Divorced ( )
5. Migration status. 1: Indigenous ( ) 2: Migrant ( )
6. Distance from the homestead to the HMFS site in Kilometer……..
7. What is your primary occupation 1: Crop cultivation 2:Livestock keeping 3: Ecotourism 4: Milk sell 5: Employment 5: Lumbering

Section C: Perception about HMFS

8. What is the relationship between community and park management 1: Good ( )
   2: Neither poor nor good ( ) 3: Poor ( )
9. Who should manage the HMFS 1:TANAPA ( ) 2: Community and TANAPA ( )
   3: Community ( )

Section D: Effect on livelihoods/livelihoods status

10. Your household has access to HMFS forest products? 1=Yes 2=No
11. If, yes what products 1: Fire wood 2: Fodders 3:beekeeping

Section E: Effects on ecological condition

15. What kind of materials did you use to get from the Forest Reserve before it became part of NP? (a)……. (b)…… (c)……(d)……

16. What is the ecological importance of conservation?

(a)…….. (b)……. (c)……..

17. What kind of energy/fuel do you use?

(a)…….. (b)……. (c)…….…..

18. Where do you get firewood? ……

19. How easy was access of the resources in the past?

a. Very easy ( ) b. Easy ( ) c. Difficulty ( ) d. Very difficulty ( )

20. How easy is it to access the said resources now?

a. Very easy ( ) b. Easy ( ) c. Difficulty ( ) d. Very difficulty ( )

21. What is the environment condition of HMSF when was under forest management

1: Very bad ( ) 2: Bad ( ) 3: Good ( ) 4: Very good

22. What is the environment condition of HMSF under TANAPA?

1: Very bad ( ) 2: Bad ( ) 3: Good ( ) 4: Very good

Section F: Effect on socio - economic activities

23. Income generating project you can perform 1:Portly 2:Fish pond 3:Stingless beekeeping 4:Non stingless beekeeping 5:Market of banana 6:Cofee 7: Milk goat 8: Cultural tourism

Checklists for Key Informants' Survey

A: Checklist for District Natural Resource Offices

1 Kindly give reasons why HMFS management was transferred to KINAPA?

2 What were the management objectives of managing HMFS under FBD?

3 What were management objectives of HMFS under TANAPA?

B: Village government and Village Natural Resource Committee

1. Please give an account for the past and current management of the HMFS under different management
2. What is the extent of community involvement in the management of the HMFS under TANAPA?
3. What are your opinions with regard to change in management of HMFS under TANAPA?

C: Key informants Village leaders, traditional leaders. Poachers witch doctors

1. What is the important of Half Mile Forest Strip to your livelihood?
2. Who should manage the Half Mile Forest Strip?
3. Conservation of the HMFS is important for supporting environments?
4. If your provided with alternative income generating activities can you stop depending on Half Mile Forest Strip resources

5. What are your opinions with regard to change in management of HMFS under TANAPA?
6. What benefits surrounding community get from new management of TANAPA?
7. What is the condition of Half Mile Strip under TANAPA?
8. Are you allowed to collect any resources from Half Mile Forest Strip?

THANK YOU FOR YOUR TIME AND COOPERATION HAVE A BLESSED DAY